



2nd International Congress on Artificial Intelligence in Medical Sciences

14-16 May 2025 Tehran-Iran

Topics

- Biomedical Data Processing
- AI in Digital Health
- Generative AI in Healthcare
- Personalized Medicine
- AI in Pharmacy
- Advanced Technologies & Medical Equipment
- Health Policy, Law & Management in AI



About the Congress

Artificial Intelligence (AI) is a central driver of innovation in global healthcare, attracting growing interest from policymakers, researchers, and technology leaders. In response, the Smart University of Medical Sciences, guided by the AIMS (Artificial Intelligence in Medical Sciences) Excellence Committee, has actively fostered research and collaboration in Artificial Intelligence in Medical Sciences.

The inaugural International Congress on Artificial Intelligence in Medical Sciences (AIMS2023), held in May 2023 on Kish Island, united leading academic institutions, research centers, and experts worldwide. Supported by the Ministry of Health and private sector partners, the congress featured a comprehensive scientific program covering:

- Advanced Medical Technologies (wearables, IoT, digital pathology, robotics, VR/AR)
- AI in Medical Sciences (biomedical data processing, bioinformatics, machine learning, P7 medicine, computational neuroscience)
- Smart Health (telemedicine, mHealth, health information systems, interoperability, data privacy)
- Smart Healthcare Solutions (clinical decision support, virtual assistants, smart hospitals, adaptive technologies)

With over 1,000 daily attendees, the event included workshops, keynote speeches, and expert panels on diverse topics such as AI policy, personalized medicine, medical imaging, AI in surgery, education, and e-health. From 484 submissions, 359 posters and 37 oral presentations were accepted. Student-led panels addressed AI challenges, basic sciences, drug and vaccine design, clinical applications, and dentistry, with awards presented to outstanding groups. The event was indexed by the World Islamic Citation Index (ISC, 02230-86438) and CiviliCa, and provided continuing education credits in accordance with national regulations.

Preceding the congress, the AI in Medical Sciences Competition promoted local expertise, technical skills, and entrepreneurship. Organized in collaboration with leading universities, it attracted over 50 participants, advancing selected teams to a second round focused on medical image processing and healthcare system challenges. Winners were honored at the closing ceremony.

Building on this success, the Second International Congress (AIMS2025), held from May 14–16, 2025, in Tehran, expanded the platform for interdisciplinary exchange, networking, and exploration of innovations, challenges, and investment opportunities in smart health technologies. Hosted by the Smart University of Medical Sciences and held alongside a specialized exhibition, AIMS2025 offered keynote lectures, oral and poster presentations, scientific panels, workshops, and the AI competition. Both in-person and virtual participation facilitated wide domestic and international engagement.

The event featured renowned speakers from top Iranian universities and international experts from Malaysia, India, France, the UK, Sweden, Australia, the United States, and



Turkey. Attendees included faculty members, healthcare professionals, specialists, medical educators, students, and researchers active in AI and health sciences. Leading up to the congress, a series of hybrid pre-congress scientific sessions took place between February 16 and May 11, 2025, addressing core themes and offering certification and professional development credits to faculty members.

The congress was indexed in the World Islamic Citation Index (ISC, 03241-42072) and CiviliCa, and granted continuing education credits in compliance with national standards. AIMS2025 also hosted specialized, hands-on workshops at the Smart University of Medical Sciences, providing participants with practical experience in AI healthcare applications.

The main scientific themes of the congress included the following areas:

- AI in Digital Health
- AI in Pharmacy
- Advanced Technologies & Medical Equipment
- Biomedical Data Processing
- Generative AI in Healthcare
- Health Policy, Law & Management in AI
- Personalized Medicine





Opening Note from the Congress President
Dr. Hassan Bakhtiary

In recent years, the rapid and extraordinary advancements in artificial intelligence have opened new horizons in the field of medical sciences. From automated disease diagnosis using machine learning algorithms to the development of intelligent clinical decision support systems; from the application of computer vision in medical imaging to the use of natural language processing in the documentation and analysis of health data—each of these breakthroughs points to a smarter and more precise future in healthcare.

Following the successful organization of the 1st International Congress on Artificial Intelligence in Medical Sciences—held in May 2023 on Kish Island, beside the azure waters of the Persian Gulf, with more than 1,000 participants and the presence of prominent national and international experts—we were honored to host the 2nd International Congress from May 14 to 16, 2025, in Tehran at the Iran International Conference Center.

This year's congress was dedicated to addressing critical themes such as:

- AI challenges and policy-making in healthcare systems
- Artificial intelligence in medical technologies and equipment
- AI in personalized medicine
- Artificial intelligence in pharmaceutical sciences
- Medical data processing
- Clinical decision support systems and smart hospitals
- AI in medical education
- Artificial intelligence in telemedicine
- Large language models in healthcare

The congress sought to present a comprehensive picture of the capabilities, challenges, and future directions of AI in medicine. Reaching this goal was made possible through the tireless dedication of the members of both the Scientific and Executive Committees, whose focused and collaborative efforts ensured the successful organization of this important event.

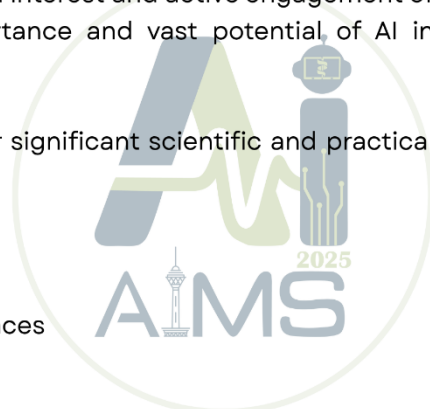
This congress served as a valuable opportunity to advance knowledge, foster innovation, and build effective collaborations among researchers and professionals in the field. The widespread interest and active engagement of leading experts—both from Iran and abroad—highlighted the growing importance and vast potential of AI in transforming healthcare systems at both national and global levels.

I sincerely hope that the outcomes of this congress will lay the groundwork for significant scientific and practical progress in the application of artificial intelligence in medical sciences.

With warm regards,

Dr. Hassan Bakhtiary

President of 2nd International Congress on Artificial Intelligence in Medical Sciences





Note from the Scientific Chair

Dr. Babak Sabet

In the Name of God

Dear Esteemed Professors, Respected Researchers, and Honorable Students,

The 2nd International Congress on Artificial Intelligence in Medical Sciences, hosted by the Smart University of Medical Sciences, served as a remarkable platform for bringing together experts, scholars, and enthusiasts in the field of artificial intelligence applications in health and medicine.

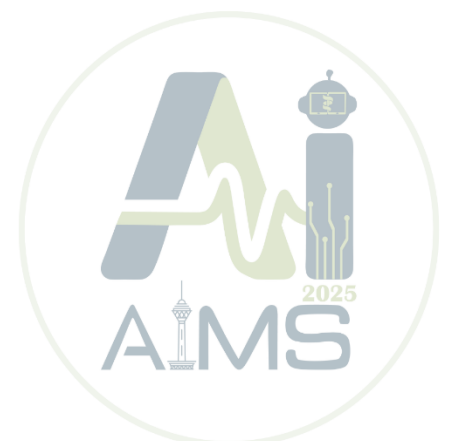
Held in Tehran from May 14 to 16, 2025, the congress welcomed the active participation of over 2,000 researchers from across the country and abroad. The sessions explored various dimensions of how AI can enhance healthcare delivery, research, and education.

Among the key outcomes of the congress were the initiation of practical applications of AI research in advancing the intelligent transformation of the health system, and the establishment of an ethics committee dedicated to guiding the responsible use of AI in healthcare settings.

The congress also served as a platform to facilitate joint collaborations between academic researchers from both the Ministry of Health and Medical Education (MOHME) and the Ministry of Science, Research and Technology (MSRT), alongside professionals from AI-related industries and infrastructure sectors.

Another highlight was the strong presence of students, who actively contributed by presenting innovative projects and startup ideas, showcasing the vibrant energy and potential of the next generation.

With the slogan “A Healthy and Intelligent Start,” the congress concluded after three inspiring days of scientific exchange and collaboration





Note from the Executive Chair

Dr.Ahmad Hashemian

In the Name of the One Who Brings Tranquility to Hearts

The overwhelming participation and enthusiastic presence of professors, researchers, and students at the Second International Congress on Artificial Intelligence in Medical Sciences left an enduring mark on the scientific and research community of our nation.

The registration of 4,300 individuals, the attendance of more than 2,000 participants, and the submission of nearly 1,000 papers clearly demonstrated the growing importance and necessity of integrating artificial intelligence into medical sciences. In light of the accelerating global advancement of cutting-edge technologies, the research findings presented at this congress—along with the valuable insights shared by national and international experts in specialized panels—constitute a significant resource and a driving force in advancing the role of AI in our country's healthcare system.

The Secretariat of the Congress remains committed to conveying the outcomes and messages of this major event to policymakers and all relevant stakeholders.

We sincerely hope that the devoted professionals and caretakers of our beloved Iran will utilize these achievements to help build a more intelligent and efficient healthcare system.

Finally, I would like to express my heartfelt appreciation to all esteemed participants and to my dedicated colleagues at the Congress Secretariat. We look forward to hosting an even more impactful Third International Congress on Artificial Intelligence in Medical Sciences in 1405 (2026).





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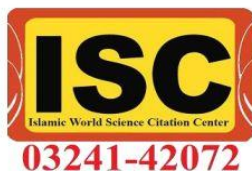


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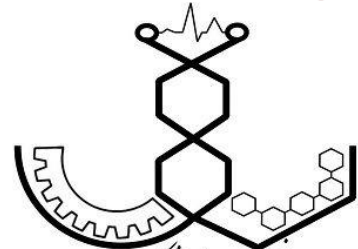
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Pre-congress events



AI Innovations in Telehealth

A series of pre-congress events for AIMS 2025

The aims:

1. Discussing the latest AI tools in telehealth
2. AI solutions into existing telehealth platforms to improve efficiency
3. Fostering collaboration among healthcare professionals
4. Discussing ways to use AI to enhance the patient experience
5. Future Trends in AI and telehealth

16 February-2025

Venue: Smart University of Medical Sciences



Dr. Farhad Fatehi
Centre for Health Services Research
University of Queensland



Dr. Asghar Ehteshami
Associate Professor,
Health Information Technology
Research Center



Dr. Seyed Farzin Mircheraghi
Head of the Educational Deputy
Gonabad University of Medical Sciences



Dr. Manuel C Gonzalez Garcia
The Australian
e-Health Research Centre

webinar link:



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9th Health Law Annual Conference

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Topics:

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25th to 27th
February, 2025



From 08:30 AM
To 04:30 PM



Registration Date : 15 Feb
Registration Link : <https://event.smums.ac.ir>



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۲۶ فروردین ماه - ۱۴۰۴

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۱. فرمولاسیون دارو
۲. مطالعات پیش بالینی
۳. مطالعات کارآزمایی بالینی
۴. توسعه صنعت دارویی در ایران
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۲۱ اردیبهشت ماه - ۱۴۰۴

اهداف:

۱. ارائه آخرین پیشرفت‌های هوش مصنوعی در پردازش تصاویر پزشکی و داده‌های بینایی انسان
۲. پردازش سیگنال‌های عصبی و مدل‌سازی محاسباتی اعصاب بینایی
۳. بررسی کاربرد یادگیری عمیق و بینایی کامپیوتر در تحلیل داده‌های بینایی
۴. بررسی نقش هوش مصنوعی در تشخیص بیماری‌های چشم (مانند رتینوپاتی دیابتی، گلوکوم و ...)



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Workshops



سلسله کارگاه‌های دومین کنگره بین‌المللی هوش مصنوعی در علوم پزشکی



۳۱ فروردین
ساعت: ۹-۱۱

کارگاه فشرده مقاله‌نویسی و ثبت اختراع با کمک هوش مصنوعی
استاد: دکتر علیرضا فیض خواه



۳۱ فروردین
ساعت: ۱۲-۱۴

پیش‌بینی خصوصیات مولکولی به کمک هوش مصنوعی
استاد: دکتر احسان ابوطالب



۱۷ اردیبهشت
ساعت: ۹-۱۱

ارتقای آموزش بیمار با ابزارهای هوش مصنوعی
استاد: دکتر حمیدرضا دهقان



۱۴ اردیبهشت
ساعت: ۹-۱۱

از ایده تا چاپ مقاله با ابزارهای هوش مصنوعی
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سلسله کارگاه‌های دومین کنگره بین‌المللی هوش مصنوعی در علوم پزشکی



۱۲۴ اردیبهشت
ساعت: ۱۰-۱۲

پردازش هوشمند تصاویر پزشکی، توصیف‌پذیری و تفسیرپذیری،
حال و آینده
استاد: دکتر عمادالدین فاطمی‌زاده



۱۲۴ اردیبهشت
ساعت: ۱۰-۱۲

معرفی ابزارهای مفید هوش مصنوعی در کل فرایند پژوهش
استاد: دکتر اعظم اصلانی



۱۲۴ اردیبهشت
ساعت: ۱۴-۱۶

مدل‌های پیش‌بینی و کارکرد آنها در سیستم‌های تصمیم‌یار
استاد: دکتر سعید اسلامی



۱۲۵ اردیبهشت
ساعت: ۱۰-۱۲

بهبود میکرو لرنینگ با هوش مصنوعی: سفری‌سازی محتوای
یادگیری غوطه‌ور برای تجربیات یادگیری بهینه
استاد: DR. Hasnain Zafar Baloch



۱۲۵ اردیبهشت
ساعت: ۱۰-۱۲

فناوری‌های شفاف، قابل اطمینان، بدون سوگیری و ایمن
در هوش مصنوعی برای پزشکی
استاد: دکتر حمیدرضا مراقب



۱۲۵ اردیبهشت
ساعت: ۱۴-۱۶

کاربرد هوش مصنوعی در رابط‌های مغز رایانه
استاد: دکتر محمدباقر شمس‌اللهی



۱۲۵ اردیبهشت
ساعت: ۱۴-۱۶

تجزیه و تحلیل تصاویر پزشکی با استفاده از یادگیری ماشینی
و یادگیری عمیق
استاد: دکتر حمید سلطانیان‌زاده



۱۲۵ اردیبهشت
ساعت: ۱۴:۳۰-۱۶:۳۰

حقوق فناوری‌های نوین در سلامت
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دکتر سید سهند عیسی‌پور، احسان لامح



۱۲۵ اردیبهشت
ساعت: ۱۶-۱۸

تصمیم‌گیری چندمعیاره هوشمند در پزشکی
استاد: دکتر محمد رضا بیک زاده



۱۲۶ اردیبهشت
ساعت: ۱۰-۱۲

کاربرد هوش مصنوعی در مدیریت مراقبت‌های بهداشتی
استاد: دکتر شهرام توفیقی

محل برگزاری کارگاه‌ها: تهران، مرکز همایش‌های بین‌المللی ایران (نورالرضا)



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اعلام نتایج مرحله مقدماتی: ۱۴۰۴/۰۲/۱۵

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۲۶-۲۴ اردیبهشت ماه ۱۴۰۴

تهران، مرکز همایش های بین المللی ایران (نورالرضا)

اهداف نمایشگاه:

- معرفی شرکت های تولید کننده و وارد کننده کالاها و محصولات با تکنولوژی هوشمند در حوزه نظام سلامت
- معرفی شرکت های استارت آپ در حوزه هوش مصنوعی
- معرفی دستاوردهای دانشگاه های علوم پزشکی در تولید محصولات با محوریت هوش مصنوعی در علوم پزشکی
- بستر سازی برای معرفی و حمایت از محصولات و ثبت شرکت دانش بنیان به صورت حضوری در محل برگزاری نمایشگاه
- شبکه سازی بین پژوهشگران و صنعتگران صنعت هوش مصنوعی در حوزه نظام سلامت
- اهدای تندیس یاد بود کنگره به تمامی غرفه های شرکت کننده در نمایشگاه
- اهدای تندیس و جایزه ویژه کنگره به محصولات کاربردی برتر در صنعت هوش مصنوعی در علوم پزشکی

محورهای نمایشگاه:

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Wednesday, May 14, 2025

Session 1 (08:30 – 10:00)

Chair of the Panel: Dr. Amirhossein Takian

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Challenges and Policies of AI in the Healthcare System	Dr. Amirhossein Takian	Academic Panel Discussion on Challenges and Policies of Artificial Intelligence in the Healthcare System (Open Questions and Interactive Discussion)	08:30 – 08:50
		Dr. Rassoul Dinarvand		08:50 – 09:10
		Dr. Mohammad Raeeszadeh		09:10 – 09:25
		Dr. Shahriar Eslamitabar		09:25 – 09:40
		Dr. Sevilay Ucar Yüzbaş		09:40 – 09:55

Wednesday, May 14, 2025

Session 2 (10:30 – 12:00)

Chair of the Panel: Dr. Hamid Reza Marateb

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Artificial Intelligence in Medical Technologies and Equipment	Dr. Hamid Reza Marateb	FAIR: Frameworks for AI Integration and Regulation in Medical Devices	10:30 – 10:45
		Dr. Hadi Digaleh	Overcoming Bone-Induced Imaging Challenges: AI-Powered Segmentation of Brain Vasculature and Adjacent Tumors Using Contrast-Enhanced and Non-Contrast CT Data	10:45 – 11:00
		Dr. Seyed Ahmad Ahmadi	Health Policy for the Optimal Deployment of Artificial Intelligence in Medical Technologies and Equipment	11:00 – 11:15
		Dr. Hamid Behroozi	The Role of the Mobile Communications Company of Iran (MCI) as a Smart Infrastructure Technology Provider	11:15 – 11:30
		Eng. Omid Shafeie Zadeh	Tomorrow's Lifesaving Devices Demand Reliable AI Today: A Call to Action for the Medical Device Industry	11:30 – 11:45
		Dr. Andrew A. Gumbs	Artificial Intelligence and the Perspective of Autonomous Actions	11:45 – 12:00

Wednesday, May 14, 2025

Session 3 (13:30 – 15:00)

Chair of the Panel: Dr. Seyed Javad Mowla

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Artificial Intelligence in Personalized Medicine	Dr. Seyed Javad Mowla	Integration of Spatial Single-Cell Landscapes to Guide Personalized Oncology	13:30 – 13:50
		Dr. Dariush Farhud	Artificial Intelligence and Ethics: Challenges and Solutions	13:50 – 14:10
		Dr. Kaveh Kavousi	Integration of Spatial Single-Cell Landscapes to Guide Personalized Oncology	14:10 – 14:25
		Dr. Marjan Mansourian	Artificial Intelligence in Personalized Medicine: Risk Assessment for Disease Onset	14:25 – 14:40
		Dr. Changiz Eslahchi	Complex Matrix Comb: Predicting Drug Combination Doses for IC50 Using Complex Numbers and Matrix Factorization	14:40 – 14:55

Thursday, May 15, 2025

Session 1 (08:10 – 09:40)

Chair of the Panel: Dr. Farshad Hosseini Shirazi

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Artificial Intelligence in Pharmacy	Dr. Farshad Hosseini Shirazi	Intelligence & Pharmacy	08:10 – 08:40
		Dr. Younes Ghasemi	Pharma 4.0: the future of pharmaceutical manufacturing	08:40 – 09:00
		Dr. Sajjad Gharaghani	Drug Discovery Process: From Classical Methods to New AI Techniques	09:00 – 09:20
		Dr. Fahimeh Ghasemi	Computational Drug Design Based on Natural Language Processing	09:20 – 09:40

Thursday, May 15, 2025

Session 2 (10:00 – 12:00)

Chair of the Panel: Dr. Hamid Soltanian-Zadeh

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Biomedical Data Processing	Dr. Mohammad Bagher Shamsollahi	Machine learning models for biomedical signal processing	10:00 – 10:20
		Dr. Mohammadreza Momenzadeh	Breast cancer prediction using sequential pattern analysis in gene expression data	10:20 – 10:40
		Dr. Emad Fatemizadeh	Foundation models in medical image processing and analysis	10:40 – 11:00
		Dr. Hamid Soltanian-Zadeh	Neuroimage Analysis Using Artificial Intelligence Techniques	11:00 – 10:20
		Dr. Ram Bilas Pachori	AI-based computer-aided medical diagnosis of neurological disorders	11:20 – 11:40
		Q & A and Panel Discussion		11:40 – 12:00

Thursday, May 15, 2025

Session 3 (13:00 – 14:30)

Chair of the Panel: Dr. Saeid Eslami Hasanabadi

Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Clinical Decision Support Systems and Smart Hospitals	Dr. Ehsan Nabovati	From Concept to Impact: How to Evaluate AI-Based Clinical Decision Support System Projects in Medicine	13:00 – 13:10
		Dr. Sharareh Rostam Niakan Kalthori	Large Language Models in Clinical Decision Support: Opportunities and Challenges	13:10 – 13:20
		Dr. Mohammad Reza Afrash	Transparency and Interpretability in Clinical Decision Support Systems: Challenges, Solutions and Practical Experiences in Clinical Adoption	13:20 – 13:30
		Dr. Mustafa Ghaderzadeh	AI at the Heart of Smart Hospitals: Real Case Studies and Impactful Implementations	13:30 – 13:40
		Dr. Hanieh Zehtab Hashemi	Adoption Models of Clinical Decision Support Systems (CDSS): Key Factors and Strategie	13:40 – 13:50
		Dr. Saeid Eslami Hasanabadi	Artificial Intelligence-Based Clinical Decision Support: Requirements and Challenges Based on Practical Experiences in Iran	13:50 – 14:00
		Q & A and Panel Discussion		14:00 – 14:30

Thursday, May 15, 2025				
Session 4 (15:00 – 17:00)				
Chair of the Panel: Dr. Soleiman Ahmady				
Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Artificial Intelligence in Medical Education	Dr. Soleiman Ahmady	Academic Panel Discussion on Artificial Intelligence in Medical Education (Open Questions and Interactive Discussion)	15:00 – 15:20
		Dr. Hasnain Zafar Baloch		15:20 – 15:35
		Dr. Arkadiusz Jawian		15:35 – 15:50
		Dr. Babak Sabet Divshali		15:50 – 16:00
		Dr. Abtin Heidarzadeh		16:00 – 16:15
		Dr. Mahdi Aghabagheri		16:15 – 16:25
		Dr. Ebrahim Kalantar Mehrjardi		16:25 – 16:35
		Dr. Ehsan Toofaninejad		16:35 – 16:45
		Dr. Javad Rasti		16:45 – 16:55
Friday, May 16, 2025				
Session 1 (08:10 – 09:40)				
Chair of the Panel: Dr. Reza Golpira				
Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Artificial Intelligence in Telemedicine	Dr. Azam Aslani	Panel Introduction and Audience Expectations	08:10 – 08:15
		Dr. Reza Golpira	The Initial Development and Implementation of Telemedicine in the Iranian Health System	08:15 – 08:30
		Dr. Hassan Bakhtiary	General University Policies on Telemedicine	08:30 – 08:40
		Dr. Kambiz Bahaadinbeigy	Factors Contributing to the Success of Telemedicine in Australia	08:40 – 08:55
		Dr. Batool Mehrshad	Artificial Intelligence and Telemedicine: Ethical, Legal, and Regulatory Challenges in the Age of Technology	08:55 – 09:10
		Dr. Asghar Ehteshami	Factors Influencing the Implementation of Telemedicine in Iran	09:10 – 09:25
		Dr. Anthony Smith	The Future of Telemedicine with Artificial Intelligence	09:25 – 09:45
			Panel Summary	09:45 – 09:50
Friday, May 16, 2025				
Session 2 (10:00 – 11:30)				
Chair of the Panel: Dr. Hamid R. Rabiee				
Caspian Hall	Title of the Panel	Panel Members	Presentation Title	Time
	Large Language Models in Healthcare	Dr. Hamid R. Rabiee	Panel Introduction	10:00 – 10:05
		Dr. Behrouz Minaei-Bidgoli	Using LLMs to Improve Medical Data Mining	10:05 – 10:25
		Dr. Nasser Mozayani	A Specialized RAG for Diabetic Patients	10:25 – 10:45
		Dr. Mohammad Reza Beikzadeh	Revolutionizing Rehabilitation with Generative AI (LLM): Advancing Research, Development, Education, and Industry Applications	10:45 – 11:05
			Q & A and Panel Discussion	11:05 – 11:30



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G-1001

Sperm screening with neural networks model

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Abstract:

Background and Aims: Infertility affects around 30 to 40 percent of men and is a significant concern for couples. Intracytoplasmic sperm injection (ICSI) is a leading treatment method for infertility. The accuracy of sperm selection in ICSI depends on embryologists' expertise, leading to potential errors. Current sperm analysis methods follow WHO guidelines and depend on lab technicians' skills, resulting in variability and errors. Some studies have utilized the ResNet-50 neural network model for human sperm screening, aiming to improve the success rate of ICSI by using healthy sperm. This study focuses on "Sperm Screening with Neural Network Models" to enhance the ICSI process.

Methods: Research data was gathered by reviewing articles on Google Scholar, PubMed, Web of Science, and Scopus, focusing on "neural network, male infertility, sperm screening." Inclusion criteria involved articles on increasing fertility and sperm screening using neural networks. Data extraction involved screening article titles and abstracts by two researchers, extending to full-text articles when necessary.

Results: In reviewed articles, a dataset categorized sperm into healthy and unhealthy types after pre-processing. Image pre-processing consisted of three stages: noise removal using a median filter, image normalization to adjust pixel intensity, and data augmentation to enhance image quality and model accuracy. The proposed model achieved a 96.66% accuracy rate, effectively identifying healthy sperm.

Conclusion: Incorporating neural networks and artificial intelligence to boost fertility rates shows promise. Utilizing a deep learning model like ResNet-50 for accurate detection of healthy human sperm with nearly 100% accuracy proved successful. This model is efficient in identifying healthy sperm, potentially improving the success of sperm injection into eggs and enhancing pregnancy rates. With simplified pre-processing steps, the model provides quick and accurate results, simplifying sperm injection procedures for andrologists.

Keywords: Screening, Male Infertility, Sperm, Neural Network

G-1002

A Review on the Prediction of Metastasis in Ewing's Sarcoma Patients Using Machine Learning Techniques

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Abstract:

Background and Aims: This study aimed to develop and validate machine learning-based predictive models for assessing metastatic risk in Ewing sarcoma (ES) patients. Serving as a valuable resource for physicians, the research aimed to streamline clinical processes. The risk prediction model, based on machine learning algorithms, holds promise for enhancing patient outcomes and quality of life.

Methods: Through a comprehensive review of articles on platforms like Google Scholar, PubMed, Web of Science, and Scopus using keywords like neural network, Ewing sarcoma, and metastasis, data collection focused on articles pertaining to metastasis diagnosis and prediction in ES using neural networks. Data extraction initially involved screening article titles and abstracts by three researchers, and, when necessary, extended to full-text articles.

Results: Among studies on ES metastasis, two focused on predicting lung metastasis (LM) and lymph node metastasis (LNM) in ES patients. SEER data and information from four medical centers in China were utilized to train and evaluate these models. The LM study, involving 980 ES patients with 18.8% having lung metastasis, identified the Random Forest (RF) model as the top predictor with an AUC of 0.705, leading to the development of an online tool. The LNM study, encompassing 974 ES patients with 135 having confirmed or evaluated lymph node metastasis, highlighted race, T stage, M stage (stages of metastasis), and lung metastasis as independent LNM predictors. Six models were developed, with the RF model showcasing superior performance, with an average AUC increase from 0.705 to 0.764 compared to the other models. Web-based calculators were created for each prediction model to aid physicians in decision-making for ES patients.

Conclusion: Machine learning proves advantageous in predicting cancer spread to lymph nodes in ES patients, with the RF model demonstrating superior performance. Accessible as a web tool, the prediction model presents opportunities to enhance personalized treatment for Ewing sarcoma patients. By leveraging clinicopathological data, physicians can promptly identify lymph node involvement in Ewing sarcoma. The efficacy of the risk prediction models, particularly the RF model in this study, stands out

Keywords: Neural network, Ewing sarcoma, Metastasis

G-1003

Application of Artificial Intelligence to Develop Personalized Healthcare with a Focus on Cardiovascular Disease

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Abstract:

Background and Aims: Cardiovascular diseases (CVDs) are a leading cause of mortality worldwide, presenting significant challenges for healthcare systems. Personalized healthcare aims to tailor medical treatments to individual patients based on genetic, lifestyle, and environmental factors. However, its widespread adoption has been hindered by data complexity and the need for advanced computational models. This study aims to explore the application of machine learning (ML) in the development of predictive models for stratifying CVD risk and providing personalized drug recommendations.

Methods: Research data was gathered by reviewing articles from Google Scholar, PubMed, Web of Science, and Scopus. The focus was on studies exploring neural networks, cardiovascular diseases, drug recommendations, and feature selection. The studies involved the use of various AI and ML techniques to enhance cardiovascular disease risk stratification and drug recommendations. A variety of datasets, including multi-center and large-scale patient data, were utilized in these studies for model validation.

Results: This study introduces a framework called DPDRF, which leverages data science and machine learning, along with a novel feature selection algorithm, EG-HFS, to improve the accuracy of CVD predictive models. The DPDRF framework demonstrated 96.23% accuracy in predicting absolute CVD risk using a publicly available dataset. The results highlight AI's potential to enhance early diagnosis and personalized treatment, improving CVD management.

Conclusion: The integration of data science and ML into CVD prediction and drug recommendation represents a promising approach for personalized healthcare. The DPDRF framework offers significant potential to improve patient outcomes by aiding early diagnosis and

providing personalized care strategies. Further research and model development are necessary to refine these systems for broader clinical application.

Keywords: Artificial Intelligence, Cardiovascular Disease, Machine

G-1005

The effect of artificial intelligence on the prevention of medication errors

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Abstract:

Background and Aims: Medication errors are a crucial concern in healthcare workers, leading to adverse patient outcomes, increased healthcare costs, and diminished trust in medical systems. AI encompasses various technologies, including machine learning, natural language processing, and predictive analytics which can be integrated into medication management systems to reduce errors at multiple stages of the medication process. This article explores the impact of AI on medication error prevention, examining its applications, benefits, challenges, and future directions.

Methods: This study deals with the role of artificial intelligence tools in reducing the incidence of medication errors. A thorough search of databases such as PubMed, Scopus, and Web of Science, as well as the Google Scholar search engine, was used to gather relevant articles on this topic.

Results: AI can help health workers, providing safer care, by reducing medication errors at different stages. Clinical decision support systems (CDSS) powered by AI analyze patient data and provide real-time recommendations based on evidence-based guidelines. For example, AI algorithms can flag potential drug interactions, allergies, or contraindications before a prescription is finalized. It can also enhance the administration phase of medication management. Smart infusion pumps equipped with AI algorithms can adjust dosages based on real-time patient data, ensuring that patients receive the correct amount of medication. Furthermore, AI-driven mobile applications can remind nurses about medication schedules and provide information about potential side effects or interactions. AI streamlines workflows, allowing healthcare professionals to focus more on patient care rather than administrative tasks. Also, AI systems can analyze vast amounts of data to identify patterns and trends related to medication errors, enabling healthcare organizations to implement targeted interventions.

Conclusion: Artificial intelligence has the potential to significantly reduce medication errors through enhanced accuracy, efficiency, and personalized care. While challenges remain in its implementation and integration into existing systems, the benefits of AI-driven solutions are clear. As healthcare continues to embrace technological advancements, leveraging AI for medication error prevention will be crucial in improving patient safety and outcomes.

Keywords: Medication Error, Artificial Intelligence, Patient Safety



G-1006

Preoperative Application of Artificial Intelligence in Breast Cancer Surgery: A systematic review

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Abstract:

Background and Aims: Breast cancer is the most frequent cancer and the second leading cause of cancer-related death among women all over the world [1]. The surgical approach to treating breast cancer has undergone significant transformation over time [2]. Artificial intelligence algorithms can refine surgical approaches and predict patient-specific outcomes [3]. This review aims to investigate the potential preoperative applications of AI in breast cancer surgery.

Methods: We conducted the current systematic review in accordance with the PRISMA guidelines [4]. We conducted a systematic search of the PubMed, Web of Science, and Scopus databases from inception to February 2024. Original articles examining the preoperative application of AI, such as machine learning and deep learning in breast cancer surgery, were included.

Results: The search yielded 703 articles, of which 39 studies were included in this systematic review. 13 different types of AI applications were identified, including breast volume assessment (n = 1; 2.33%), breast tumor segmentation (n = 9; 20.93%), survival prediction (n = 2; 4.65%), breast tissue classification (n = 7; 16.28%), breast symmetry evaluation (n = 1; 2.33%), tumor recurrence prediction (n = 8; 18.60%), tumor dislocation prediction (n = 1; 2.33%), pathological complete response (pCR) prediction (n = 2; 4.65%), tumor margin prediction (n = 2; 4.65%), tumor grading (n = 1; 2.33%), neoadjuvant chemotherapy (NAC) response prediction (n = 5; 11.63%), imaging analysis (n = 3; 6.98%), and breast shape classification (n = 1; 2.33%).

Conclusion: Artificial intelligence is poised to play an increasingly important role in optimizing surgical care for breast cancer patients. By assisting with preoperative planning, intraoperative decision-making, and postoperative assessment, AI-based tools have the potential to improve oncologic outcomes, reduce surgical morbidity, and enhance the overall quality of breast cancer surgery. These technologies may become an integral part of the modern breast cancer surgeon's toolkit as they continue to mature and validate in clinical trials. Further exploration and validation of these techniques are still needed.

Keywords: Breast Cancer Surgery, Artificial Intelligence, Preoperative

G-1007

Predicting Type 2 Diabetes Mellitus Risk Using a Random Forest Approach

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Abstract:

Background and Aims: Type 2 Diabetes Mellitus (T2DM) is a major risk factor for cardiovascular diseases and is widely recognized as a significant clinical and public health issue. Early diagnosis can help mitigate the impact of the disease. This study aimed to present a simple model for predicting T2DM using the Random Forest method, which can be utilized in telemedicine devices and mobile applications.

Methods: In this study, we selected the Random Forest classifier as our predictive model. The Random Forest algorithm is an ensemble learning technique that builds multiple decision trees during training and makes predictions by selecting the most frequent class for classification or averaging the predictions of individual trees for regression. Using this model, we investigated various health-related factors and their interactions to classify diabetes accurately. We identified the most important features for predicting diabetes using the Random Forest model. The importance of each feature was measured by how much it reduced uncertainty in the decision-making process across all trees in the model. These features included factors such as age, gender, Body Mass Index (BMI), HbA1c level (a measure of average blood sugar over time), and blood glucose level. Additionally, other relevant features included family history of diabetes, blood pressure, cholesterol levels, lifestyle factors such as physical activity and diet, and any other medical conditions or biomarkers that may influence the likelihood of developing diabetes.

Results: The model achieved an accuracy of approximately 95%, with a precision of 0.98 for class A (non-diabetic) and 0.7 for class B (diabetic). Additionally, it correctly recalled 96% of non-diabetic cases and 80% of diabetic cases. The relatively high accuracy, along with balanced performance across both classes, suggests that the model is well-calibrated and robust.

Conclusion: The results indicate that T2DM can be predicted using a decision tree model without the need for laboratory tests. Therefore, this model could be applied in pre-clinical and public health screening programs.

Keywords: Classification, Decision Tree, Diabetes, Random Forest

G-1008

Development of a Web Application for Enhanced Breast Cancer Detection Using Deep Learning and Ensemble Models

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Abstract:

Background and Aims: Breast cancer represents about 25% of all cancer cases in women, with 1.7 million diagnoses annually, making early detection crucial for improving survival rates. Mammography, while being the gold standard for screening, has limitations, particularly in women with dense breast tissue. Artificial Intelligence (AI), specifically Deep Learning (DL), has shown potential in improving breast cancer detection by providing more accurate and consistent interpretations. This study aims to compare various deep learning algorithms for breast cancer detection and explore their potential to enhance mammography quality.

Methods: This study utilized the CBIS-DDSM and Breast-Cancer-Classification datasets to evaluate multiple deep learning models, including VGG16, InceptionV3, DenseNet121, Xception, EfficientNet, MobileNetV2, and Vision Transformer (ViT). The models were pre-trained on the ImageNet dataset and further fine-tuned for binary classification (benign or malignant). The study also integrated data augmentation techniques like random flips, rotations, and translations to improve model robustness.

Results: The Vision Transformer (ViT) achieved the highest accuracy of 86.11% on the CBIS-DDSM dataset and 95.66% on the Breast-Cancer-Classification dataset. The ensemble model with multi-head attention achieved an overall accuracy of 96.24%. The integration of transfer learning with pre-trained models significantly improved classification performance.

Conclusion: Deep learning models, especially the Vision Transformer and ensemble methods, hold great promise for improving breast cancer detection. The use of multi-head attention mechanisms further enhances model performance by focusing on critical image regions. Future research should focus on integrating these models into clinical workflows and improving their interpretability to assist radiologists in making informed decisions.

Keywords: Real-Time Diagnosis, Healthcare Application, Deep Learning

G-1010

Artificial Intelligence in Surgical Planning: Optimizing Approaches for Humans and Animals

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Abstract:

Background and Aims: This study examines the role of Artificial Intelligence (AI) in optimizing surgical planning in both human medicine and veterinary medicine, focusing on recent advancements, challenges, and future opportunities.

Methods: A systematic review was conducted on 40 studies published between 2015 and 2023. The studies included experimental research, case studies, and comparative studies. Studies were evaluated using PRISMA criteria, and data were analyzed using qualitative content analysis.

Results: Findings showed that AI implementation led to significant improvements in diagnostic accuracy (mean 93.5%) and reduction in image interpretation time (mean 45%). AI-driven simulations resulted in a 40% improvement in surgical outcome prediction and a 35% reduction in post-operative complications. In veterinary medicine, a 50% improvement in implant placement accuracy and a 40% increase in early tumor detection rates were observed. 80% of studies indicated potential for knowledge transfer between human and veterinary medicine.

Conclusion: AI demonstrates significant potential to revolutionize surgical planning in both human and veterinary medicine. Key challenges include the need for high-quality data, privacy concerns, and the requirement for more extensive clinical evaluations. Future research should focus on developing more transparent algorithms, improving data quality, and conducting comprehensive clinical studies.

Keywords: Artificial Intelligence, Surgical Planning, Comparative Medicine

G-1016

Artificial Intelligence-based Approaches to Assess Dietary Patterns: A Systematic Review

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Abstract:

Background and Aims: The development of artificial intelligence has provided new opportunities for research in the field of nutrition science. This article was done with the aim of reviewing and comprehensively examining studies related to the field of diet and food patterns that have used artificial intelligence techniques and machine learning algorithms.

Methods: All studies published until June 2023 were searched using PubMed Cochrane, EMBASE and SCOPUS databases and with related keywords. No time and language restrictions were applied during the search.

Results: After a complete review of the articles, 31 relevant articles were selected that were consistent with the purpose of the present study. Different machine learning methods have different accuracy in predicting food patterns. For example, the intelligent neural network is more accurate in predicting healthy food index quintiles, while it is more accurate in decision tree meals. Another application of machine learning is extracting food patterns and investigating their relationship with various diseases such as obesity, heart disease, stroke, risk of death from cardiovascular disease and cancer. Also, some machine learning methods, such as decision trees, are able to provide models for predicting adherence to different diets, such as the Mediterranean diet.

Conclusion: Different artificial intelligence methods can help to better understand food patterns related to chronic diseases. The most important algorithms in the study of food patterns are decision tree, random forest, K-means, K-nearest neighbor, regression methods, support vector machine and intelligent neural network. These methods can help to better understand dietary patterns associated with chronic diseases by categorizing and finding hidden associations between groups and foods. More studies are needed in this area to better understand these connections.

Keywords: AI, Machine learning, Nutrition, Food pattern

G-1017

Integrating Artificial Intelligence with 3D Printing Technology: A Revolution in Medical Devices

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Abstract:

Background and Aims: Three-dimensional (3D) printing technology is an advanced manufacturing method that enables the creation of complex structures layer by layer from digital models. Unlike traditional manufacturing techniques, which rely on subtractive or molding processes, 3D printing offers advantages such as customization, increased production speed, cost-effectiveness, and reduced material waste. Given the rising prevalence of chronic diseases and aging populations, healthcare expenditures are increasing globally. Optimizing the production of medical devices through cost-effective and efficient methods can significantly impact healthcare by reducing treatment costs, improving patient outcomes, and promoting a more sustainable healthcare system.

Methods: This study reviews the potential of 3D printing in the medical field, focusing on its integration with Artificial Intelligence (AI) and the Internet of Medical Things (IoMT). The role of these technologies in enhancing the design, production, and application of biomedical devices is examined. Additionally, the impact of AI-powered data analysis and IoMT-enabled real-time monitoring on personalized patient care is explored.

Results: The findings suggest that integrating 3D printing with AI and IoMT enhances the functionality and efficiency of medical devices. IoMT facilitates real-time data collection and remote health monitoring, while AI-driven analytics improve diagnostic accuracy and enable personalized treatment strategies. This combination has the potential to revolutionize medical device manufacturing, leading to more accessible, cost-effective, and high-performance healthcare solutions.

Conclusion: Despite existing challenges, the convergence of 3D printing, AI, and IoMT is expected to play a crucial role in the future of biomedical device development. These technologies collectively improve the design, production, and functionality of medical devices, ultimately enhancing patient care and healthcare sustainability.

Keywords: 3D printing, Artificial Intelligence, Biomedical Devices

G-1021

Medical imaging using mobile health technology: A review studyNastaran Dezhgam^{1*}

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Abstract:

Background and Aims: Mobile health (m-Health), as a subset of electronic health and the most significant technological advancement in modern times, is considered a means to provide healthcare services, including in the field of medical imaging, through mobile communication devices. The aim of this review study is to examine medical imaging utilizing m-Health technology.

Methods: This review study was conducted in 2024. PubMed, Google scholar and Scopus databases were searched using the keywords imaging, medical imaging, companion health, companion health in medical imaging. Articles that were published between 1990 and 2024 were extracted and after careful study and extracting the required information, this information was reported in the present study.

Results: A total of 26 articles were collected in this study. By removing irrelevant articles, finally 20 articles were examined. Recent studies have shown that mobile applications create extensive opportunities as an auxiliary tool in m-Health for medical imaging. Despite the numerous advantages of using mobile health and mobile applications, including mobile communications, wireless technology, facilitating service delivery, portability and powerful computing, its development faces fundamental safety and technical challenges. These challenges include the insufficient capacity of phones to carry radiology images, the lack of timely and quality activation of images, the inability to perform high-quality 3D imaging, and the transfer of images in a safe and secure environment. On the other hand, despite the positive acceptance of this technology and its widespread popularity, the knowledge regarding the use of medical imaging applications and the level of usage of mobile applications, especially WhatsApp in medical imaging among medical imaging students is very limited.

Conclusion: With the increasing use of mobile phones for medical imaging, it is essential to take measures to obtain informed consent from patients, protect patient privacy, utilize reliable information sources, use a standard format for information transfer, and apply security measures (including password policies, methods to counteract unsuccessful login attempts, and the implementation of network administrator-controlled passwords). Also, for the wide use of these applications by students, written training should be included in their educational programs.

Keywords: Imaging, Medical, m-Health, Health

G-1022

MedSAM: Revolutionizing Medical Image Segmentation with Advanced Deep Learning

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Abstract:

Background and Aims: MedSAM, or Medical Segment Anything Model, is a pioneering deep learning framework designed to enhance medical image segmentation across various modalities. Traditional segmentation methods often cater to specific imaging types and lack generalizability. MedSAM aims to bridge this gap by providing a universal model capable of segmenting diverse anatomical structures and lesions, thus facilitating accurate diagnosis and treatment planning. It is anticipated that by leveraging extensive training on a comprehensive dataset, MedSAM will outperform existing models in accuracy and versatility.

Methods: The development of MedSAM involved training on a large-scale dataset consisting of 1,570,263 image-mask pairs, which cover over 30 cancer types and 10 imaging modalities. This extensive dataset allows the model to learn a rich representation of diverse medical images, capturing a wide array of anatomical structures and pathological conditions. Comprehensive evaluations were conducted across 86 internal and 60 external validation tasks, utilizing metrics like the Dice Similarity Coefficient (DSC) to assess performance.

Results: MedSAM demonstrated remarkable performance across multiple segmentation tasks, achieving median DSC scores of 87.8% in nasopharynx cancer segmentation. This score significantly surpasses traditional models like U-Net and DeepLabV3+, which typically report scores around 75-80% for similar tasks. MedSAM also excelled in segmenting other challenging targets such as liver tumors and cervical cancers. For liver segmentation, it achieved a DSC of 90.5%, showcasing its ability to delineate structures with indistinguishable boundaries effectively. The model's adaptability was further illustrated through its application in various imaging modalities, including MRI, CT scans, and PET scans. In quantitative analyses, MedSAM exhibited a Pearson correlation of 0.99 in tumor burden quantification compared to expert evaluations, indicating a high level of agreement with clinical assessments. Moreover, the model also demonstrated efficiency in processing time, making it suitable for real-time applications in clinical workflows.

Conclusion: MedSAM represents a substantial advancement in medical image analysis, offering clinicians enhanced diagnostic accuracy and personalized treatment options. Its ability to generalize across various imaging modalities, positions it as a transformative tool in clinical settings, streamlining workflows and improving patient outcomes.

Keywords: MedSAM, Medical Image Segmentation, Cancer

G-1023

Using a new method in deep learning for early detection of various cancers

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Abstract:

A convolutional neural network is a special type of multilayer neural network that processes data with a grid-like arrangement and then extracts important features from it. A major advantage of using CNNs is that there is no need for large-scale preprocessing of the images. Artificial intelligence, especially deep learning, has had a tremendous impact on medical science, and in this article, we have discussed a new method in deep learning in order to identify types of cancers early.

Background and Aims: This article has been done in a scientific research method using the Python programming language in Google Colab. Our goal is early diagnosis of all types of cancers with a special deep learning method through CT scan and MRA image processing, and in the next step, these images are classified into patients and healthy people. In the treatment of cancers, the most important thing is the accurate and early diagnosis of cancer, which we have achieved in this article.

Methods: Our method in this paper is to use the Yolov8 method in deep learning. After detecting the presence or absence of tumor in medical images, using classification models, these images are divided into patients and healthy people. All coding of this artificial intelligence model has been done using Python programming language.

Results: We studied the articles of other researchers and then we found a suitable model for processing lung images. The accuracy of this model is more than 93% on new images, which shows the proper functioning of this neural network.

Conclusion: In the last stage of our article, we expressed the future challenges in using neural networks to diagnose cancers and suggestions for other researchers in the field of artificial intelligence and neural networks. The use of the right model in the neural network, the right data, augmentation, etc. are among the most important reasons that made our neural network perform so well.

Keywords: Cancer, Lung cancer, AI, Neural network

G-1024

Predicting Treatment Outcomes in Sudden Sensorineural Hearing Loss: A Logistic Regression Approach

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Abstract:

Background and Aims: The increasing interest in predicting outcomes from clinical treatments has underscored the importance of accurate prognostication in improving patient care. Sudden Sensorineural Hearing Loss (SSNHL) often necessitates urgent medical intervention, and timely recognition and management can significantly enhance auditory recovery and quality of life for affected individuals. This study aimed to utilize logistic regression to predict treatment outcomes in patients with SSNHL.

Methods: Data were collected from the medical records of patients diagnosed with SSNHL at Qaem Hospital in Mashhad, Iran, from December 2010 to December 2020. Patients received systemic and intratympanic steroid treatments. Demographic information, treatment initiation timing, and audiometric data were extracted and rigorously assessed for accuracy. Audiometric outcomes were evaluated using Siegel's criteria. Univariate analyses were performed to identify initial patterns, followed by logistic regression modeling using 80% of the data for training and 20% for testing, facilitated by R software.

Results: Among 330 patients studied, 283 (84.5%) reported improvement. Logistic regression proved effective in identifying relationships between predictors and the binary outcome of treatment response, revealing that patient age and initial severity of hearing loss at treatment onset were significant variables. The model's generalizability was established with accuracy, precision, and sensitivity rates of 86.36%, 90.0%, and 94.73%, respectively.

Conclusion: In conclusion, this study demonstrates that logistic regression is a valuable tool for predicting treatment outcomes in patients with SSNHL. It highlights the significance of age and hearing loss severity as influential factors that warrant closer attention in clinical considerations.

Keywords: Logistic Regression, Treatment Outcomes, Accuracy, Precision

G-1025

Investigating the Use of Artificial Intelligence (AI) in Pharmacology and Discovering Drug Side Effects: Laboratory Supplement Testing in The Methotrexate Pilot in Leukemia

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Abstract:

Background and Aims: In the modern era, the complexity and increase in data in healthcare will lead us to the increasing use of artificial intelligence .

Methods: To choose the best path towards precision medicine, it is necessary to carefully examine the overall data of patients along with numerous and extensive factors to distinguish between sick and relatively healthy individuals. Artificial intelligence can improve the potential of healthcare for patients and, through advanced calculations and inference, enables the system to reason and learn, while at the same time leading to easier decision-making for the physician.

Results: In this study, in order to investigate the histopathological and histopathological side effects of methotrexate, it was used in the laboratory clinic. Thus, we examined all laboratory data including culture medium, serological data of the studied mice and tissue densities entirely by the above density. (P0.001) Methotrexate was one of the adjuvant chemotherapy drugs in the field of leukemia, the side effects of which had not been identified in a unified manner to date; We first designed and implemented targeted and intelligent drug delivery using a nano-drug delivery system based on multilayer nanoliposomes, but the complications of this process were unknown to us, which were identified and investigated by integrating laboratory data and deep learning predictions through multiple regression. The accuracy of the above process after re-examination with docking and molecular dynamics was evaluated to be about 94.8%, which is an extraordinary percentage. The complications of myeloid and lymphoid lineages were identified and evaluated by advanced dissociation simulation to about 98.2%. (P0.0001) Artificial intelligence is currently being used in various fields by healthcare providers and life science companies.

Conclusion: With the availability of a wide range of data sets and modern computer techniques such as machine learning (ML) and deep learning (DL), researchers can create a new era of genomic medicine and effective drug discovery and design. The above results confirm the undeniable impact of artificial intelligence in making laboratory pilots shorter and smarter and implementing new protocols.

Keywords: Methotrexate, Leukemia, Pharmacology, Deep Learning, Machine

G-1026

Predicting the response to corticosteroids in the treatment of Covid-19 respiratory crisis based on Bayesian algorithm

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Abstract:

Background and Aims: In recent years, artificial intelligence (AI) and machine learning (ML) have made significant advancements, particularly in the medical field, where they can enhance processes like drug development and diagnosis. This study focuses on using ML algorithms to predict responses to corticosteroid treatment in COVID-19 respiratory crises, aiming to provide insights into corticosteroid effectiveness.

Methods: The study was conducted in two phases. Initially, data were gathered from medical records of 205 ICU patients at Al-Zahra Hospital between March and September 2021 who received corticosteroids, specifically dexamethasone. These patients had an average hospital stay of 23.1 days, with 16.1 days spent in the ICU.

Results: Key findings indicated that diabetes was the most prevalent condition among participants. Of the 205 patients, 92 recovered and were discharged, while 113 sadly passed away. Statistically significant differences ($p < 0.05$) were found between the recovered and deceased groups regarding several clinical parameters, including age, gender, mechanical ventilation duration, oxygen saturation, and various scoring systems (SOFA, APACHE II, GCS).

In the second phase, the study employed a Naïve Bayes classifier using Python and the scikit-learn package to develop an AI model. The analysis revealed strong correlations between recovery or mortality and factors like age, bilirubin levels, and the receipt of specific corticosteroids. The model demonstrated an accuracy of over 73% in predicting patient outcomes, and the area under the ROC curve reached 0.81, indicating effective predictive performance.

Conclusion: the study identified critical parameters influencing COVID-19 patient outcomes, validating these findings through AI analysis. The results are consistent with previous research and highlight the potential of AI in predicting recovery and mortality, underscoring its importance in clinical decision-making during respiratory crises associated with COVID-19.

Keywords: Naïve Bayes algorithm, Machine Learning, Covid-19

G-1035

Deep Learning-Based Automated Detection and Classification of Brain Tumors A Case Study Implementation Using YOLOv8 Algorithm

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Abstract:

Background and Aims: The application of artificial intelligence (AI), particularly deep learning, in the detection and classification of brain tumors has emerged as a pivotal research domain in medical imaging. YOLOv8, an advanced real-time object detection algorithm, provides rapid processing and high precision for identifying tumors in magnetic resonance imaging (MRI) scans. However, challenges such as variability in tumor morphology, inconsistent MRI quality, and imbalanced datasets compromise detection reliability. This study seeks to develop an automated, high-accuracy system leveraging YOLOv8 to support medical professionals in achieving faster and more precise brain tumor diagnoses, thereby enhancing patient outcomes.

Methods: A dataset comprising 2,175 MRI images was utilized, divided into training (80%), validation (15%), and testing (5%) subsets. The YOLOv8 single-stage architecture was implemented to simultaneously localize tumors and classify their types with minimal latency. Model training was conducted until optimal performance was achieved at iteration 48, with performance assessed using accuracy and mean average precision at a 50% intersection-over-union threshold (mAP50).

Results: The YOLOv8-based model demonstrated exceptional detection accuracies of 95% for pituitary tumors and 97% for meningiomas, with the "no tumor" class achieving 87.5% accuracy. In contrast, glioma detection exhibited the lowest accuracy at 68.2%, largely due to a high false-positive rate in this category. The model achieved an overall mAP50 of 94% at peak performance (iteration 48), affirming its robustness in tumor localization and classification. These results underscore the need for targeted improvements in glioma detection, including larger training datasets, advanced data augmentation techniques, and hyperparameter optimization.

Conclusion: The YOLOv8-based system exhibited high accuracy in detecting pituitary tumors and meningiomas but faced challenges with gliomas, reflecting class-specific limitations. To improve performance, we recommend expanding the glioma training dataset, employing sophisticated data augmentation, fine-tuning model parameters, and reassessing classification approaches.

This system holds promise as a reliable assistive tool for clinicians, offering the potential to accelerate diagnostic processes and optimize treatment planning.

Keywords: Brain Tumor, Artificial Intelligence, Deep Learning

G-1036

Integrating Explainable AI into Deep Learning Models for MRI-Based Alzheimer's Disease Diagnosis: A Review

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Abstract:

Background and Aims: Alzheimer's Disease (AD) is a progressive neurodegenerative disorder characterized by the accumulation of amyloid plaques and neurofibrillary tangles in the brain. Detecting AD in its preliminary stages before clinical manifestations is crucial for timely treatment. Although deep learning (DL) models have shown promising results in diagnosing Alzheimer's disease (AD), their lack of transparency and interpretability presents significant barriers to their adoption by healthcare professionals. This study aims to address this challenge by exploring the application of Explainable Artificial Intelligence (XAI) techniques to enhance the interpretability of DL models for AD diagnosis.

Methods: PubMed, Science Direct, Web of Science databases, and Google Scholar were explored using combinations of Keywords: "Alzheimer's disease", "Deep Learning", "Explainable artificial intelligence", "LIME", "SHAP", and "Grad-CAM". Finally, 15 more recent and relevant records were included in the study.

Results: Neuroimaging, particularly Magnetic Resonance Imaging (MRI), has emerged as a crucial tool in the diagnosis of Alzheimer's disease. Although automated AD diagnosis through DL models has demonstrated promising results, the "black-box" nature of deep learning models raises concerns. This lack of interpretability can lead to distrust among medical professionals, especially when diagnostic errors could have serious consequences. Addressing the need for transparency in AI-based medical diagnostics, recent studies have explored various XAI frameworks, including Local Interpretable Model-Agnostic Explanations (LIME), Shapley Additive Explanations (SHAP), and Gradient-weighted Class Activation Mapping (Grad-CAM), to interpret complex AI models for AD classification. By Leveraging XAI methods, the developed model not only detects Alzheimer's disease but also offers transparent insights into the intricate patterns within the MRI data. These methods also empower patients with a deeper understanding of their condition, potentially improving AD management and fostering informed decision-making.

Conclusion: While XAI holds great promise for improving the interpretability of AI models in Alzheimer's detection, several challenges such as interpretability of complex models, validation of XAI methods, integration in to clinical workflow, regulatory and ethical consideration, and

generalizability, need to be addressed to enhance its effectiveness and acceptance in clinical practice.

Keywords: Alzheimer's disease, Deep Learning, Explainable AI

G-1037

Can artificial intelligence-driven predictive analytics enhance maternal-fetal outcomes in midwifery? A review.

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Abstract:

Background and Aims: The integration of data and technology in healthcare enables informed decision-making, risk identification, and personalized care for expectant mothers and their infants. This review evaluates the role of AI-driven predictive analytics in assessing maternal-fetal outcomes within midwifery.

Methods: Comprehensive searches were performed in Google Scholar, Web of Science, PubMed, and Scopus using relevant search terms. Eligibility was determined by screening titles, abstracts, and full texts. Data were meticulously extracted and descriptively summarized, adhering to the PRISMA guidelines. Narrative synthesis was employed for data analysis.

Results: A total of 15 studies were included in this review. The extracted data were narratively categorized into four thematic groups: (1) Role of AI in Healthcare Decision-Making, (2) Applications of AI in Maternal Care, (3) Benefits such as Early Risk Identification and Prevention, and Personalized Care Plans and Interventions, and (4) Challenges and Limitations including Data Privacy and Ethical Concerns, and Integration with Existing Healthcare Systems.

Conclusion: The findings underscore the transformative potential of AI in enhancing maternal care. By leveraging large datasets, AI-driven predictive analytics empower midwives to foresee and avert potential complications during pregnancy and childbirth. This technology facilitates early risk detection, allows for the customization of care plans, and ultimately improves maternal and fetal health outcomes.

Keywords: AI, Predictive Analytics, Maternal-fetal Outcomes

G-1038

Different applications of telemedicine - assessing the challenges, barriers, and opportunities- a narrative review

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Abstract:

Background and Aims: Telemedicine (TLM) is a telecommunication technique used to create, promote, and accelerate healthcare services. Due to its societal significance, this study aims to demonstrate the essential applications of TLM in the health sector along with the challenges, obstacles, and opportunities that lie ahead.

Methods: The research collected various studies and reports relevant to the subject by utilizing MeSH terms in authentic and available international databases. Following this, 30 related articles were selected based on specific study criteria, and the required results were extracted from these selected studies.

Results: The findings indicate that TLM plays a significant role in more than 13 major areas of health and treatment, facilitating processes for both patients and medical staff in most of these areas. Although TLM offers many advantages, it also faces obstacles and challenges that call for further research to improve the management of this technology.

Conclusion: Given the high importance of TLM in the health sector across numerous countries, there is a pressing need for efforts to promote this technology and eliminate the existing barriers. Therefore, additional evaluations regarding the efficiency of TLM in terms of economics, speed of action, effectiveness, and infrastructure provision are essential to overcome the highlighted challenges and enhance the efficiency of this technology's utilization.

Keywords: Telemedicine, Healthcare Services, Challenges, Opportunities, Efficiency

G-1045

THE IMPORTANCE OF DATABASES APPLIED IN ARTIFICIAL INTELLIGENCE FOR DRUG DISCOVERY

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Abstract:

Background and Aims: Artificial intelligence (AI) is a technology which enables the intervention of computers and machines in different aspects of human life. This technology is designed to aid in faster and more accurate achievement of scientists to the required data, information and analysis. The scientists of pharmaceutical science have applied AI in different steps of their researches to design and formulate new pharmaceutical formulations and technologies. Since drug development is a complex, high cost and time consuming process, application of new technologies is important for better, faster and more accurate information achievements. It can be considered that application of AI in research and development was a revolution in the field of drug discovery and formulation. The great amount of biological, medical, pharmaceutical and clinical data has provided a foundation for employment of AI in drug discovery. This review provides a brief information on different pharmaceutical databases applied in AI and their importance in new drug discovery.

Methods: Articles from valid journals with the relevant topic and information were discovered from data bases, including "science direct" and "national library of medicine". In the first step, the articles published before 2018 were removed from the review process. Next, the articles providing more accurate information were choosed and the review went through.

Results: Drug development is a complex process requiring adequate information on drug targets, different characteristics of drug and chemical molecules, possible interactions between drugs and chemical compounds, possible drug-target interactions, etc. Databases involving chemical composition and structure and other characteristics of drugs and chemical compounds are ChEMBL, PubChem, DrugBank, DrugMap, ChemDB, etc. Data bases providing information on possible drug-target interactions are Drug Target Commons (DTC), DGIdb, etc. more databases and the specific character of each one is further explained in this article.

Conclusion: In conclusion, different literatures have declared the importance of data bases applied in AI for drug discovery. Based on the available pharmaceutical and chemical data bases, new AI techniques can be investigated and created to enhance the progress of drug development.

Keywords: Artificial Intelligence, Drug Discovery, Data Base.

G-1046

The Role of Integrated Artificial Intelligence in Precision Medicine: Enhancing Cancer Treatment

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Abstract:

Background and Aims: Personalized medicine is revolutionizing healthcare by customizing treatment plans based on individual patients' unique genetic and environmental factors. This article examines the applications of Integrated Artificial Intelligence (IAI) in personalized medicine, with a particular focus on the prediction, diagnosis, and treatment of cancer. The primary objective of this research is to evaluate and analyze the methods of artificial intelligence in improving treatment outcomes for cancer patients.

Methods: In this study, genomic and radiomic data from various sources were collected and analyzed. Published articles in reputable databases were reviewed. Various artificial intelligence algorithms, including deep neural networks and support vector machines (SVM), were assessed for their ability to predict treatment responses and diagnose cancer types.

Results: The results indicate that artificial intelligence algorithms possess a high capability for predicting and diagnosing cancer. For instance, the accuracy of SVM models in some studies reached 84% and an AUC of 0.99. Additionally, the use of radiomic features in predicting responses to neoadjuvant chemotherapy (NACT) in specific cancers yielded positive results. Overall, artificial intelligence significantly enhances disease risk identification and the development of personalized treatment plans.

Conclusion: The application of artificial intelligence in personalized medicine has the potential to improve clinical decision-making and increase the accuracy of cancer treatments. This approach can serve as an effective tool in managing cancer patients. However, further research is needed to fully assess the impacts of these algorithms and their effectiveness.

Keywords: Precision Medicine, Artificial Intelligence (AI), Biomarker

G-1047

Medical Rights and the Guarantee of the Implementation of Medical Ethics: Considerations on Artificial Intelligence in Healthcare

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Abstract:

Background and Aims: The rapid advancement of artificial intelligence (AI) in healthcare has created unprecedented opportunities to improve patient outcomes, enhance medical research, and streamline healthcare operations. However, as AI becomes increasingly integrated into healthcare systems, it is essential to address the ethical implications of its implementation to ensure that medical rights are protected. This paper aims to explore the relationship between medical rights and the guarantee of medical ethics in the context of AI-driven healthcare, highlighting the key considerations that must be taken into account to ensure that the benefits of AI are fully realized while maintaining adherence to medical ethical principles.

Methods: This paper adopts a qualitative approach, reviewing relevant literature on the intersection of AI, medical rights, and medical ethics. It synthesizes case studies, ethical analyses, and regulatory frameworks to assess the potential challenges posed by AI in healthcare. The research focuses on identifying the ethical issues that must be addressed in the development and deployment of AI systems to safeguard medical rights and maintain ethical standards.

Results: The findings indicate that while AI has the potential to revolutionize healthcare by improving efficiency and patient outcomes, it also presents significant ethical concerns. Key challenges include the potential for biases in AI-powered diagnostic tools, which may undermine the right to informed consent and the right to quality care. Furthermore, the extensive collection and analysis of patient data by AI systems raise serious concerns regarding patient privacy and confidentiality. The paper also identifies the need for robust regulatory frameworks to address these issues effectively.

Conclusion: AI-driven healthcare systems offer significant promise in transforming healthcare delivery and improving patient outcomes. However, it is imperative that medical rights are

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protected and medical ethics are upheld in the design and implementation of AI systems. Achieving this requires a multifaceted approach, involving the creation of ethical AI systems, the

establishment of comprehensive regulatory frameworks, and ongoing monitoring of AI technologies to ensure that ethical standards are consistently maintained.

Keywords: Artificial Intelligence, Medical Rights, Healthcare Regulation

G-1051

Combination of Artificial Intelligence and learner-centered teaching methods on the learning rate of medical students

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Abstract:

Background and Aims: Learning is a complex process that involves permanent changes in knowledge, skills, and behavior. With rapid societal changes, modern educational systems need to develop effective teaching methods that equip students with relevant skills and knowledge. Traditional passive methods are outdated, leading to a shift towards student-centered approaches. AI can be a promising example in medical education, creating an adaptive learning environment suitable for all styles.

Methods: All information in this review study was collected by referring to the scientific databases of Google Scholar, PubMed, Scopus and Web of science by searching for keywords of artificial intelligence, AI, learner-centered teaching, medical. Then, 15 articles that met the inclusion criteria were evaluated.

Results: AI technologies offer real-time feedback and adaptive assessments, enabling continuous improvement and a deeper understanding of complex medical concepts. Studies, such as those using VR simulations, show how AI can enhance clinical skills and confidence among medical students. AI-driven systems facilitate dynamic learning through real-time feedback, simulation, and data analytics, providing personalized support and insight into student progress. However, challenges such as integration, ethical issues, cost, and learner over-dependency need careful planning and continuous assessment.

Conclusion: The integration of AI within learner-centered methods holds the potential for change in medical education, optimizing learning rates and developing clinical skills. Further research is needed to determine the long-term impact and extent of this innovative approach in medical training.

Keywords: Artificial Intelligence, AI, Learner-Centered Teaching, Medical

G-1053

The Role of Artificial Intelligence in Enhancing Clinical Decision-Making: A Narrative Review on Advancements, Challenges, and Ethical Implications

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Abstract:

Background and Aims: The Integration Of Artificial Intelligence (Ai) Into Clinical Decision-Making (CDM) Represents A Transformative Advancement In Healthcare, Particularly In Emergency Settings Where Medical Professionals Face Significant Challenges. This Narrative Review Examines the Role of Ai in Enhancing CDM By Analyzing Large Datasets, Improving Diagnostic Accuracy, And Streamlining Decision-Making Processes.

Methods: This Narrative Review Collected Data from Google Scholar, PubMed, Scopus, And Web of Science Using Keywords Such as Artificial Intelligence (Ai), Clinical Decision-Making (CDM), Diagnostic Accuracy, Healthcare Ethics, And Clinical Decision Support Systems (CDSS). After Screening, 15 Relevant Articles Meeting the Inclusion Criteria Were Selected for Analysis.

Results: The Paper Emphasizes the Importance of Clinical Decision Support Systems (CDSS) That Utilize Ai Algorithms to Merge Clinical Expertise with Patient Data. The Primary Goals Are to Enhance Patient Safety, Reduce Misdiagnoses, And Improve the Overall Quality of Healthcare. Ai's Applications Extend Across Various Domains, Including Clinical Diagnostics, Radiology, And Emergency Medicine, Where It Aids in Rapid Diagnosis and Optimal Treatment Planning. Despite Its Potential, Ai in Healthcare Faces Challenges Such as Algorithmic Bias, The Need for Expert Oversight, And Ethical Concerns Regarding Data Privacy and Security. This Review Underscores the Necessity for Collaboration Between Ai Developers and Healthcare Practitioners to Ensure That Ai Tools Are Designed and Implemented Effectively, Addressing Both Practical and Ethical Challenges.

Conclusion: The Paper Highlights the Importance of Training Healthcare Professionals to Use Ai Tools Effectively While Preserving the Irreplaceable Human Element in Patient Care. By Fostering

a Synergistic Relationship Between Ai Technology and Clinical Expertise, The Integration of Ai in CDM Can Lead to Improved Patient Outcomes, Enhanced Efficiency, And Better Resource Management Within Healthcare Systems. Ultimately, This Review Advocates for A Balanced Approach to Ai Integration, Ensuring That the Benefits of Technology Are Realized While Addressing Inherent Challenges in Clinical Environments.

Keywords: Artificial Intelligence, CDM, CDSS, Healthcare Ethics

G-1054

Non-invasive fractional flow reserve estimation using deep learning on intermediate left anterior descending coronary artery lesion angiography images

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Abstract:

Background: Coronary artery disease (CAD) is a predominant global health challenge, with fractional flow reserve (FFR) widely recognized as the clinical gold standard for assessing the hemodynamic significance of coronary artery stenosis. Nevertheless, traditional FFR measurement is invasive, costly, and associated with procedural risks, thus limiting its routine clinical application. Recent advances in artificial intelligence (AI) present an opportunity to non-invasively estimate FFR directly from angiography images, potentially revolutionizing the diagnostic and therapeutic approach to CAD by combining both anatomical and physiological insights.

Methods: This study introduces an AI-driven, end-to-end deep learning model for estimating FFR, targeting intermediate stenosis in the left anterior descending (LAD) artery (50-70% stenosis). Leveraging a dataset of 3,625 LAD angiography images from 41 patients, we evaluated nine pre-trained convolutional neural networks (CNNs) and identified DenseNet169 as the optimal model for image feature extraction and FFR classification. Rigorous data preprocessing steps—including resizing, normalization, and data augmentation—were applied to enhance model generalization. DenseNet169 was meticulously fine-tuned for maximum sensitivity, specificity, and classification accuracy, with performance metrics encompassing area under the curve (AUC), F1-score, precision, and recall.

Results: The DenseNet169 model demonstrated exceptional diagnostic accuracy, achieving an AUC of 0.81, sensitivity of 0.86, specificity of 0.75, and overall accuracy of 81%. These results validate the model's capacity to reliably distinguish functionally significant from non-significant coronary stenosis, closely mirroring the diagnostic accuracy of invasive FFR. This non-invasive approach offers a fast, reliable, and resource-efficient tool for accurate FFR estimation, streamlining the CAD diagnostic workflow and reducing dependency on invasive measurements.

Conclusion: This AI-powered FFR estimation model represents a significant advancement in CAD diagnostics, providing a precise, non-invasive alternative that aligns with clinical standards while circumventing the limitations of traditional FFR. By integrating physiological assessment into routine catheterization lab workflows, this model has the potential to enhance decision-making, improve patient outcomes, and optimize healthcare resource allocation. Future studies with

broader clinical validation could further substantiate its clinical utility, paving the way for AI-driven precision medicine to redefine CAD management and enhance the quality of cardiovascular care globally.

Keywords: Intermediate lesions, Coronary blood flow Fractional

G-1059

The Use of Artificial Intelligence and Advanced Technology in Spine Surgery

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) and advanced technologies in spine surgery is revolutionizing patient care by enhancing diagnostic accuracy, surgical planning, and postoperative management. These innovations facilitate real-time feedback during procedures and enable personalized treatment recommendations ultimately aiming to improve surgical outcomes and reduce complications in patients with spinal disorders.

Methods: This article was a systematic review. Databases PubMed, Web of Science, Science direct and Google Scholar systematically searched. The time frame was between 2015 and 2024. Initially, 54 articles were retrieved and after reviewing the titles, keywords, abstracts and full text of the identified sources, finally, 11 articles, who met our inclusion and exclusion criteria were included in this study were included in the study.

Results: Recent studies have shown a growing trend in utilizing AI algorithms for predictive analytics and supervised image recognition in spine surgery. These technologies offer benefits in preoperative workup, patient selection, outcome prediction, quality enhancement of research, perioperative surgical assistance, postoperative prognosis, data tracking optimization, and intraoperative spine surgical performance.

Conclusion: Artificial intelligence offering advancements in etiology understanding, diagnosis, treatment, postoperative prognosis, and decision support systems for spinal diseases. the integration of AI in spine surgery has shown promising results in improving medical practice by processing big data and image information efficiently. also technologies like computer-assisted navigation systems and surgical robots holds promise for the future of spine surgery. However, ethical considerations regarding the proper application of machine learning algorithms remain a significant challenge that needs to be addressed to ensure patient safety and optimal clinical decision-making. In conclusion, artificial intelligence and advanced technology have immense potential to transform comprehensive spine care by improving preoperative patient selection, surgical indications, and postoperative care.

Keywords: Artificial Intelligence, Spine Surgery

G-1060

The role of artificial intelligence in NICU neonatal care

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Abstract:

Background and Aims: Artificial intelligence (AI) is transforming neonatal intensive care units (NICUs). Using advanced algorithms and machine learning, AI enhances patient care by monitoring and analyzing vital signs, predicting potential complications, and assisting with treatment decisions. This leads to improved outcomes for newborns and streamlines operational efficiency by automating routine tasks and providing valuable insights to healthcare providers.

Methods: AI is transforming the NICU by bringing advanced technology to the forefront of neonatal care, allowing healthcare providers to intervene early and adjust treatment plans. AI algorithms analyze vast amounts of data from multiple sources, including electronic health records (EHRs), to predict potential complications in newborns, allowing healthcare providers to intervene early and adjust treatment plans. AI-powered systems continuously monitor infants' vital signs and other health indicators, detecting abnormalities or worsening in real time and alerting medical staff to take immediate action.

Results: AI analyzes medical imaging, such as X-rays and ultrasounds, to identify conditions, such as pneumonia or congenital anomalies, more accurately and quickly than traditional methods. Personalized treatment plans are created using AI to analyze individual patient data, improving the effectiveness of interventions. AI also optimizes resource allocation in the NICU by predicting patient admissions and discharges and ensuring that staff and equipment are available when needed.

Conclusion: AI helps doctors make informed decisions quickly and confidently by providing evidence-based recommendations for treatment options. Also, Artificial intelligence, by analyzing large data sets to identify trends, outcomes, and potential areas for improvement in treatment protocols, research in neonatal care.

Keywords: Neonatal Intensive Care Units, Artificial intelligence

G-1061

Design and evaluation of a six-stage clinical decision support system in pediatric nursing

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Abstract:

Background and Aims: Designing and evaluating a clinical decision support system (CDSS) in pediatric nursing requires a holistic approach. This approach should prioritize user needs, integrate evidence-based guidelines, and continuously evaluate the system's impact on clinical outcomes. Healthcare facilities can create an effective CDSS for pediatric patients by following six steps. The goals of the CDSS should include improving patient outcomes by providing evidence-based recommendations, increasing the efficiency of clinical activities in pediatric nursing, reducing medication errors, and improving safety in pediatric care.

Methods: The system's design is based on user-centered design. It involves pediatric nurses and healthcare providers in the design process to ensure that the system meets their needs and integrates seamlessly into their workflow. Data integration consists in accessing and analyzing data from electronic health records, laboratory results, and other relevant sources, including evidence-based clinical guidelines and protocols, with specific considerations including: age and design of alert systems for vital signs, potential drug interactions, and reminders of preventive care measures, selection of appropriate technologies for the CDSS, such as database management that stores clinical guidelines and patient data, use of machine learning algorithms for predictive analytics and personalized recommendations, and development of a user interface that is easy for nurses to use.

Results: The evaluation framework includes tests of ease of use and integration of the system into pediatric nurses' clinical workflows, assessment of clinical outcomes, and measurement of the CDSS's impact on patient outcomes, such as reduction of medication errors and improvement of clinical performance.

Conclusion: User feedback on their satisfaction with the system, implementation strategy, and training materials and refresher sessions for nurses are essential to ensure they are comfortable using the CDSS. It is imperative to implement CDSS in a controlled environment, identify issues before full-scale rollout, establish a system for continuous evaluation, and update it based on user feedback and new guidelines.

Keywords: Nursing, Pediatrics, Six-stage, Decision Support System

G-1067

Investigating The Impact Of Patient Relationship Management Systems And Artificial Intelligence On Healthcare Service Improvement

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Abstract:

Background and Aims: Customer Relationship Management (CRM) systems optimize interactions between organizations and customers, offering significant benefits such as improved customer satisfaction, loyalty, and data-driven decision-making. With the advent of artificial intelligence (AI), CRM systems have enhanced their capabilities by automating tasks and analyzing large datasets, demonstrating improved performance across various sectors, including finance, hospitality, and, notably, healthcare. In healthcare settings, CRM has evolved into Patient Relationship Management (PRM), focusing on enhancing patient experiences and communication with medical professionals.

Methods: This study explores the integration of AI-based PRM in healthcare, analyzing its impact on patient engagement, satisfaction, and operational efficiency. By reviewing existing literature and case studies, the study evaluates how AI-driven PRM systems process vast amounts of patient data, personalize interactions, and optimize decision-making in healthcare facilities.

Results: Findings indicate that AI-enhanced PRM systems significantly improve patient satisfaction and loyalty by tailoring interactions based on individual needs. Additionally, AI integration optimizes hospital operations, reduces costs, and enhances resource management. AI-driven predictive analytics and automation contribute to more effective preventive and personalized care, ultimately leading to better healthcare outcomes.

Conclusion: The incorporation of AI in patient relationship management transforms healthcare communication and service delivery. AI-powered PRM systems not only support modern healthcare objectives but also improve patient-centered care, operational efficiency, and overall healthcare outcomes. As healthcare evolves, AI-based PRM presents a promising approach to meeting the dynamic needs of patients and medical institutions.

Keywords: AI-based Healthcare, AI, Patient Relationship Management

G-1069

A Comprehensive Analysis of Artificial Intelligence Applications in Advancing Health Literacy: Exploring AI-Driven Approaches to Enhance Public Health Knowledge, Patient Empowerment, and Health Decision-Making.

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Abstract:

Background and Aims: Artificial Intelligence (AI) is transforming health literacy by enhancing public health knowledge, empowering patients, and supporting informed decision-making. This review examines AI applications that personalize health communication and improve access to essential health information.

Methods: This review systematically selected English-language articles from January 2019 to November 2024. Using keywords such as Health Literacy, Artificial Intelligence, Knowledge Acquisition, and Computer Vision Systems, the search covered databases like PubMed, Web of Science, Science Direct, Cochrane Library, AHA PsycNET, and Google Scholar. A total of 200,184 articles were initially identified. After applying inclusion criteria, such as full-text availability, publication date, RCTs, and human-focused studies, 8 articles were selected for review.

Results: AI shows potential to improve health literacy by simplifying patient education materials (PEMs), making health information more accessible, and significantly lowering the reading levels required to understand complex medical information. AI-driven tools like ChatGPT and other conversational agents have shown promise in engaging patients, especially in underserved communities, by providing information in a more accessible format. Nonetheless, challenges related to accuracy, transparency, and building user trust in AI systems remain obstacles.

Conclusion: While AI offers promising avenues for expanding access to health information, it also presents risks, including the potential for misinformation. The successful application of AI in health literacy will require the development of targeted digital health tools, as well as integration into educational curricula to ensure effective use. To achieve full implementation and realize the

potential benefits of AI, further research is essential to validate its impact on health outcomes and health equity.

Keywords: Health literacy, Health Knowledge, Artificial Intelligence,

G-1073

Medical Students Attitudes Towards the Use of ChatGPT in Education: A Cross-Sectional Study

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Abstract:

Background and Aims: This study aimed to evaluate the attitude and extent of use of ChatGPT by medical students in education.

Methods: In October 2024, this cross-sectional research was carried out. This survey, which was developed using the Technology Acceptance Model (TAM) methodology, consists of 23 questions for ChatGPT users and 13 questions for those who have heard of ChatGPT but have not used it. The questions were translated into English using the front-back standard of the World Health Organization. Expert consensus was used to gauge the questionnaire's validity, and the test-retest technique ($r = 0.90$) was used to assess its reliability. The proportionate per size sampling method was used to enroll medical students from Mashhad University of Medical Sciences in this investigation. Software called SPSSVE27 was used to analyze the data. This study has been approved by the ethics committee of Mashhad University of Medical Sciences.

Results: The survey was completed by 122 students (100% response rate). 110 students (90.2%) reported having heard of ChatGPT. According to 86 pupils (70.5%), they have already utilized ChatGPT. Additionally, out of the students who utilized ChatGPT, 35 (28.7%) reported that ChatGPT improved their academic performance. Of the students, sixty-nine (56.6%) said ChatGPT was simple to use. Additionally, 67 (54.9%) of the students said they are excited to use ChatGPT and other similar technologies for study and coursework. The accuracy of the data produced by ChatGPT was a concern for 37.7% of study participants, in comparison. Also, 69 (56.6%) students expressed that they were concerned about using ChatGPT and not developing their critical thinking.

Conclusion: Medical students have received ChatGPT well, but there are concerns about its accuracy and impact on critical thinking. This research shows that the integration of artificial intelligence in medical education requires attention to its positive and negative aspects.

Keywords: Artificial Intelligence, ChatGPT, Learning Tool, Medical

G-1075

Research on 3D bioprinters of body organs (narrative review)

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Abstract:

Background and Aims: In the present era and in the world, we live in, we witness technological progress in various fields every day. One of the concerns that exist in human societies is related to patients who are waiting for organ donation and transplantation. The aim of this study is to investigate 3D bioprinters of body organs.

Methods: In this review study, articles published between February 2019 and November 2023 were reviewed. Internal databases including Magiran, Sid, as well as external scientific resource databases including PubMed, web of science Medlib, Science Direct, and the Google Scholar search engine were used to collect articles. The keywords bioprinter, organ, 3D, and in Persian and English sources were used to search. After evaluating the entry criteria and quality of the articles, 8 studies were identified as eligible and included in the present study.

Results: Previous studies have shown that creating a complete organ often requires a combination of different cell types, as each tissue is made up of different cells. One advantage of 3D organ printing over traditional transplantation is the ability to use cells derived from the patient's own body to build the new organ. This significantly reduces the risk of transplant rejection and may not require immunosuppressive drugs. Currently, creating structures that are surgically implanted into the body requires the use of large 3D printers, which carry their own risks, including tissue damage and the risk of infection, material incompatibility with body tissue, and since biomaterials are usually soft and fragile, they have the potential to be damaged during the implantation process.

Conclusion: Based on the results of the studies, 3D bioprinting is a completely new technology. Although this technology has great potential, its risks cannot be ignored. However, with increasing progress, it could create a huge revolution in the field of medicine in the not-so-distant future.

Keywords: Bioprinter, Organ, 3D

G-1077

Investigation of the Detection Rate of Machine Learning Models in Recognition and Classification of Colorectal Polyps

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Abstract:

Background and Aims: Colorectal polyps are diagnosed and treated with colonoscopy. There are two challenges in the discussion of colorectal polyps. First, the rate of undetected polyps in colonoscopies, where 25% of polyps are not detected, which can be due to poor bowel preparation, lesions located in areas that are difficult to evaluate, lack of experience or distraction of the endoscopist, the appearance of the polyp, and inappropriate techniques. The second challenge is to distinguish different types of polyps, especially adenoma and hyperplastic types. Because adenomas are preferred for polypectomy due to the risk of malignancy compared to hyperplastic polyps. In this study, we intend to use recorded images of polyps and diagnostic algorithms to produce an artificial intelligence platform for quick detection and classification of polyps.

Methods: In this study, our sample size was 250, and colonoscopy was performed using the 170-cv OLYMPUS system. The imaging parameters were set by the endoscopist and the required number of images was recorded for each polyp. The sample removed by the endoscopist was sent to the pathology laboratory. The criterion for diagnosing the type of polyp was the sample pathology report.

Results: The experimental data set contains 250 complete colonoscopy images from 250 different patients. The ratio of males to females was 1.43, the average age was 61.25 (interquartile range: 54-70), the overall accuracy of CNN in detecting visible tools in the test dataset was 86.12%, and the loss bonding box was close to zero (0.04) for the class. "Adenoma", precision was 0.86, recall was 0.92, and F1 score was 0.89. For the "Non Adenoma" class, precision was 0.86, recall was 0.73, and F1 score was 0.78.

Conclusion: In conclusion, our study shows that instrument detection using artificial intelligence technology is reliable and has high sensitivity and specificity. Therefore, the new artificial intelligence system can be useful to reduce distracting CAdE diagnoses during colonoscopy procedures. Although the clinical benefits of the new AI system require further evaluation, our study demonstrates the great potential of AI technology beyond superficial evaluation.

Keywords: Polyp, Colorectal, Colonoscopy, Artificial Intelligence

G-1079

Ethical challenges of artificial intelligence in medical sciences

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Abstract:

Background and Aims: Implementing an ethical system in the behavior of AI systems does not simply require abstract intelligence, but also a specific form of human and artificial intelligence. Intelligent agents have distinctive features and actions such as being singular, complex, specialized, persistent, and autonomous. The human moral code is irreparably flawed: it is a moral code of accountability (not responsibility), and a lack of complete freedom that cannot be compensated for by inventing ethical systems, ideal values, and moral education. Intelligence, however, gives a conscience and even a soul to the machine. In this article, by expressing the concept and conceptualization of ethical intelligence and referring to the characteristics of artificial intelligent agents, the harms of applying ethical rules to intelligent agents as well as the progress towards ethical artificial intelligence are pointed out and the most important challenges of implementing ethical intelligence in AI are analyzed and analyzed.

Methods: This study is a review. To collect information, evidence searches were used in the Web of Science, PubMed, Scopus, and Google Scholar databases using the keywords artificial intelligence, ethics, and medical sciences.

Results: Ethical issues related to artificial intelligence include: disruption of social justice, algorithmic bias, data safety, respect for human dignity, informed consent, error and compensation, the principle of individual autonomy, complete allocation of treatment, emotional labor, data confidentiality, and privacy.

Conclusion: The use of artificial intelligence can create a huge impact in all areas of medical sciences, but it is necessary to pay attention to the establishment of evaluation committees in educational, medical, and health centers to review compliance with ethical principles, safety, human dignity, and data confidentiality.

Keywords: Ethical, Challenges, Artificial Intelligence, Medical

G-1080

Legal and Ethical Frameworks for Artificial Intelligence Applications in Healthcare Systems; Focusing on Global Experiences and Practical Considerations in Comparison with Internal Guidelines: A Narrative Review Study

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Abstract:

Background and Aims: Integrating AI into healthcare systems presents transformative potential ethical and legal challenges. This narrative review explored the diverse regulatory landscapes governing AI in healthcare across various global contexts.

Methods: This review searched PubMed/MEDLINE, Scopus, Web of Science, IEEE Xplore, and Google Scholar databases utilizing "Artificial Intelligence," "Machine Learning," "Deep Learning," "Healthcare," "Ethics," "Challenges," and "Regulations" keywords among publications from 2019 to 2024 in both English and Persian, encompassing review articles, research papers, and policy documents. Studies that exhibited low methodological quality or were not directly related to healthcare were excluded. The extracted data were analyzed and organized into six main themes: current trends in AI applications in healthcare, ethical and legal challenges, regional differences in regulatory approaches, the impact on doctor-patient relationships, educational and empowerment needs, and regional approaches. The validation process involved independent assessments by two researchers, with a third researcher addressing any disagreements, and the final findings were confirmed with input from an AI expert to ensure a comprehensive analysis of the literature on AI in healthcare.

Results: The results underscored the intricate landscape of legal and ethical frameworks regulating AI applications within healthcare systems. A total of 43 articles were reviewed, offering a thorough overview of global experiences and practical insights. The results revealed that the global regulation of AI in healthcare varies widely, with only a few countries establishing comprehensive legal frameworks. Iran's regulatory environment is marked by evolving policies and fragmentation, with ongoing discussions about ethical concerns in private hospitals but no specific AI regulations from the Ministry of Health and Medical Education. Despite the potential

for AI integration in Iranian healthcare, significant challenges related to compliance, ethics, and data security persist as patient expectations continue to rise.

Conclusion: AI is revolutionizing healthcare by enhancing early disease detection, optimizing treatment plans, and increasing the efficiency and accuracy of medical services. It minimizes human error and accelerates diagnostics, improving access to quality care. However, to maximize AI's benefits, it is crucial to establish a comprehensive framework that addresses ethical concerns and adapts to the fast-paced evolution of technology.

Keywords: Artificial Intelligence, Healthcare Systems, Ethical Considerations

G-1082

Application of artificial intelligence in screening and diagnosis of diabetic macular edema

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Abstract:

Background and Aims: Diabetic macular edema (DME) is a leading cause of vision impairment, necessitating efficient screening and diagnosis. This review explores the application of artificial intelligence (AI) techniques in DME screening, diagnosis, and classification using retinal imaging modalities.

Methods: We searched six databases (PubMed, Scopus, Web of Science, Science Direct, IEEE, and ACM) from January 1, 2005, to July 4, 2021, retrieving 879 articles. After applying inclusion/exclusion criteria, 38 studies were selected. Methodological quality was assessed using the QUADAS-2 tool.

Results: AI techniques, particularly deep learning, demonstrate high accuracy in DME screening and diagnosis using optical coherence tomography (OCT) and color fundus photography (CFP). These methods significantly improve sensitivity and specificity, with AI-based decision support systems enhancing diagnostic performance.

Conclusion: Deep learning models offer an efficient and accurate approach to DME screening and diagnosis. Integrating AI into retinal image analysis improves diagnostic reliability, supporting early detection and management.

Keywords: DME, AI, ML, DL, Screening, Diagnosis

G-1085

Advancements in Deep Brain Stimulation Devices and the Role of Artificial Intelligence in Improving Treatment for Movement and Psychiatric Disorders

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Abstract:

Background and Aims: Deep Brain Stimulation has emerged as a transformative approach in neurostimulation, playing a crucial role in treating movement and psychiatric disorders. Despite its broad applications, Deep Brain Stimulation technology and techniques continue to evolve to address limitations in precision and patient outcomes. This study aims to review advancements in Deep Brain Stimulation technology and evaluates its effectiveness in treating motor and psychiatric disorders, with a focus on recent innovations in device engineering and clinical applications.

Methods: This review synthesizes findings from recent studies published over the last decade, analyzing advancements in Deep Brain Stimulation device design, electrode improvements, parameter optimization, and programming approaches. It includes an assessment of clinical trials involving patients with Parkinson's disease, dystonia, essential tremor, and treatment-resistant psychiatric conditions. Data were collected from clinical databases and analyzed to assess the effects of Deep Brain Stimulation on symptom management and quality of life.

Results: The review highlights significant advancements, including multi-channel electrodes, novel programming algorithms, and AI-driven systems for adaptive stimulation. Findings indicate improvements in motor function and reduced symptoms in patients with movement disorders and suggest promising outcomes for those with severe depression and obsessive-compulsive disorder.

Conclusion: Deep Brain Stimulation continues to show positive clinical outcomes in managing complex neurological disorders, with technological advancements enhancing precision and adaptability. Further research should explore personalized Deep Brain Stimulation approaches and assess long-term effects, which are critical for broadening clinical applications and meeting patient-specific needs. Expanding studies on AI integration in Deep Brain Stimulation devices could further optimize therapeutic results and minimize adverse impacts.

Keywords: Deep Brain Stimulation, Artificial Intelligence, Neurostimulation,

G-1086

Advancements and Applications of Artificial Intelligence in Modern Dentistry

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Abstract:

Background and Aims: Artificial intelligence (AI) has been increasingly utilized in healthcare, offering innovative solutions to complex clinical challenges. In dentistry, AI has the potential to enhance diagnostic accuracy and improve treatment planning. Among its most significant applications are the detection and management of periodontal disease and dental caries, which are two major concerns in oral health. Periodontal disease affects the gums and the bone supporting the teeth, leading to tooth loss in severe cases. Dental caries, a progressive condition causing tooth decay, also requires early detection to prevent extensive damage. This study aims to explore the role of AI in these conditions and assess its potential for improving dental care.

Methods: This review examines the evolution of AI in dental medicine, highlighting its contributions to modern dentistry. Key AI models, including artificial neural networks (ANNs), convolutional neural networks (CNNs), and the random forest algorithm, are discussed. Additionally, AI applications in periodontology, cariology, prosthodontics, orthodontics, and endodontics are analyzed, focusing on their ability to classify periodontal conditions, detect bone loss, and assess disease severity.

Results: AI technologies have demonstrated significant potential in analyzing dental images, identifying early signs of periodontal disease and caries, and assisting in diagnostic and treatment planning. These advancements can improve accuracy, reduce human error, and enhance overall patient outcomes. However, despite these benefits, AI adoption in dentistry remains limited due to challenges related to integration, cost, and the need for extensive validation.

Conclusion: AI has the potential to revolutionize dental healthcare by improving diagnosis and treatment strategies. However, further research and technological advancements are required to overcome existing barriers to implementation. Addressing these challenges will be crucial for AI to become a standard tool in dentistry, ensuring more precise and efficient patient care.

Keywords: AI, Periodontal Disease, Dental Caries, Dentistry

G-1087

Application of Artificial Intelligence in Cancer Research: A systematic review

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Abstract:

Background and Aims: Artificial intelligence has been an active research topic in recent years and has contributed to the resolution of a variety of medical problems, including cancer. Artificial intelligence is revolutionizing cancer research and treatment using advanced methods. This systematic review was conducted to investigate the role of artificial intelligence in cancer research.

Methods: A systematic and comprehensive search for studies published between 2019 and 2024 was conducted in databases such as PubMed, Scopus, EMBASE, Web of Science, and the Cochrane Library, using keywords such as “cancer,” “artificial intelligence,” and “cancer research.” Studies were selected based on predefined inclusion and exclusion criteria. The inclusion criteria included studies that dealt with the application of artificial intelligence in at least one of the fields of cancer diagnosis, prevention, or treatment. Duplicates, non-English language studies, and articles with unavailable full text were excluded. The remaining studies were reviewed by two researchers; their abstracts were examined, and low-quality or unrelated studies were excluded. A risk of bias assessment was conducted using the JBI tool, which includes evaluation methodologies for all types of studies. The selected studies were critically appraised, and relevant data were extracted. This review followed the PRISMA statement.

Results: Out of 185 articles, 17 articles were included in this systematic review. These studies demonstrated the diverse applications of Artificial intelligence in cancer research, encompassing discovery of drugs, early detection and staging of cancer, detecting cancer mutations using machine learning, predicting drug efficacy, prognosis prediction, imaging analysis, patient matching for clinical trials, biomarker and genetics analysis, and the role of Artificial intelligence in improving patient care and clinical decision-making. This tools can help pathologists in diagnosing cancer more accurately and consistently, reducing the case error rates, estimate the likelihood for a person to get cancer by identifying the risk factors.

Conclusion: This systematic review highlights the promising role of Artificial intelligence in cancer research, emphasizing opportunities for early detection, enhancing treatment strategies, and

understanding disease mechanisms. However, further integration of Artificial intelligence tools into clinical practice is needed to realize their potential in cancer management.

Keywords: Artificial Intelligence, Oncology, Cancer Research, Medicine

G-1088

Artificial Intelligence role in Patient Safety: A systematic Review Study

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Abstract:

Background and Aims: Patient safety means keeping patients away from avoidable harm during medical care. Even with efforts to improve safety, there are still challenges. Artificial intelligence (AI) is now being used in nursing to help provide better care. This systematic review was conducted to investigate the role of artificial intelligence in Patient Safety by analyzing relevant articles.

Methods: A systematic and comprehensive search for studies published between 2019 and 2024 was conducted in databases such as PubMed, Scopus, EMBASE, Web of Science, and the Cochrane Library, using keywords such as "patient safety", "artificial intelligence," and "AI". Studies were selected based on predefined inclusion and exclusion criteria. The inclusion criteria included studies that dealt with the application of artificial intelligence in patient safety. Duplicates, non-English language studies, articles with unavailable full text, and studies reporting only AI performance but not its influence on patient safety outcomes were removed. The remaining studies were reviewed by two researchers; their abstracts were examined, and low-quality or unrelated studies were excluded. A risk of bias assessment was conducted using the JBI tool, which includes evaluation methodologies for all types of studies. The selected studies were critically appraised, and relevant data were extracted. This review followed the PRISMA statement.

Results: Out of 315 articles, 23 articles were included in this systematic review. These studies used various AI techniques such as machine learning, natural language processing, and deep learning to improve patient safety. These techniques were applied to classify clinical alarms like cardiac arrhythmia alarms or vital sign alarms, analyze clinical reports like falling or bleeding reports, identify risks, improve the quality of care provided to patients, and address adverse drug events. It is important to emphasize that standardized evaluation metrics and reporting are crucial for ensuring the reliability and effectiveness of AI interventions.

Conclusion: This systematic review shows the promising role of Artificial intelligence in patient safety, by detecting errors, organizing patients, and managing.

Keywords: Artificial Intelligence, Clinical Error, Nursing

G-1089

Harnessing Artificial Intelligence in Alzheimer's Disease Management: Navigating Ethical Challenges in AI

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Abstract:

Background: Alzheimer's Disease (AD) presents a significant global health challenge, characterized by progressive cognitive decline and affecting millions worldwide, particularly among the elderly population. While aging remains the primary risk factor, the etiology of AD is multifactorial, involving genetic predispositions and environmental influences. Effective management strategies are essential, necessitating early detection and intervention. This article explores the potential role of Artificial Intelligence (AI) in addressing the complexities of AD management, emphasizing the ethical considerations inherent in AI applications.

Methods: This systematic review follows PRISMA guidelines to synthesize existing literature on AI applications in AD management. The study involves a comprehensive literature search, study selection, data extraction, data analysis, and quality assessment using the Appraisal tool for Cross-Sectional Studies (AXIS). Data were analyzed, and figures were created using R programming.

Results: AI-driven technologies offer innovative approaches for early diagnosis, personalized treatment planning, and caregiver support. Leveraging intelligent sensing systems and genetic analysis, AI facilitates early detection by analyzing complex data patterns and identifying biomarkers associated with AD pathology. Additionally, AI enhances treatment outcomes through individualized interventions, utilizing advanced algorithms to analyze medical histories, genetic profiles, and lifestyle factors. Nanotechnology-based therapies and digital solutions further augment diagnostic and therapeutic capabilities, though rigorous evaluation is essential. Despite the promise of AI in AD management, ethical considerations such as algorithmic accuracy, data privacy, and the depersonalization of patient care must be addressed. Furthermore, the lack of standardized practices and regulatory guidelines presents challenges to the widespread implementation of AI technologies.

Conclusion: Although AI shows promise in Alzheimer's Disease management, collaborative efforts among policymakers, regulators, and the biomedical community are crucial to ensure the

responsible and ethical integration of AI in AD management. By leveraging AI-driven innovations while addressing ethical concerns, this article advocates for improved patient outcomes and enhanced quality of life for individuals impacted by AD and their caregivers.

Keywords: AD, Artificial Intelligence, Dementia Care, Early

G-1090

Designing and building a system for investigating the effect of drugs listed in Iran official drug list on routine medical diagnostic tests

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Abstract:

Background and Aims: Drug interactions with diagnostic laboratory tests can lead to misinterpretation of results, compromising patient safety. These interactions are often overlooked by healthcare professionals, including laboratory staff. The aim of this study was to design and develop an AI-powered system to identify and report drug-laboratory test interactions, reducing associated risks and improving diagnostic accuracy. This study aims to design and implement an AI-powered system to detect and report drug-laboratory test interactions, minimizing associated risks and improving the accuracy of diagnostic processes.

Methods: A comprehensive review of literature and clinical guidelines was conducted to identify critical drug-laboratory test interactions. The system was designed to integrate with laboratory information systems (LIS), providing real-time alerts for healthcare providers about potential interactions.

Results: The system has been deployed and is currently operational. It is actively receiving feedback from healthcare providers and patients, which will be utilized to refine its performance and effectiveness.

Conclusion: The proposed AI system offers a promising tool to address the challenges posed by drug-laboratory test interactions. By enhancing diagnostic accuracy and patient safety, it has the potential to reduce healthcare costs. Further development and evaluation based on collected feedback will ensure its adaptability and effectiveness in diverse clinical settings.

Keywords: Drug Interactions, Laboratory Tests, Artificial Intelligence

G-1091

Feature Selection in Diabetes complication by Using SHAP technique

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Abstract:

Background and Aims: Diabetes is reaching epidemic proportions in many developing and newly industrialized countries. It is clinically challenging and important to diagnose diabetes complications at an early stage. In this paper, we exploit the principle of random forests for the implementation of a powerful model for the diagnosis of diabetes And simultaneously interpret risk factors by using the SHAP technique.

Methods: We obtained the demographic characteristics and laboratory data from the EHRs for patients admitted to Besat and Shahid Beheshti Hospitals, the affiliated hospitals of the Hamadan University of Medical Science in Iran from April 2020 to August 2022. The data included 16 indicators and 965 patients. We used the Random Forest (RF) model. Finally, the SHAP technique is used to explain the model. Using SHAP frameworks allows us to understand the relationships between risk factors and generate individualized risk factor rankings.

Results: The RF model performance metrics; Hamming loss (0.10), recall (0.84), F1_Score (0.86), Precision (0.83), and AUC (0.86). the explanation of RF with SHAP identified age, duration of diabetes, blood sugar after breakfast, blood pressure, LDL, BMI, and TC as top significant factors for diabetes complications.

Conclusion: The results of the experiments show that our approach based on random forest has proved to be efficient in machine learning methods. Using the SHAP value provides transparency and interpretability to ML models, which will hopefully help clinicians make medical decisions and increase the acceptability of integrating ML into healthcare to help reduce the burden of disease.

Keywords: Diabetic Complication, Machine Learning, Random Forest

G-1092

A comparison of SMOTE-based machine learning algorithms for predicting hospital mortality in traumatic patients

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Abstract:

Background and Aims: Trauma is one of the most critical public health issues worldwide, leading to death and disability and affecting the age groups. Thus there's great interest in models to prognosticate mortality in trauma patients. The present study aims to explore the potential of developing and evaluating SMOTE-based machine-learning tools for predicting hospital mortality in trauma patients with imbalanced data.

Methods: This cross-sectional study included 475 cases referred to Shahid Rajaee Hospital, selected through census sampling, between October 2022 and June 2023. The data were extracted from the patient's medical records. According to the unbalanced nature of the data, SMOTE approaches were used. further Decision Tree(DT), Random Forest(RF), K- Nearest Neighborhood(KNN), Canonical Neural Network(CNN), Support Vector Machine(SVM), Extreme Gradient Boosting(XGBoost) and Logistic Regression(LR) methods were used to predict in-hospital mortality of patients with traumatic injuries. Metrics similar to accuracy, precision, recall, and area under the receiver operating characteristic curve(AUC) were used to estimate the performance of the algorithms.

Results: Most patients were male(446,93.89), their mean age was 32.26 ±0.21 years, and The mean follow-up time from the date of trauma to the date of outcome was 4.14 ±5.21 days. The performance of ML algorithms isn't good with imbalanced data, whereas the performance of SMOTE-based ML algorithms is significantly improved. The results showed that XGBoost performed the best among the prediction approaches. While the synthetic minority oversampling technique(SMOTE), a type of over-sampling, also demonstrated a certain position of performance, under-sampling was superior. Overall, predicting by the XGBoost model with samples using SMOTE had the best results.

Conclusion: This study presented the findings of an empirical comparison of sampling techniques and classification algorithms that can impact the accuracy of imbalanced samples by combining two techniques. ML algorithms based on SMOTE may be more effective than other ML algorithms in predicting the outcome of traumatic injuries.

Keywords: Imbalanced Data, Machine Learning Algorithms, SMOTE

G-1094

Investigating the role of ontology in improving health information management systems

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Abstract:

Background and Aims: Information and knowledge are unquestionably regarded as one of the most crucial and significant elements for both micro and macro decision-making in the health system. A universal architecture that enables information sharing and reuse for all applications is the result of the Semantic Web initiative. With the rise of electronic health records and the requirement to share medical data across organizations, the Semantic Web can help advance the sharing of medical data across various systems by utilizing standards to facilitate interoperability in transmission and ontologies to establish a common language

Methods: The function of ontologies in enhancing health information management system operations is investigated in this study. The ontology of patients with type 2 diabetes was also investigated in this study. The accuracy of the final DMO-based algorithm was validated with a manual audit of the general practice EHR.

Results: Studies have shown that ontologies improve users' comprehension and recognition of a domain, aid recover documents in natural language, result in effective information searches, and remove heterogeneity in data. Ontologies have the potential to greatly enhance information system performance and are essential for information retrieval in systems like electronic health records. Increasing interoperability, information integrity, consistency, data quality, and effective information retrieval are some of the ways that ontology is being used in hospital information systems. According to the findings of the study, type 2 diabetes patients' ontologies may be accurately retrieved for intelligent patient identification when compared to data from Iranian and Australian patients..

Conclusion: From big text sets, like medical records, phrases (like smoking and cancer) and their semantic links (like "Smoking causes cancer") can be found using natural language processing and data mining techniques. These words' records and the linkages they have found can be utilized to build new ontologies or to support ones that already exist. Intelligent semantic search in electronic health records will be a future topic in the fields of ontology and e-health.

Keywords: Ontology, Health Information System, Medical, e-Health

G-1096

Opportunities and Limitations of Telemedicine in Infertility Management

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Abstract:

Background and Aims: Telemedicine experienced remarkable growth during and after the recent COVID-19 pandemic. Telemedicine, a technological tool, is being applied in assisted reproduction technology to provide remote consultations, monitoring, and support for patients.

Methods: We review scientific databases and use artificial intelligent to assess the beneficial use of telemedicine in reproductive medicine and infertility treatment and limitation factors of the evolution in the clinical practice of medicine through telehealth and telemedicine.

Results: Reproductive medicine and infertility treatment present a complex array of challenges that can significantly influence patient outcomes and quality of life. In recent years, telemedicine has emerged as a promising solution to address these challenges. By leveraging digital technologies, healthcare providers can enhance patient care, improve access to specialized services, and reduce the burden of traditional healthcare delivery models. To assess these outcomes essential equipment is needed for telemedicine in reproductive medicine; high-speed internet connection, high-quality video conferencing equipment, secure electronic health record systems, remote patient monitoring devices and telehealth platforms.

Conclusion: Overall, these requirements provide remarkable opportunities for governments and businesses to invest in technology for telemedicine in assisted reproduction.

Keywords: Telemedicine, Assisted Reproduction Technology, Reproductive Medicine

G-1098

The Impact of Artificial Intelligence on Stewardship Functions in the Health System: Opportunities and Threats in a Narrative Review

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Abstract:

Background and Aims: It is indisputable that artificial intelligence (AI) is permeating many areas of life in the modern world, especially the healthcare sector. Setting health goals, developing policies, monitoring and evaluating performance, guaranteeing accountability, and managing resources are the five main Stewardship functions that are examined in this study, along with the opportunities and challenges that AI brings. Finding the potential and difficulties brought about by the usage of AI in this field is the aim of this study.

Methods: This study examined 17 articles published between 2000 and 2024 using a narrative review methodology. The papers under evaluation were pertinent to the risks and possibilities that artificial intelligence presents to health systems' Stewardship roles. Reputable global databases including Scopus, Google Scholar, and PubMed as well as Persian-language websites like Irandoc, SID, and Magiran were the sources of the articles.

Results: The findings suggest that AI can detect disease trends and behavioral patterns through big data analysis, allowing for the creation of more practical health goals. AI also aids in the creation of policies by simulating different outcomes and providing more intelligent suggestions. Real-time data analysis promotes public trust, increases accountability and transparency, and aids in identifying flaws. AI also makes resource management easier by forecasting future requirements and improving allocation. But issues like data privacy and quality continue to be major obstacles.

Conclusion: The performance of healthcare systems could be improved by artificial intelligence through better data analysis, realistic goal-setting, policy simulation, and efficient resource allocation. Increasing the system's efficacy and efficiency can be greatly aided by this technology. But in order to fully take use of these advantages, issues like privacy, security, and ethics must be resolved. Achieving a responsive and sustainable healthcare system that allows the use of AI

opportunities to meet health goals requires strengthening the technical and educational infrastructures.

Keywords: Artificial Intelligence, Stewardship Functions, Opportunities

G-1099

Machine Learning Models for Predicting Breast Cancer Recurrence: A Comparison of Tree-Based Classifiers

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4 *

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Abstract:

Background and Aims: Breast cancer is one of the most prevalent cancers among women globally, accounting for nearly one-third of new cancer cases in women and resulting in the deaths of approximately 42,000 patients each year, making it a significant public health concern. When a patient is diagnosed with breast cancer, the malignant mass must be removed, followed by predicting the disease's progression—a process this study aims to automate using machine learning methods.

Methods: To assess model performance and generalizability, we used ten-fold cross-validation on the Wisconsin Prognostic Breast Cancer dataset, which contains Fine Needle Aspirate test records of 198 cases (151 non-recurrence, 47 recurrence). Principal Component Analysis was applied to reduce dimensionality. We evaluated three tree-based classifiers: a standalone Decision Tree and two ensemble models. The ensemble models included a bagging-based Random Forest and a boosting-based model, Extreme Gradient Boosting. Model efficacy was measured using accuracy, F1 score, and area under the Receiver Operating Characteristic curve.

Results: Extreme Gradient Boosting demonstrated the highest performance across all metrics. Using ten-fold cross-validation, the mean test accuracies for Extreme Gradient Boosting, Random Forest, and Decision Tree models were 0.960 ± 0.025 , 0.951 ± 0.033 , and 0.944 ± 0.035 , respectively. Data imbalance had minimal impact on model performance, as evidenced by F1 scores of 0.945 ± 0.036 (Extreme Gradient Boosting), 0.933 ± 0.044 (Random Forest), and 0.925 ± 0.043 (Decision Tree). All models demonstrated strong class discrimination, with area under the

Receiver Operating Characteristic curve values of 0.954 ± 0.031 (Extreme Gradient Boosting), 0.946 ± 0.036 (Decision Tree), and 0.939 ± 0.034 (Random Forest).

Conclusion: This study demonstrates that machine learning models, particularly Extreme Gradient Boosting, effectively predict breast cancer recurrence. Extreme Gradient Boosting outperformed Random Forest and Decision Tree models in accuracy, F1 score, and area under the Receiver Operating Characteristic curve, with minimal impact from class imbalance. These results suggest that ensemble methods like Extreme Gradient Boosting are valuable for early breast cancer recurrence prediction. Future work could focus on further optimization and the integration of clinical features for improved clinical application.

Keywords: Artificial Intelligence, Machine Learning, Breast

G-1100

Machine Learning for Prediction of Intraoperative Awareness: A Step towards Safer Anesthesia Practices

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Abstract:

Background and Aims: Awareness intraoperative is an unusual yet serious complication of general anesthesia, resulting in psychological distress or post-traumatic stress disorder. Identification of risk for intraoperative awareness would permit proactive care by the anesthesiologist and reduce the associated risks. The purpose of this study was to examine the application of machine learning in the development of a predictive model that uses patient demographics, physiological data, and surgical factors in the prediction of intraoperative awareness.

Methods: The dataset includes age, weight, gender, heart rate, mean arterial pressure-MAP, anesthesia dosage, time length of surgery, and whether the surgery was in emergency or non-emergency. The medication dosage via anesthesia is adjusted in proportion to body weight and then again adjusted in favor of elderly patients (60 years). Random Forest Classifier was chosen because of its ability to deal with high-order interactions among features effectively. The original dataset had been divided into a training subset and a test subset, correspondingly. Among the steps of data preprocessing included standardization. Accuracy, log loss, and cross-validation accuracy were performance metrics considered in the model. Python's scikit-learn library was used for model implementation; feature importances were visualized using matplotlib.

Results: The Random Forest model had an accuracy of 85% for the test data, exhibited low log loss values indicative of reliable probabilistic forecasts, and maintained consistent cross-validation accuracy across folds. Feature importance analysis revealed that anesthesia dosage, heart rate and MAP were the most important predictors, followed by age and surgical duration. Results confirm the potential of machine learning in the prediction of intraoperative awareness.

Conclusion: This study has shown that machine learning not only is feasible for predicting intraoperative awareness but it is also useful clinically. Along with improvements, integration of predictive analytics within anesthesiology workflows will revolutionize the field in patient safety and care.

Keywords: Intraoperative Awareness, Machine Learning, Random Forest

G-1103

A BERT-Based Approach for Diagnosing Gynecological Disorders from Patient-Reported Sentences

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Abstract:

Background: Gynecological disorders such as Genital Infections, Polycystic Ovary Syndrome (PCOS), Uterine Fibroids, Endometriosis, and Premature Ovarian Failure (POF) often present with overlapping and ambiguous symptoms, posing significant challenges for accurate diagnosis. Accurate disease diagnosis based on patient-reported symptoms is essential for improving healthcare outcomes. This study proposes a deep learning model based on BERT (Bidirectional Encoder Representations from Transformers) for classifying diseases from patient-reported text.

Methods: A deep learning model is developed using the Keras Functional API and a pre-trained BERT encoder fine-tuned for medical text. The model was trained on a dataset of 940 labeled patient-reported sentences across five gynecological conditions. It processes raw text through an Input Layer, BERT Preprocessor for tokenization, and BERT Encoder to capture contextual representations of the symptoms. A Dropout Layer prevents overfitting, and a Dense Layer with softmax activation provides the classification probabilities. The model was trained using the Adam optimizer and sparse categorical cross-entropy over seven epochs to ensure effective learning.

Results: By the final epoch of training, the model achieved a training accuracy of 92.42%, with the validation accuracy reaching a peak of 80.85% during epoch 4. The training process showed consistent improvement, with significant loss reductions and accuracy increases. The final model exhibited stable performance on the validation set, confirming its effectiveness in classifying diseases based on patient-reported symptoms.

Example:

"The patient has been experiencing heavy menstrual bleeding and lower abdominal pain. She also reports occasional itching and a mild burning sensation during urination."

The model outputs:

Endometriosis: 76.79%

Genital Infections: 22.32%

POF: 0.71%

This test sample demonstrates how the model correctly identifies Endometriosis as the most likely diagnosis, despite overlapping symptoms with Genital Infections, based on the higher probability associated with heavy bleeding and abdominal pain.

Conclusion: The Medaid model demonstrates the potential of BERT-based deep learning for automating the diagnosis of gynecological disorders from patient-reported symptoms. Despite challenges such as overfitting after five epochs and modest validation accuracy due to dataset imbalance, the model's ability to provide automated and interpretable support suggests it could improve diagnostic speed and patient outcomes.

Keywords: BERT Algorithm, Gynecological Disorders, Automated Diagnosis

G-1105

Investigating the level of satisfaction and perceived learning of students from clip-based education in an electronic way in neurology nursing course

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Abstract:

Background and Aims: Nursing in Iran has gone through various historical periods and has been influenced by nursing education from the United States and the United Kingdom, transforming into academic nursing. With the onset of the Islamic Revolution and the war, the need for nursing increased, and the philosophy and educational models of nursing underwent changes. After the war, with the establishment of the Ministry of Health, Treatment, and Medical Education, the Nursing Organization, and the Nursing Board, the foundations for the professionalization of nursing in Iran were laid. Despite the progress, there are still significant issues in nursing in Iran that need attention. Examining the developments in nursing in Iran has shown that using modern educational methods can help improve the quality of nursing education.

Methods: A literature review was conducted by searching databases such as PubMed, CINAHL, and Scopus for studies published between 2012 and 2023. Studies included in the review evaluated the use of video clips in nurses and perceived learning of students from clip-based education in an electronic way.

Results: Students who use educational clips have better clinical skills, and the results can help to better understand the effect of educational clips on student satisfaction in nursing internships.

Conclusion: Using educational clips helps students learn and improve learning and increase student satisfaction

Keywords: Artificial Intelligence, Satisfaction, Electronic Way, Nurse

G-1106

Using Artificial Intelligence for low-cost, home-based elder care: Addressing the daily living assistance needs of semi-independent elders to prevent institutionalization

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Abstract:

Background and Aims: The global aging population necessitates innovative solutions to support semi-independent elders in maintaining independence and quality of life while preventing institutionalization. Artificial intelligence (AI) offers transformative potential for delivering low-cost, home-based care tailored to the unique needs of this demographic. This review explores the capabilities of AI in addressing the daily living assistance requirements of semi-independent elders and highlights its potential role in reducing institutional care reliance.

Methods: This article synthesizes findings from recent studies and pilot programs employing AI-driven technologies for elder care. Key focus areas include AI-powered virtual assistants, smart home integrations, health monitoring devices, and adaptive learning algorithms. The review evaluates implementation strategies, effectiveness in assisting with activities of daily living (ADLs), and user acceptance. Practical considerations such as cost-effectiveness, scalability, and the ethical implications of data privacy and autonomy are discussed.

Results: Evidence suggests that AI technologies enhance elder independence by providing real-time assistance, timely reminders, and remote monitoring, significantly improving ADL performance and reducing caregiver burden. Studies report high user satisfaction rates, although challenges persist regarding usability for technologically unskilled elders and technical malfunctions. Notable examples include AI systems improving medication adherence, fall prevention, and social engagement.

Conclusion: AI offers a promising solution for low-cost, home-based elder care, fostering aging-in-place and preventing premature institutionalization. To maximize benefits, future implementations must prioritize user-friendly design, ensure equitable access, and address ethical concerns. Policymakers and developers should collaborate to create robust frameworks supporting widespread adoption.

Keywords: Smart Home Technology, Elderly Care, Aging-in-Place

G-1115

Application of Multi-Criteria AI-Based Modeling in Predicting and Assessing Fire Safety in Healthcare Facilities

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Abstract:

Background and Aims: Fire safety in healthcare facilities is of paramount importance due to the limited evacuation capabilities of occupants in these centers. Consequently, inadequate fire safety precautions result in increased fatalities and financial losses. This research introduces an integrated model to predict and assess fire safety for occupants within these buildings.

Methods: To achieve this, 315 fire scenarios were simulated to determine the fire safety level through emergency evacuation modeling (using Pathfinder software) and fire and smoke spread modeling (using PyroSim software). In each scenario, 13 features, including fire load density, occupancy, and building characteristics, were selected as model inputs to predict fire safety and evacuation risk.

Results: Among the AI-based techniques examined, the MLP-PSO (500 iterations) method demonstrated the best performance for predicting the fire safety level of hospital occupants, with an RMSE (Total data) of 0.078, an R^2 (Total data) of 0.99, and an SD (Total data) of 1.46. When compared to the FRAME approach, the results of the MLP-PSO model exhibited a significant correlation in fire safety predictions with respect to the Fire Risk Assessment Method for Engineering (FRAME).

Conclusion: Hospital administrators can enhance emergency preparedness and mitigate fire risks with the aid of this precise approach. The integration of simulation and machine learning provides a more comprehensive and accurate assessment and prediction of fire safety, ultimately contributing to safer healthcare buildings.

Keywords: Fire Safety, MLP-PSO, Hospital, Evacuation Risk.

G-1116

Classification of Alzheimer's Disease and Mild Cognitive Impairment Using MRI Data: A Comparison of MLP and CNN Models

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Abstract:

Background and Aims: With an aging global population, the prevalence of geriatric conditions is increasing and creating a need for innovative approaches to early detection and accurate classification. Artificial intelligence has transformed healthcare. One of its applications is in the diagnosis and classification of similar diseases such as Alzheimer's disease and Mild Cognitive Impairment. AI techniques, including machine learning and deep learning, have recently been applied to process Magnetic Resonance Imaging data for this purpose.

Methods: In this research, we evaluated two models, Convolutional Neural Networks and Multilayer Perceptrons, using a collected set of MRI data from Kaggle. The MLP model consisted of three layers with 128, 64, and 3 neurons, respectively, while the CNN model comprised five layers with 32, 64, 128, 128, and 3 neurons. Both models were trained with the categorical crossentropy loss function, using 10 epochs and a batch size of 32, to ensure a fair comparison of their accuracy. Additionally, we employed ReLU and softmax activation functions, along with the Adam optimizer with a learning rate of 0.001.

Results: We train the models for 10 epoch and with batch size of 32 and the result indicate a total accuracy above 95.0% for both models. However, the CNN outperformed the MLP, achieving an accuracy of 98.45% compared to the MLP's accuracy of 95.35%.

Conclusion: The results indicate that while both models are effective for classifying MRI data, the CNN model is more accurate. Incorporating additional data types could further enhance the models' ability to diagnose more complex and diverse diseases. Also, using preprocessing and feature extraction can improve the accuracy.

Keywords: AI, CNN, MLP, Alzheimer, MCI, MRI

G-1118

The Impact of Artificial Intelligence on Improving Care Quality and Reducing Anxiety in Hospitalized Children

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Abstract:

Background and Aims: Artificial intelligence (AI) has emerged as a transformative tool in healthcare, particularly in pediatric settings, where it holds significant promise for enhancing the quality of care and alleviating anxiety among children. This systematic review aims to delve into the multifaceted impact of AI on improving the hospital experience for pediatric patients and optimizing nursing services, thereby fostering a more supportive environment during hospitalization.

Methods: To conduct this systematic review, a comprehensive search was performed across reputable databases, including PubMed, CINAHL, and Scopus, targeting articles published between 2010 and 2024. The inclusion criteria focused on studies that examined the influence of AI technologies on reducing anxiety levels and enhancing the quality of care for hospitalized children. Following PRISMA guidelines, eligible articles were meticulously analyzed, and the findings were categorized qualitatively to highlight the various dimensions of AI's impact.

Results: The findings revealed that AI plays a significant role in mitigating anxiety in pediatric patients through the deployment of interactive tools such as social robots, virtual reality programs, and intelligent monitoring systems. These technologies not only engage children but also provide distraction and comfort during stressful procedures. Furthermore, AI has been instrumental in improving nursing efficiency by streamlining workflows, reducing the likelihood of care errors, and ultimately boosting patient satisfaction. The integration of AI in nursing practices has allowed healthcare providers to focus more on patient interaction and personalized care.

Conclusion: The evidence suggests that AI is effective in reducing anxiety and enhancing the quality of care for pediatric patients in hospital settings. However, to fully realize the potential of this technology, further research is needed to explore broader applications and conduct long-term evaluations of its impact on pediatric healthcare. Continued development and thoughtful

implementation of AI innovations can lead to significant advancements in the way care is delivered to children in hospitals.

Keywords: Artificial Intelligence, Anxiety Reduction, Pediatric Health

G-1121

The effect of cultural parameters on policymaking in telehealth in Iran: a review study

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Abstract:

Background and Aims: Telehealth is one of the ways to provide healthcare services to all people in society, especially those who live in deprived areas. It has benefits such as lower cost and easier access to high quality services. Policy-making in health is also carried out with the aim of improving and promoting the quality of life of individuals. This policy-making is influenced by various factors, including cultural factors. This study aimed to examine the impact of cultural factors on policy-making in the field of telehealth in Iran.

Methods: In this review, selected keywords including telehealth, telemedicine, culture, Iranian culture, policy, and health policy-making were searched from Persian published articles using Scopus, SID, Cochrane Library, and Google Scholar databases. Articles that met the inclusion criteria were selected and extracted from all of them.

Results: Based on the seven selected articles, the impact of cultural factors on policymaking in telehealth in Iran was divided into eight categories: 1. Weak privacy protection methods, 2. Patients' preference for face-to-face visits, 3. Patients' concern about the quality of services provided, 4. Attitudinal and behavioral limitations of people, 5. Avoiding technology in the elderly, 6. Resistance of doctors and healthcare providers, 7. Language difference, level of health literacy and academic literacy, and 8. The phenomenon of resistance to change.

Conclusion: Considering the increasing development of information technology and its application in life, especially in the field of people's health, the successful development of telehealth and solving cultural problems in the country's health system requires increasing the awareness and training of people both as service providers and as recipients. Policymaking in this area should be designed comprehensively and by considering cultural factors, because the close relationship between policymaking in health and culture results in the creation of better and stronger solutions in society.

Keywords: Telehealth, Policy Making, Telemedicine, Cultural

G-1122

Application of Traditional Machine Learning Algorithms in Predicting Bone Metastasis in Prostate Cancer Patients: A Systematic Review and Meta-Analysis

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Abstract:

Background and Aims: Traditional machine learning algorithms have been widely used to predict bone metastasis in prostate cancer patients, providing valuable support for medical decision-making and treatment planning. This systematic review aims to evaluate their performance in this context.

Methods: A comprehensive search of PubMed, Cochrane Library, and Scopus databases was conducted by two independent reviewers to identify studies investigating traditional machine learning algorithms for bone metastasis prediction in prostate cancer. Four studies that met the inclusion criteria were selected. The methodological quality of these studies was assessed using the PROBAST tool.

Results: Among the selected studies, key clinical features for predicting bone metastasis included Tumor stage, Total Prostate-Specific Antigen level and Gleason score. The most commonly used algorithms were Random Forest, Logistic Regression and eXtreme Gradient Boosting. Meta-analysis results revealed that the eXtreme Gradient Boosting model outperformed others, with an Area under the curve (AUC) of 95.434% (95% CI: 95.430%–95.440%), accuracy of 88.065% (95% CI: 88.061%–88.070%) and sensitivity of 90.419% (95% CI: 90.410%–90.430%).

Conclusion: Traditional machine learning algorithms, especially the eXtreme Gradient Boosting model, can play a potential role in predicting bone metastasis in prostate cancer patients. These models can support clinical decision-making, but further refinement of study design and broader evaluation are necessary to enhance their reliability and accuracy.

Keywords: Machine Learning, Bone metastasis, Prostate Cancer

G-1126

Leveraging Machine Learning for Early Detection of Neurodegenerative Disorders Among the Elderly Using Diffusion Tensor Imaging (DTI).

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Abstract:

Background and Aims: A promising tool for understanding age-related neurodegeneration is diffusion tensor imaging (DTI) of the brain's white matter. Researchers are using machine learning to improve the early detection of neurological disorders such as Parkinson's. The study examines the effectiveness of machine learning-based DTI applications in increasing diagnostic accuracy, identifying markers, and enabling early interventions in older people.

Methods: In this review study, a review of English language articles from January 2019 to November 2024 with AND, OR operators and English keywords Having the full text of the article, the year of publication between 2019 and 2024, Clinical trial studies, and Human studies with Rayyan software were done through scientific databases including PubMed, Web of Science, Science Direct, Cochrane Library, APA PsycNET, and Google Scholar. A total of 23,559 articles with related keywords were extracted. Then, after checking and considering the entry and exit criteria, 21 articles were selected and included in the study.

Results: Machine learning models demonstrated varied performance across studies, with Fractional Anisotropy (FA) emerging as the most reliable DTI metric for identifying white matter alterations. For instance, support vector regression using FA achieved a mean absolute error of 7.74–10.54 years for brain age prediction. Support Vector Machine classifiers achieved an accuracy of up to 87.5% for differentiating patients with idiopathic Rapid Eye Movement Sleep Behavior Disorder from healthy controls. Similarly, structural connectome profiles combined with Machine Learning (ML) models enhanced classification accuracy for focal epilepsy but showed limited efficacy in predicting Ant-seizure Medication responsiveness. Early detection of neurodegenerative conditions like Parkinson's Disease remains challenging, with diagnostic performance ranging from 67% to 87% depending on the input features and ML algorithms utilized.

Conclusion: the combined use of DTI and ML shows promise in detecting and categorizing neurodegenerative disorders in older adults. FA is superior in detecting age-related and pathological changes. Integration of various imaging techniques improves accuracy but challenges remain. Future research should focus on standardization and collaboration for clinical application.

Keywords: Machine Learning, Diffusion Tensor Imaging, Neurodegenerative

G-1127

Advances in diagnostic tools due to artificial intelligence: A revolution in the early diagnosis of cardiovascular diseases

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Abstract:

Background and Aims: A revolution in the early diagnosis of cardiovascular diseases has been created with the advancement of AI-based diagnostic tools, which can lead to a transformation in the landscape of healthcare diagnostics.

Methods: This research is a review study conducted by searching the databases of Google Scholar, PubMed, and Science Direct, considering the time limitation (2021-2023). The articles were reviewed in three stages: title screening, abstract review, and full-text review, and unrelated articles were excluded.

Results: AI-based diagnostic tools with their unique algorithms can analyze diverse data sources such as medical imaging, genetic information, patient records, and lifestyle to support accurate diagnosis and assessment of cardiovascular disease risk. The advantages of this technology include increased diagnostic accuracy, early disease detection, personalized treatment recommendations, monitoring the patient's recovery process, and optimal resource utilization in healthcare settings. By enabling the early diagnosis of cardiovascular diseases through these advanced tools, timely interventions have been facilitated and the ground has been laid for reducing the complications arising from cardiovascular diseases.

Conclusion: Artificial intelligence has great potential in shaping the future of cardiovascular healthcare. New technologies and innovations are being prepared for further revolutions in the diagnosis of cardiovascular diseases, which include: predictive analysis to personalized treatment recommendations. These tools are evolving to provide more appropriate and precise solutions for the early diagnosis and management of cardiac conditions.

Keywords: Cardiovascular Disease, Diagnostic Tools, Artificial

G-1128

Transforming Training: A Game-Based Approach to Enhancing Midwives' Cancer Screening Proficiency

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Abstract:

Background and Aims: Gamification in training programs has emerged as a promising approach to enhance engagement and learning, especially in healthcare, where continuous education is crucial. For midwives, proficiency in cancer screening is essential for early detection and improved patient outcomes. Traditional training methods often suffer from low engagement and motivation, issues that gamification can effectively address by making learning more enjoyable and rewarding. This systematic review aims to evaluate the impact of gamified training on midwives' proficiency in cancer screening, comparing it to traditional methods in terms of engagement, knowledge retention, and skill enhancement.

Methods: A comprehensive search was conducted across Google Scholar, Web of Science, PubMed, and Scopus using relevant keywords. Articles were assessed for eligibility based on their titles, abstracts, and full texts. Data were meticulously extracted and summarized according to PRISMA guidelines. The evidence included systematic reviews of randomized controlled trials (RCTs) and cohort studies from 2019 to 2024. A narrative synthesis method was employed for data analysis.

Results: Five studies met the inclusion criteria and were analyzed. The extracted data were categorized into four themes: 1. Engagement and Motivation, 2. Knowledge Retention, 3. Skill Proficiency, and 4. Implementation Challenges.

Conclusion: The selected studies indicate that game-based training approaches can effectively enhance cancer screening behaviors and accuracy. The observed increases in screening attendance and improved identification accuracy are promising. However, the variability in study designs, interventions, and outcome measures underscores the necessity for standardized methodologies and larger trials to validate these findings comprehensively.

Keywords: Gamification, Midwifery Training, Cancer Screening

G-1132

The role of telehealth and AI in the care of musculoskeletal pain conditions after COVID-19

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Abstract:

Background: The adoption of virtual medicine, supported by e-health technologies and artificial intelligence (AI), experienced rapid and remarkable growth during the COVID-19 pandemic and remains an essential and transformative aspect of modern healthcare delivery today.

Methods: We thoroughly reviewed the literature to assess the effectiveness of telehealth and AI in preventing and treating musculoskeletal pain conditions. The review also explored research gaps and potential future directions based on studies published up to April 2024.

Results: Telehealth, a new generation of healthcare services using electronic or telecommunication technologies, can enhance access to care in underserved areas or regions with significant barriers. Incorporating AI into musculoskeletal rehabilitation has the potential to alleviate pain and manage conditions like osteoarthritis effectively. Furthermore, the use of AI makes it feasible to conduct rehabilitation treatments in general healthcare settings, such as primary care, expanding access to specialized care outside traditional environments.

Conclusion: The findings of this research showed that although telehealth and AI offer significant benefits, the effectiveness of virtual consultations compared to in-person healthcare interactions remains highly debated. This is particularly true in fields of medicine that depend heavily on physical examinations or the demonstration of therapeutic exercises and movements, where virtual methods may face limitations.

Keywords: Telehealth, Musculoskeletal Discomforts, New Normal, e-Health

G-1133

Enhancing Maternal-Fetal Outcomes: The Role of AI-Driven CDSS in Midwifery

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Abstract:

Background and Aims: Clinical decision support systems (CDSS) leveraging machine learning and artificial intelligence have shown considerable potential in enhancing prenatal care within midwifery. The aim of this study is to evaluate the effectiveness of AI-driven predictive analytics in enhancing maternal-fetal outcomes within midwifery, particularly through the application of Clinical Decision Support Systems (CDSS).

Methods: A thorough search was conducted across Google Scholar, Web of Science, PubMed, and Scopus using relevant keywords. Articles were screened for eligibility based on their titles, abstracts, and full texts. Data were meticulously extracted and descriptively summarized following PRISMA guidelines. The evidence ranged from systematic reviews of randomized controlled trials (RCTs) to expert-guided original studies, spanning from 2019 to 2024. A narrative synthesis approach was employed for data analysis.

Results: Five studies met the inclusion criteria and were analyzed. The extracted data on AI-augmented CDSS applications were included the prenatal care, early pregnancy, obstetric care, and postpartum care, and categorized in these themes: 1. Potential of CDSS, 2. Challenges, 3. Generalizability and Equity and 4. Empowerment through Decision Support Tools.

Conclusion: The literature underscores the significant potential of CDSS in midwifery and pregnancy care, particularly for enhancing diagnostic accuracy, risk assessments, and patient empowerment. However, current CDSS implementations are hindered by issues related to explainability and transparency, which affect clinician trust and integration into clinical workflows. Additionally, the lack of external validation and reliance on homogeneous datasets limit the generalizability and equity of these systems across diverse populations. While the empowerment of pregnant women through decision support tools is promising, further empirical research is needed to document improvements in clinical outcomes. Integrating microbiome data into CDSS could advance personalized reproductive care, but requires robust data integration and advanced analytical frameworks.

Keywords: artificial intelligence, maternal-fetal health, midwifery, Clinical decision support systems

G-1134

Investigating the Role and Function of Artificial Intelligence in Monitoring the Drug Process

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Abstract:

Background and Aims: Traditional methods of drug delivery may often prove inefficient and potentially lead to risks and adverse effects. With the expanding role of artificial intelligence (AI) in medical care, AI-based systems can play a significant role in addressing these challenges and reducing associated risks.

Methods: This study is a systematic review conducted by searching academic databases, including Google Scholar, PubMed, and ScienceDirect, with a time frame restriction of 2021–2023. Articles were reviewed in three stages: title screening, abstract evaluation, and full-text analysis. Irrelevant articles were excluded during the process.

Results: AI technologies have the potential to analyze patient data with precision, enabling personalized drug dosage prescriptions. By considering individual patient factors such as age, weight, and disease progression, AI can optimize drug regimens to enhance therapeutic efficacy while minimizing adverse reactions. Moreover, in addition to precise dosing, monitoring and evaluating drug response feedback is of paramount importance. AI systems possess the capability to continuously monitor vital signs, biomarkers, and therapeutic outcomes, providing informed decision-making and enabling proactive interventions by healthcare professionals to adjust drug delivery strategies as needed.

Conclusion: The integration of AI into pharmaceutical systems represents a significant advancement in healthcare. With the continuous progress in machine learning and the incorporation of personalized medicine, AI holds the promise of reducing medication errors, improving adherence to treatment, optimizing therapeutic regimens, and ultimately enhancing treatment outcomes.

Keywords: Artificial Intelligence, Drug Therapy, Machine Learning

G-1135

Evaluation of opportunities and challenges of artificial intelligence in medical education: a review

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Abstract:

Background and Aims: Artificial intelligence (AI) is a growing phenomenon that will soon bring widespread changes to many professions, particularly medical education. AI capabilities have the potential to transform the process of medical education, making it essential for professionals in this field to assess its impact. This study aims to review and analyze articles that discuss learning and medical education through AI.

Methods: A search for articles was conducted in the databases PubMed, Scopus, Web of Science, and Google Scholar. Only English-language articles published between 2019 and 2024 were included. Articles were screened based on inclusion criteria, and data were extracted and then coded. To assess the quality of qualitative studies, the Critical Appraisal Skills Programme (CASP) checklist was used.

Results: The search strategy in the selected databases yielded 256 articles. After title screening, 199 articles were excluded, and following a full-text review, 42 more articles were removed from the study. Based on quality assessment, only articles with a quality score above 5 were included in the review, resulting in 6 selected articles. The review indicated that AI applications in medical education include preparing for medical exams, providing access to large sample sizes and simulated cases for training, and assisting health researchers in conducting studies. However, concerns were raised regarding the unethical use of AI, reduced interaction between learners and real patients, and difficulties in verifying the accuracy and reliability of AI-generated information.

Conclusion: AI has significant potential in medical education, paving the way for new learning experiences. However, it is crucial to closely monitor the learning process in this field to prevent misuse and address the associated challenges effectively.

Keywords: Artificial Intelligence, Medical Education, Opportunities, Challenges

G-1137

Artificial Intelligence as an Assistant in management of Male-Factor Infertility

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Abstract:

Background and Aims: Infertility is a significant issue for millions of couples. In our society, it affects all aspects of life, the most important being mental health. Male factor infertility can be a health concern for men and is primarily responsible for the inability to conceive a child after a year of regular, unprotected intercourse. In recent years, artificial intelligence (AI) has played an extensive role in medical sciences, particularly in the diagnosis and treatment of various diseases. It has also shown great potential in different aspects of male infertility. One of the major infertility issues in men is reduced sperm count caused by varicocele, along with abnormal sperm shape and movement.

Methods: AI is revolutionizing the approach to male infertility by improving the analysis of sperm quality and morphology. AI algorithms can process large datasets quickly, allowing for more precise assessments of sperm characteristics, which are crucial for successful fertilization. One significant application of AI in this field is the use of deep learning techniques to analyze sperm images. These algorithms can classify sperm based on morphology, motility, and viability, providing insights into male fertility potential. For example, a study by Esteves et al. demonstrated that AI models can predict sperm DNA fragmentation and correlate it with reproductive outcomes, thereby guiding clinical decisions in assisted reproductive technologies (ART).

Results: Results For the first time, Kruger and his team identified a link between egg fertilization and sperm shape. Research indicates that normal sperm morphology contributes to successful fertilization and can enhance live birth rates in IVF and ICSI procedures. Utilizing deep learning and machine learning, AI can effectively visualize and classify the sperm's head, tail, and midpiece. These algorithms analyze sperm morphology quickly and accurately.

Conclusion: AI acts as a powerful tool that complements the expertise of specialists, ultimately leading to better management of male infertility.

Keywords: Artificial Intelligence, Male-Factor Infertility, Sperm Analysis

G-1138

Cell Culture Through Artificial Intelligence for tissue engineering and regenerative Medicine

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) in cell culture presents transformative opportunities for advancing biological research and biotechnology. AI-driven methodologies enhance precision, efficiency, and reproducibility in cell culture processes. This abstract explores the pivotal roles AI plays, including optimizing growth conditions, automating data analysis, and predicting cell behavior.

Methods: AI algorithms can analyze vast datasets from imaging and sensor technologies to identify optimal conditions for cell growth, reducing time and resource consumption. AI is increasingly being utilized in cell counting, characterization of bacterial contamination, and monitoring cross-contamination in cell culture rooms. AI can help identify and classify bacterial species present in cell cultures by analyzing patterns in data obtained from sequencing or imaging techniques. This aids researchers in understanding the sources and types of contamination, facilitating better contamination management strategies by analyzing cell morphology and growth patterns. Also, by flagging any anomalies, these systems help maintain the integrity of cell lines and ensure reliable experimental results.

Results: Machine learning models predict cell differentiation and proliferation patterns, enabling researchers to tailor experimental parameters dynamically. Furthermore, AI-powered automation reduces human error and increases throughput, facilitating large-scale experiments with consistent results. Also, studies demonstrate significant improvements in cell viability and

experimental accuracy when AI systems are implemented. The potential for AI to revolutionize tissue engineering and regenerative medicine is immense, as it allows for the development of more effective and individualized treatment strategies.

Conclusion: In conclusion, the synergy between AI and cell culture techniques offers a promising frontier for scientific discovery and innovation, paving the way for breakthroughs in various fields of biology and medicine.

Keywords: Artificial Intelligence, Cell Culture, Tissue Engineering

G-1139

How Artificial Intelligence manage biomaterial for scaffold production in stem cell research

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Abstract:

Background and Aims: Artificial intelligence (AI) has emerged as a transformative force across various fields, particularly in tissue engineering and stem cell research. Its significant contributions include the optimization of biomaterials and scaffold development for tissue engineering applications. This study aims to explore the role of AI techniques, specifically machine learning and deep learning, in enhancing the behavior of stem cells and improving scaffold design.

Methods: AI was utilized to control stem cell behaviors such as migration, adhesion, and differentiation, which are directly influenced by the properties of the scaffolds. Researchers modified several parameters, including biomaterial types, components, manufacturing processes, and scaffold geometries, to investigate their effects on cellular fate. Additionally, AI algorithms were employed for image analysis to characterize scaffold properties like morphology, porosity, and cell adhesion, utilizing diverse data types including tabular, image, and video data.

Results: The application of AI demonstrated a significant ability to optimize scaffold design and enhance characterization techniques. The predictive capabilities of AI allowed for the forecasting of cell behavior and culturing outcomes, effectively reducing experimental workloads. Furthermore, AI-guided modifications led to improved cell-scaffold interactions, suggesting enhanced efficacy in tissue engineering applications.

Conclusion: The integration of AI in biomaterial research and tissue engineering holds great promise for advancing personalized medicine approaches, enabling the creation of tailored scaffolds that cater to specific patient needs. As AI technology continues to evolve, its applications in biomaterials and tissue engineering are expected to expand, potentially revolutionizing the field. The findings underscore the importance of AI in optimizing scaffold design and improving

the management of stem cell behaviors, paving the way for more effective tissue engineering solutions.

Keywords: Artificial Intelligence, Stem Cell, Tissue Engineering,

G-1140

Predicting the Success of Varicocele Surgery in the Treatment of Male Infertility

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Abstract:

Background and Aims: Artificial intelligence (AI) is increasingly being utilized to predict the success of varicocele surgery in the context of infertility treatment. Varicocele, an enlargement of the veins within the scrotum, can affect sperm quality and male fertility. By leveraging AI algorithms, clinicians can analyze various factors that contribute to surgical outcomes, leading to more personalized treatment plans.

Methods: Varicocele may lead to reduction of sperm production and count, disrupt male fertility, alter sperm morphology, and diminish sperm quality. Consequently, in assisted reproductive techniques such as IVF and ICSI, satisfactory results may not be achieved. While varicocele surgery may improve sperm quality, it remains an unresolved issue to determine which patients are suitable candidates for the surgery concerning sperm quality.

Results: One of the key applications of AI is in the development of predictive models using both deep learning and machine learning, which incorporate patient-specific data such as age, semen analysis results, and hormonal profiles. A study by Bensalah et al. demonstrated that AI could effectively predict the likelihood of improved semen parameters post-varicocelectomy based on preoperative data.

Additionally, AI can assist in identifying biomarkers correlated with surgical success. Research has shown that AI-driven analysis of sperm DNA fragmentation and oxidative stress levels can provide insights into the expected outcomes of varicocele repair. This enables specialists to better stratify patients according to their likelihood of benefiting from the surgery.

Conclusion: AI plays a crucial role in predicting the success of varicocele surgery in infertility treatment by utilizing data-driven approaches to improve patient selection and optimize surgical outcomes.

Keywords: Artificial Intelligence, Varicocele, Male Fertility

G-1141

Assessing Convolutional Neural Networks (CNN) Models in Diabetic Retinopathy Diagnosis: Systematic Review

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Abstract:

Background and Aims: Diabetic retinopathy (DR) is the leading cause of blindness among adults, highlighting its critical public health impact. Early diagnosis is essential but challenging due to the reliance on time-consuming analyses by experienced clinicians. Artificial intelligence especially through convolutional neural networks (CNNs), shows significant promise in enhancing DR diagnosis. CNNs can efficiently and accurately analyze retinal images, often matching human expert capabilities. This study aimed to evaluate a CNN model for diagnosing DR.

Methods: This systematic review was conducted with PRISMA guidelines for the evaluation of studies using convolutional neural networks (CNN) for the diagnosis of diabetic retinopathy (DR). The review included original research articles published in English up to 2024, data sources including PubMed and Web of Science using keywords such as "CNN", "diagnosis" and "diabetic retinopathy". Key features extracted from the articles included CNN types, input features (e.g. fundus images and OCT), methodology, evaluation criteria (e.g. accuracy and sensitivity), results, limitations and sample size. The aim of this analysis was to identify trends in methodology and performance measures, highlighting improvements in DR diagnostic accuracy using CNN.

Results: Out of 560 extracted articles, 58 met the eligibility criteria for inclusion in the study, focusing on the performance of Convolutional Neural Networks (CNNs) in detecting diabetic retinopathy (DR). Most studies primarily analyzed samples from individuals with Type 2 diabetes, which made up 56% of the samples. For DR detection, the most commonly used images were Optical Coherence Tomography (OCT), MRI, and fundus images, with fundus images constituting the largest portion at 40%. The significant CNN models included ResNet variants (20% of studies), followed by VGGNet and AlexNet (each 15%). The evaluation metrics showed strong CNN performance in identifying diabetic retinopathy, with an average accuracy of 92.5%, specificity and sensitivity of 94.5%, and an average AUC of 0.961.

Conclusion: This article demonstrates the effectiveness of Convolutional Neural Networks (CNNs) in detecting DR. The findings suggest that integrating various imaging modalities and advanced AI techniques can significantly enhance diagnostic accuracy, leading to better patient outcomes in

diabetic retinopathy management. Future research should focus on further optimizing these models to improve their clinical applicability.

Keywords: Convolutional Neural Networks, Diabetic Retinopathy, Detection

G-1143

Revising the Roles and Competencies of Faculty Members in the Age of Artificial Intelligence

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Abstract:

Background and Aims: The advent of artificial intelligence (AI) in higher education has significantly transformed faculty roles and responsibilities, necessitating a reevaluation to align with this technology's rapid advancement. This study aimed to assess AI's impact on these roles, identify shifts in their value, and determine the key competencies associated with them.

Methods: By analyzing the regulations for faculty promotion approved by the Supreme Council of the Cultural Revolution (2015), this study examined the primary roles of faculty members, including teaching, research, cultural-educational, administrative, and personal development. The methodology involved extracting details of faculty duties in the primary roles, particularly teaching, research, and cultural-educational roles. Subsequently, a group of experts and professors were consulted to assess the impact of AI on the diminishing or enhancement of these roles. The skills and competencies associated with the enhanced roles were then identified

Results:

The results were categorized into three domains: teaching, research, and cultural-educational. While AI excels in knowledge transfer, faculty members' abilities to convey experiential knowledge, influence student attitudes, and impart practical skills become more prominent. In the realm of research, AI can facilitate certain research processes such as proposal writing, literature review, and data analysis, potentially diminishing faculty involvement in these areas. However, faculty members' roles in selecting research topics, managing research, and interpreting qualitative data become more significant. In the cultural-educational role, faculty members retain a prominent position due to their ability to transmit cultural, ethical, and philosophical values and cultivate students' insight and wisdom. Overall, of the 22 identified faculty duties, 10 roles became less prominent, while 12 roles became more prominent in the future. Based on these findings, practical skills, the ability to transmit values and knowledge, and competencies such as

philosophical-analytical thinking and creativity, especially metaphorical creativity, should be given greater consideration when selecting new generations of faculty

Conclusion: Recruitment and promotion should prioritize practical skills, philosophical reasoning, metaphorical creativity, and value-based mentorship. A shift from knowledge-centric models to those grounded in philosophy and ontology is an essential response to emerging challenges in the age of artificial intelligence.

Keywords: Faculty Members, Academic Member, Competencies, AI

G-1144

The use of artificial intelligence in predicting risky behaviors of adolescents and young adults

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Abstract:

Background and Aims: Given the high prevalence of risky behaviors such as drug and alcohol use and inappropriate sexual relationships among this age group, this technology can help identify patterns and factors influencing these behaviors. Various studies have shown that machine learning models are capable of analyzing complex data, detecting nonlinear relationships, and providing accurate predictions. This study aimed to review the literature on "the use of artificial intelligence in predicting risky behaviors among adolescents and young adults."

Methods: Comprehensive searches were conducted in reputable databases including Google Scholar, PubMed, Science Direct, and ISI Web of Science from 2000 to 2024. A wide range of keywords (machine learning, risky behaviors, adolescents and young adults, predictive modeling, deep neural networks (DNN)) was used to ensure full coverage of relevant topics. Only English-language articles that included qualitative or quantitative studies, randomized controlled trials (RCTs), quasi-experimental, and longitudinal studies focusing on the management of risky behaviors in adolescents were selected.

Results: One study by John Lohner in 2019 predicted individuals' sexual orientation from their photographs using two machine learning models: deep neural networks (DNN) and facial morphology (FM). The study found that the DNN's accuracy was 68% for men and 77% for women. Additionally, Amber Nigam and colleagues conducted a study to predict sexual health vulnerabilities among migrants. In 2019, Vahid Yazdi Feyz Abadi investigated factors influencing risky behaviors among Iranian adolescents, finding that family, age, gender, and religious beliefs were among the influential factors. Anita Raj and colleagues in 2021 examined non-marital sexual violence and found that prior exposure to violence was a stronger predictor of sexual violence.

Conclusion: Various studies, including those on predicting sexual orientation and sexual health vulnerabilities, demonstrate the high capability of these techniques in identifying complex patterns and factors influencing risky behaviors.

Keywords: Machine Learning, Risky Behaviors, Adolescents

G-1147

Artificial Intelligence in medical education

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Abstract:

Background and Aims: Artificial intelligence has become a revolutionary agent in healthcare and medical education, focusing on their applications in teaching methods, student assessment and skill development. By reviewing studies and case studies of different approaches, this article seeks to provide an evidence-based understanding of the potential of AI in medical education. The application of artificial intelligence (AI) in medical education spans instructional strategies and clinical learning. Technologies such as machine learning (ML), natural language processing (NLP), and virtual reality (VR) are beginning to change how students learn, practice, and improve. This paper aims to assess the current use of AI in medical education, describe the technologies involved, their effects on student outcomes, and the challenges.

Methods: A systematic search of PubMed, Scopus, Google Scholar, IEEE Xplore, and Web of Science was conducted for peer-reviewed studies from 2015 to 2024. Included studies used AI tools specifically developed for medical education, such as simulations, personalized learning, AI-assisted assessments, and clinical decision support. Selected articles were checked out for quality using the PRISMA checklist. Data were extracted on AI technologies, implementation models, educational outcomes, and challenges.

Results: The application of AI and VR technologies has significantly transformed medical education. VR-based simulations, such as Osso VR and Touch Surgery, offer immersive, risk-free environments where students can develop surgical skills. Additionally, AI-powered personalized learning systems like Smart Sparrow provide adaptive content tailored to individual learning needs, while tools such as Kahoot! enhance engagement through interactive formats. In clinical decision-making training, systems like IBM Watson for Health and DeepMind support students by offering diagnostic suggestions, fostering critical thinking. Moreover, AI plays a crucial role in assessments; platforms such as Stanford's AI-Assessment Tool provide immediate feedback and automated scoring. AI is also integrated into OSCEs to ensure more consistent and objective clinical evaluations.

Conclusion: AI can significantly enhance medical education through various methods such as personalized learning, immersive simulations, and efficient assessment. However, different barriers including faculty readiness, ethical concerns, and institutional acceptance must be considered for widespread adoption.

Keywords: ArtificialIntelligence(AI), MedicalEducation, MachineLearning(ML), VirtualSimulation, PersonalizedLearning, ClinicalDecisionMaking,

G-1150

Application of Machine Learning Algorithms in Surgery: A Systematic Review

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Abstract:

Background and Aims: This systematic review explores the impact of machine learning (ML) in surgery, examining its benefits, challenges, and key insights from existing literature.

Methods: A systematic review of review studies was conducted by searching scientific databases (Embase, Web of Science, Scopus, and PubMed) on October 3, 2024, using keywords "ML" and "surgery" in titles and abstracts. Inclusion criteria were studies in English, with full text available, investigating the application, role, or evaluation of ML in surgery. The PRISMA guidelines were followed, with no time restrictions applied.

Results: A total of 952 studies were identified, and 15 met the inclusion criteria. Five studies focused on ML in general surgeries, while 9 explored specific surgical areas, including neurosurgery (2), orthopedics (2), abdomen, spine (2), colorectal, intestine, stomach, and vascular surgeries.

Advantages of ML in surgery include:

Predictive Analytics: Risk classification and decision support for effective surgeries.

Advanced Surgical Planning: Personalized treatment plans and optimized resource allocation.

Infection Monitoring: Faster detection and cost reduction.

Challenges include:

Data quality concerns.

Limited datasets and need for external validation.

Ethical and legal issues, including accountability.

Key insights include:

Performance Indicators: ML models often surpass traditional methods, achieving over 85% accuracy in many cases. **Clinical Outcomes:** Improved outcomes, particularly in complex surgeries, were noted with ML use.

Implementation Challenges: Issues with data quality, validation, and ethical considerations are recurring barriers.

Conclusion: Machine learning offers transformative potential in surgery, enhancing predictive analytics, planning, and infection surveillance. Despite these benefits, addressing data quality, validation, and ethical challenges remains crucial for successful integration into surgical practice.

Keywords: Surgery, Machine Learning, ML, Artificial Intelligence

G-1151

Application of Machine Learning Tools in Disaster Management

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Abstract:

Application of Machine Learning Tools in Disaster and Emergency Management

Background and Aims: Disasters are now an integral part of people's lives. With the advancement of technologies and the emergence of artificial intelligence, we are faced with a multitude of tools that can be utilized for preparedness and effective response to disasters. This article aims to identify existing machine learning tools for disaster preparedness and response.

Methods: This is an applied study conducted cross-sectionally using a narrative literature review approach in databases such as PubMed, Scopus, and Google Scholar. The keywords used include (Machine Learning, Classification, Damage, Earthquake, Disaster, Deep Learning, Internet of Things, Warning System, Prediction, Convolutional Neural Network, Artificial Neural Network, Artificial Intelligence, Decision Tree, Random Forest, Reinforcement Learning) without any time restrictions. The research population consisted of all articles available in these databases. The inclusion criteria for selecting articles included relevance to the research objective and availability of full text. Initially, the titles and abstracts of the articles were reviewed, and if selected, the full text was analyzed. The results of the search were examined through content analysis.

Results: After applying the keywords in the databases, approximately 2000 articles were obtained. From this number, 40 articles were selected. The results indicated that the applications of machine learning in disasters can be categorized into three main classes (image classification, object detection, and warning and recommendation systems) and several subcategories (Image Classification: damage identification post-disaster, damage assessment post-disaster, monitoring inaccessible areas. Object Detection: automatic feature detection, search and rescue identification of victims post-disaster, minimizing casualties from disasters. Warning Systems: remote sensing technology, early warnings for disasters, prevention strategies).

Conclusion: Given the useful capabilities of machine learning in various phases of crisis management, it is essential for health professionals to pay attention to these functionalities and utilize this science to mitigate risks and damages, as well as to ensure a rapid response to disasters to reduce human and financial losses.

Keywords: MachineLearning, DeepLearning, Damage, Disaster, Artificial Intelligence

G-1152

Umbrella Review on the Challenges and Gaps of Artificial Intelligence in the Insurance Industry

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Abstract:

Background and Aims: The insurance industry, with access to big data and the use of artificial intelligence (AI), can make significant changes by automating processes and data processing in better assessing issues such as increasing decision-making power, improving efficiency, identifying customer behavioral patterns, and anti-money laundering measures in the insurance industry. Therefore, the aim of this study is to conduct an umbrella review to identify the challenges and gaps of AI in the insurance industry and provide research ideas to guide and develop more practical applications in the insurance industry.

Methods: A systematic search was conducted in the Web of Sciences, Scopus, PubMed, and Embase databases, and 1318 articles were extracted from the beginning until March 12, 2024, based on the designed syntax. Then, the articles were screened based on the inclusion and exclusion criteria. The inclusion criteria were studies that systematically examined artificial intelligence in the insurance industry, and the exclusion criteria were studies that addressed software development, technique comparison, technique efficiency improvement, and technique effectiveness. Finally, 11 articles were included in the study and analyzed.

Results: Challenges and research gaps were presented in three general categories (before AI implementation, AI application area, and after AI application), with 14 items, and research suggestions were also presented in these three general categories with 20 items. The challenges extracted include data loss in the pre-processing stage, as well as the costly and time-consuming nature of this process, and the conceptual drift of algorithm accuracy due to the continuous development and evolution of data.

Conclusion: The digital world and scientific development can be expanded and made effective by considering information gaps and addressing them. Therefore, future research should take advantage of the benefits of gap correction to further strengthen the methods of dealing with anomalies in the contemporary world, reduce illegal acts and transaction errors in the world, and promote knowledge through strategic data management, which this study can be useful for

identifying gaps and research ideas. Also, research agendas and calls for special issues of journals and declaration of research urgency will affect gap correction.

Keywords: Artificial Intelligence, Insurance, Challenges, Gaps

G-1153

Artificial Intelligence and Robotics Innovations in Minimally Invasive Surgery: A Comprehensive Systematic Review

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Abstract:

Background and Aims: Minimally Invasive Surgery (MIS) aims to minimize tissue damage, bleeding, and recovery time by utilizing smaller instruments and incisions, significantly improving surgical outcomes compared to traditional open surgeries. Over recent years, the integration of Artificial Intelligence (AI) and robotics into these procedures has enhanced their precision, safety, and efficiency. This review provides a comprehensive analysis of the latest advancements in AI and robotic-assisted surgery, discussing the challenges faced, and highlighting potential future directions in both Iran and globally.

Methods: A thorough systematic review was conducted by searching respected databases, including PubMed, Scopus, Google Scholar, and SID. Studies published between 2019 and 2024 were considered if they explored the use of AI and robotics in minimally invasive surgeries. After an initial review of 174 articles, 87 were selected for full-text evaluation, with 14 meeting the inclusion criteria. The quality of these studies was assessed using PRISMA guidelines, and relevant data were extracted and categorized.

Results: The findings highlight significant improvements in surgical precision, reduced operation times, and enhanced clinical outcomes through robotic and AI technologies. For example, the accuracy of tracking surgical tool movements has risen from 76% to over 90%. Globally, systems like the "da Vinci" have offered improved precision and flexibility, but they still face challenges related to cost and ethical concerns. In Iran, the "Sina" surgical system, which uses AI to enhance tool calibration and precision, has made remarkable strides in MIS. However, there are still issues

to address, such as a lack of extensive clinical trials, public trust in AI, and technological limitations.

Conclusion: AI and robotics have transformed minimally invasive surgery, with systems like "Sina" marking a notable achievement in the localization of these technologies. However, ongoing efforts are needed to develop more sophisticated algorithms, improve infrastructure, and conduct large-scale clinical trials. Additionally, ethical considerations, such as managing AI errors and the need for standardized practices, remain critical. With the potential for advancements like telesurgery enabled by 5G networks, Iran's standing in the global robotic surgery field could be significantly strengthened by addressing these challenges.

Keywords: Artificial Intelligence, Robotics, Minimally Invasive Surgery

G-1155

Deep Learning based Electroencephalography Signals in Detection of Alcoholism

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Abstract:

Background: The diagnosis and treatment of alcoholism pose significant challenges due to its complex etiology and varied manifestations. Electroencephalography (EEG) has emerged as a promising tool for understanding the neurobiological underpinnings of alcoholism. In this study, we propose a novel approach for EEG classification normal and alcoholic by deep learning (DL) techniques.

Methods: We conducted a comprehensive review of existing literature from 2018 to 2023, utilizing databases such as Google Scholar, PubMed, Medline, Science Direct, Coherence, Embase, Proquest, Magiran Library, and SID. The chosen keywords for our search included "Machine learning", "Deep learning", "Neural Network", "Artificial Intelligence", "Algorithms", "Electroencephalography", "EEG Signals", "Alcohol Use Disorder", "Alcohol Usage Severity", "Alcoholism", "Diagnosis", "Detection", "Classification", "Systematic Review", and "Meta-Analysis". This method allowed us to gather a substantial body of relevant research to analyze and synthesize the findings.

Results: This article provides a comprehensive review of the latest advancements in utilizing deep learning techniques for EEG-based diagnosis of alcoholism. It synthesizes findings from various studies employing convolutional neural networks (CNNs), recurrent neural networks (RNNs), and hybrid architectures to analyze EEG signals associated with alcohol use disorder (AUD). The review highlights the potential of deep learning models in identifying biomarkers and patterns indicative of alcohol-related neural alterations, thus facilitating early diagnosis and personalized treatment approaches. Furthermore, it discusses challenges, future directions, and ethical considerations in the application of deep learning to EEG-based diagnosis of alcoholism. Overall, this review underscores the transformative impact of deep learning in enhancing our understanding and management of alcohol use disorder through EEG analysis.

Conclusion: Looking ahead, the potential implications of DL in EEG-based alcoholism diagnosis are vast. The future holds the promise of personalized and proactive cardiovascular care, where DL augments the diagnostic capabilities of healthcare professionals, ultimately saving lives and reducing the burden of cardiovascular diseases on a global scale.

Keywords: Deep Learning, Electroencephalography, Alcoholism

G-1157

Application of internet of things in medicine

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Abstract:

Background and Aims: The Internet of Things (IoT) is reshaping modern healthcare by connecting smart medical devices and related applications. This study aims to explore how IoT is being used in the medical field, particularly in improving patient monitoring, personalizing treatments, and streamlining healthcare processes.

Methods: We conducted a review of research articles published between 2020 and 2024 across several well-known databases, including PubMed, Web of Science, IEEE Xplore, Scopus, and Google Scholar. Using keywords like "IoT in Medicine," "Remote Patient Monitoring," and "Smart Medical Devices," we screened and selected 10 relevant articles for in-depth analysis.

Results: The findings suggest that IoT enables real-time health monitoring by using smart sensors and wearable technologies to collect patient data such as vital signs and environmental factors. This has shown promising results in managing chronic conditions like diabetes and asthma. When combined with artificial intelligence, IoT can enhance data analysis and predict health trends more accurately. Moreover, connected medical devices have helped reduce healthcare costs, improve diagnostic accuracy, and increase patient safety. Despite these benefits, there are still concerns about data privacy, cybersecurity, and regulatory standards.

Conclusion: IoT is driving a major shift in healthcare by supporting proactive care and personalized treatment approaches. However, for its full potential to be realized, stronger regulatory frameworks and security measures are essential. With the right safeguards, IoT can greatly improve patient outcomes and make healthcare more accessible and efficient.

Keywords: IoT in Medicine, Smart Devices

G-1158

Using artificial intelligence to improve healthcare services

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Abstract:

Background and Aims: Today, artificial intelligence (AI) has entered various fields. AI is one hotspot of research in the field of modern medical technology. One of the applications of artificial intelligence in medical sciences can be mentioned in improving the services of health centers. The aim of this study is to apply chatbot as a tool to improve remote care in health center.

Methods: In this study, in order to provide remote care for pregnant women from the second month of pregnancy until the birth of the baby, a series of questions were designed in a chatbot using artificial intelligence, and links of questions were provided to pregnant women each month whose details were registered at the health center. Then, other questions were asked regarding the use of this software to evaluate and record people's opinions.

Result: The results showed that the women's response at home was more accurate and more useful and effective compared to having to visit the health center. The software also received a high score in the evaluation.

Conclusion: According to the results, using a chatbot can save time, reduce anxiety and increase accuracy in responding in pregnant woman. It can be an effective tool for monitoring and remote care for pregnant women in various health centers.

Keywords: Artificial Intelligence, Chatbot, Pregnant Woman, Health

G-1039

The importance of artificial intelligence models in personalized radiation therapy

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Abstract:

Background and Aims: The ability of advanced radiotherapy techniques to produce an optimal plan varies according to the planner's experience. Additionally, developing the treatment plans may be a complex, time-consuming, and iterative process characterized by trial-and-error practices. Artificial Intelligence (AI) can assist in radiotherapy and cancer treatment by personalizing treatment plans and optimizing radiation doses for individual patients, improving treatment outcomes, and minimizing side effects. In this paper, we aim to provide an overview of artificial intelligence models in dose prediction and automated radiotherapy treatment planning.

Methods: We conducted a systematic search and collected scholarly articles published from 2018 through 2024, utilizing keywords "artificial intelligence," "radiotherapy," "automated planning," and "dose prediction." Articles were included if they addressed any aspect of artificial intelligence in relation to dose prediction and radiotherapy treatment planning in different tumor sites.

Results: Most of the studies on dose prediction and treatment planning, focused on breast cancer, prostate cancer, head and neck cancer, and cervical cancer. The previous model architectures include those based on Knowledge Based Planning (KBP), Convolutional Neural Networks (CNN), UNet, Generative Adversarial Networks (GANs), ResNet, and DenseNet. Developed methods employ the raw data (anatomical structures and/or CT images) as input and use the architectures to uncover the latent features concealed within the original raw data. Furthermore, an accurate dataset would require a predetermined number of OARs and/or PTVs as input data and are commonly customized to a particular treatment. On the other hand, the lack of sufficient and large datasets in the field of medical sciences has led to the limitation of the use and generalizability of previous models, which are also limited to the tumor site and the center under treatment.

Conclusion: Most previous studies have been done retrospectively and include the limitations of this type of study, including differences among treatment planners, treatment machines, radiation oncologists, and dataset size. Despite the current limitations and challenges, artificial intelligence models for radiotherapy dose prediction and automated treatment planning continue to evolve with new architectures, aiming to improve treatment planning accuracy.

Keywords: AI, Medicine, Radiotherapy, Automated Treatment planning

G-1040

How Artificial Intelligence Might Affect the Way an Emergency Department Works: A Review

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Abstract:

Background: Emergency Departments (EDs) play a pivotal role in healthcare systems, often dealing with high patient volumes and critical cases under time pressure. Artificial Intelligence (AI) has emerged as a transformative tool capable of optimizing healthcare delivery. This review explores how AI technologies can influence ED workflows, improve clinical decision-making, and enhance patient outcomes.

Methods: A narrative review approach was used to evaluate and synthesize current literature on AI applications across various aspects of ED operations. Key areas examined include triage, diagnostic interpretation (e.g., ECG, X-rays, CT scans), risk prediction, resource utilization, and workflow optimization. Databases and published peer-reviewed studies were reviewed, focusing on clinical performance, diagnostic accuracy, and implementation feasibility.

Results: AI has shown promising applications in:

- Triage: AI tools improve triage accuracy, reduce errors, and support the early identification of critically ill patients.
- ECG Interpretation: AI algorithms outperform clinicians in detecting rhythm abnormalities, myocardial infarction, and other cardiac pathologies.
- Medical Imaging: Deep learning models enhance diagnostic accuracy in interpreting plain X-Rays and CT scans.
- Ultrasound: AI assists novice users, improves diagnostic accuracy in cardiac and lung assessments, and supports real-time decision-making.
- Risk Prediction & Metrics: AI enables early prediction of ED volume, hospital admissions, disease severity, mortality, and patient length of stay.

Conclusion: AI offers substantial benefits in augmenting emergency care, particularly in resource-limited settings. However, challenges such as data privacy, algorithmic bias, lack of clinical

validation, and integration barriers need to be addressed. Transparent, explainable, and ethical AI deployment is essential for clinician trust and patient safety. Future work should focus on prospective trials and real-world integration.

Keywords: AI, ED, Metrics, ECG, Triage, Imaging

G-1041

Computational drug design in multiple sclerosis

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Abstract:

Background and Aims: Multiple Sclerosis (MS) is a neurodegenerative autoimmune disease that causes significant physical disabilities in young people, with its global prevalence rising sharply in recent years. Currently, various treatment methods are used to reduce the severity of the disease, but none are considered definitive cures. The production of new drugs is challenging, complex, and time-consuming. However, today, the use of artificial intelligence, including machine learning (ML) and deep learning (DL) methods in computational drug design (CDD), improves drug effectiveness and efficiency while reducing research time and costs. In recent years, numerous studies have been conducted in the field of CDD for MS disease. This article aims to review these studies and summarize the most commonly used methods in this area.

Methods: A search was conducted in the articles published in the last 7 years in PubMed, Scholar, and Scopus databases using the keywords (Multiple Sclerosis) AND (Computational drug design).

Results: Today, ML methods are employed at every stage of computational drug design (CDD) to enhance drug efficiency, including identifying drug targets, discovering hit compounds, and identifying prognostic biomarkers. Drug repurposing, which involves finding new therapeutic targets for existing drugs, is also facilitated by ML. In the complex disease such as MS, researchers use ML-based methods for clinical studies, CDD, and drug repurposing to improve disease management and treatment. So far, various ML-based methods have been used for CDD, the most widely used of which are three-dimensional Quantitative Structure-Activity relationship (3D-QSAR), molecular docking, and molecular dynamics simulation.

Conclusion: Most research in the field of CDD for MS disease has only reached the computational design stage, with few studies evaluating the proposed compounds through experimental tests. Additionally, deep learning methods have been underutilized. Therefore, there is a need for robust computational studies using advanced deep learning methods, combined with experimental evaluations, to develop new effective drugs for MS.

Keywords: Multiple Sclerosis, Drug Discovery, Machine Learning

G-1055

Leveraging Clinical Data to Improve Prediction and Diagnosis of Knee Injuries Using Artificial Intelligence

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Abstract:

Background and Aims: Knee injuries, especially those affecting the posterolateral corner (PLC) and lateral collateral ligament (LCL), are difficult to diagnose accurately. Traditional diagnostic methods such as physical examination and manual image interpretation often struggle with issues of accuracy and efficiency. The objective of this research is to explore the potential of deep learning techniques for automating the diagnosis of these injuries from knee MRI images. Specifically, this study aims to investigate how both supervised, unsupervised, and semi-supervised learning approaches can be used to improve model performance, reduce dependence on labeled data, and enhance the model's generalization capabilities across different cases and imaging variations.

Methods: In this study, we explore different deep learning approaches, including supervised, unsupervised, and semi-supervised learning methods, to diagnose knee injuries. Supervised learning techniques rely on labeled data to train models that classify injuries, while unsupervised learning can help identify patterns in data without requiring labeled input. Semi-supervised learning combines both labeled and unlabeled data, helping to improve performance even when labeled data is scarce. These approaches aim to enhance the model's ability to detect and classify injuries in knee MRI images, improving both accuracy and efficiency.

Results: The exploration of supervised, unsupervised, and semi-supervised learning approaches indicated that combining these techniques could lead to improved performance. While supervised learning provides high accuracy with labeled data, the integration of unsupervised learning can help the model uncover hidden patterns in the MRI images. Semi-supervised learning further optimizes the model, particularly in cases with limited labeled data. The results suggest that these combined methods could improve the model's diagnostic capability and generalize better across different cases and imaging variations.

Conclusion: This study demonstrates the potential of deep learning techniques, including supervised, unsupervised, and semi-supervised learning, for automating the diagnosis of knee injuries such as PLC and LCL. By reducing reliance on labeled data and improving model performance, these methods could be integrated into clinical practice to help healthcare professionals diagnose knee injuries more accurately and efficiently, ultimately enhancing patient care.

Keywords: Deep Learning, MRI Imaging, Knee Injuries, Automated Diagnosis, Data-Driven Analysis

G-1062

Design and Development of the AI Assistant of the Drug Stores of Hamadan University of Medical Sciences

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Abstract:

Background and Aims: The innovation of this research is the use of modern AI tools and LLMs and the absence of entering the field of neural network model design in order to increase the efficiency and usability of the system.

Methods: The steps of the work method are: 1) Studying suitable LLM AI models and finally selecting and using the LLAMA 3.1 70b model of Meta. 2) Preparing and completing project content files and documents such as SQL reports, Excel QA files, PDF files, etc. 3) Performing preparation and cleaning operations on the above-mentioned reports, files and documents. 4) Performing the Python development and programming process for the project such as including the libraries used are: langchain, llama_index, docker, ollama. 5) Implementing the necessary hardware infrastructure and servers with appropriate GPU. 6) Performing technical and content testing stages. 7) Final implementation.

Results: Due to data security and confidentiality requirements, all components of the final application were installed and implemented on the local server. Through the ollama Python library solution, the selected AI model was downloaded to the university's local server, and then the programming process was carried out exclusively without the need to access online models.

Conclusion: According to the experience gained from this research, it seems that many areas in organizations will become highly effective and productive if they use AI assistants.

Keywords: Chatbot, LLM, Drug Stores, Local Server

G-1063

Artificial intelligence applicants in obstetrics and gynecology

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Abstract:

Background and Aims: Artificial intelligence (AI) is revolutionizing Obstetrics, Gynecology, and Reproductive Medicine by offering innovative tools to diagnose and treat conditions related to pregnancy, childbirth, and women's reproductive health. These AI-powered solutions leverage machine learning algorithms to analyze large datasets, enabling earlier detection of potential complications, personalized treatment plans, and improved patient outcomes. This represents a significant advancement in medical care, providing greater accuracy, efficiency, and precision.

Methods: AI-powered tools use advanced algorithms and machine learning to process and analyze vast amounts of data. They assist healthcare professionals in identifying early signs of complications, tracking fetal development, monitoring maternal health, and detecting abnormalities or high-risk factors. Additionally, AI systems analyze patient-specific data to help develop personalized treatment plans tailored to individual needs and medical histories.

Results: The integration of AI in Obstetrics and Gynecology has shown remarkable potential in enhancing diagnostic accuracy and treatment efficiency. By enabling early detection of complications and providing data-driven insights, AI tools improve patient outcomes. Furthermore, the ability to create personalized treatment plans ensures that care is tailored to each patient's unique needs, optimizing therapeutic effectiveness and reducing risks.

Conclusion: AI-powered tools are transforming women's healthcare by equipping professionals with advanced capabilities to improve patient outcomes and deliver personalized care. These innovations enhance the accuracy, efficiency, and precision of diagnoses and treatments, marking a significant step forward in Obstetrics, Gynecology, and Reproductive Medicine.

Keywords: Artificial Intelligence, Obstetrics, Gynecology, Reproductive Medicine

G-1064

The use of artificial intelligence as a clinical decision support system for anti-cancer drug administration

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Abstract:

Background and Aims: Cancer is currently responsible for 12% of all deaths worldwide, making it the second leading cause of death in developed countries and the third in less developed countries, including Iran. A significant part of cancer treatment involves drug therapies. The effectiveness and occurrence of side effects in patients depend on various factors, including individual characteristics, environmental factors, comorbidities, and genetic factors. Considering these factors can help optimize drug therapy. Managing side effects, while accounting for the multiple influencing factors, is crucial in cancer treatment. The complexity of prescribing medications for patients with different types of cancer and the need for frequent follow-ups pose challenges in managing drug therapy effectively. The use of advanced technologies, such as Clinical Decision Support Systems (CDSS), can assist physicians in this process. CDSS are designed to aid physicians in decision-making tasks, utilizing artificial intelligence and health information system data to provide recommendations based on evidence-based guidelines and computational reasoning.

Methods: CDSS are computer programs that integrate artificial intelligence and health information system data. These systems focus on gathering information from multiple sources (e.g., text or evidence-based guidelines) and employ computational reasoning methods to provide recommendations to physicians. Various types of CDSS have been developed for cancer diagnosis and treatment, aiming to consider all factors influencing drug prescription and enhance the speed and accuracy of drug therapy.

Results: The implementation of CDSS in cancer treatment has shown potential in improving the precision and efficiency of drug administration. By integrating multiple factors such as patient-specific data, environmental influences, and genetic information, these systems can optimize drug therapy and reduce adverse effects. Additionally, CDSS can streamline the decision-making process for physicians, enabling more personalized and effective treatment plans.

Conclusion: The use of artificial intelligence-based CDSS in cancer treatment offers a promising approach to optimizing drug therapy. By considering all relevant factors and providing evidence-based recommendations, these systems can enhance the accuracy and speed of drug

administration, ultimately improving patient outcomes. Further development and integration of CDSS in clinical practice could significantly advance cancer treatment management.

Keywords: Artificial Intelligence, Clinical Decision Support Systems

G-1070

Aspects of Reflection of Artificial Intelligence in Medical Law

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Abstract:

Background and Aims: Artificial intelligence is a new and emerging field that uses computer technology to research and develop theories, methods, techniques, and applied systems to simulate and expand human intelligence, especially in the field of medicine. With the help of new artificial intelligence technology, the traditional medical environment has been greatly transformed and transformed; therefore, the purpose of this article is to examine the application of artificial intelligence in medical science.

Methods: This research is theoretical and the research method is descriptive-analytical, and the method of collecting information is library-based and refers to documents, books, and articles. Ethical considerations: In all stages of writing this research, honesty and trustworthiness have been observed while respecting the originality of the texts.

Results: Artificial intelligence has unimaginable potential and will transform all parts of our lives, including medicine, in the next few years. This technology has already caused great transformation and transformation in the fields of medicine. Digital health also provides us with more useful data than ever before, helping us analyze it and find new ways to treat diseases. It can also simplify medical practices and optimize the programs of doctors and patients.

Conclusion: Artificial intelligence is one of the newest fields of research. In the approach to artificial intelligence with the rules of thinking, the emphasis was on the correct inference of results. Accordingly, its goal is to study the ideas that allow computers and robots to appear intelligent. Among the most important applications of artificial intelligence, we can mention the intelligent operating system.

Keywords: Artificial Intelligence, Legal Challenges, Medical Science,

G-1071

Integrating Tele-Homecare into Standard Follow-Up Protocols for Premature Infants

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Abstract:

Background and Aims: The transition from hospital to home for premature infants poses significant challenges, particularly in monitoring their health post-discharge. Tele-homecare has emerged as a potential solution to facilitate early follow-up care, ensuring timely interventions and support for these vulnerable populations. This narrative review aimed to evaluate the existing literature on tele-homecare interventions for premature infants after hospital discharge, focusing on their effectiveness, implementation strategies, and outcomes.

Methods: A comprehensive literature search was conducted using international databases such as PubMed, Scopus, ProQuest, and Web of Science. The review included studies that examined tele-homecare practices and their impact on the health and development of premature infants during early follow-up periods.

Results: The findings indicated that tele-homecare interventions significantly enhance the monitoring and management of premature infants' post-discharge. Key benefits identified include improved parental engagement, timely identification of health issues, and reduced hospital readmission rates. Various models of tele-homecare were categorized, highlighting diverse approaches tailored to specific needs.

Conclusion: Tele-homecare represents a promising avenue for improving post-discharge care for premature infants. By facilitating better communication between families and healthcare providers, these interventions can lead to enhanced health outcomes and greater parental satisfaction. Future research should focus on optimizing these models to maximize their effectiveness and accessibility in diverse healthcare settings.

Keywords: Tele-homecare, premature infants, post-discharge care, telehealth

G-1072

Enhancing Post-Discharge Care for Premature Infants: Tele-Homecare Perspectives Among Healthcare Professionals

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Abstract:

Background and Aims: The transition to home care for premature infants post-discharge is critical for their ongoing health and development. Tele-homecare has emerged as a promising approach to support families during this transition. However, its effectiveness and acceptance among healthcare providers remain underexplored. This study aimed to investigate and compare the experiences of nurses and physicians regarding the use of tele-homecare for premature infants following their discharge from neonatal intensive care units (NICUs).

Methods: A qualitative research design was employed, utilizing conventional content analysis to explore the perspectives of healthcare providers. Semi-structured interviews were conducted with 55 healthcare professionals (30 nurses and 25 physicians) from three NICUs affiliated with Isfahan University of Medical Sciences. Participants were purposively sampled, and data collection was carried out over five months, from October 2022 to February 2023, until data saturation was reached.

Results: The analysis revealed two main components: the benefits and challenges of tele-homecare. Participants highlighted the advantages of tele-homecare, including continuous monitoring and parental support, which alleviated anxiety and enhanced caregiving confidence. However, concerns were raised about the ambiguous roles of healthcare providers in teleconsultation, emphasizing the need for clearer guidelines and training.

Conclusion: The findings underscore a significant gap in research regarding healthcare professionals' perspectives on tele-homecare for premature infants. Implementing a structured telecare follow-up initiative could enhance care quality while empowering parents in their caregiving roles. Addressing identified challenges through targeted training and systematization can optimize tele-homecare implementation, ultimately improving health outcomes for premature infants.

Keywords: Tele-homecare, Premature Infants, Neonatal Intensive care

G-1110

Applications of Machine Learning in Glaucoma Diagnosis: A Systematic Review

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Abstract:

Background and Aims: Early and accurate diagnosis of glaucoma is a major clinical challenge, as delays can lead to irreversible vision loss. Machine learning (ML) approaches, with their ability to simultaneously analyze complex data from multiple sources, hold significant potential to improve glaucoma diagnosis. The aim of this systematic review is to examine the applications of ML in glaucoma diagnosis and to evaluate their performance, limitations, and clinical applicability.

Methods: This systematic review was conducted by searching five databases—PubMed, Scopus, Web of Science, ScienceDirect, and IEEE—from January 1, 2010, to May 30, 2023, using a structured search strategy. Following the PRISMA protocol for study selection, a total of 2,585 articles were identified. After applying inclusion and exclusion criteria, 35 studies were selected for data extraction and qualitative assessment.

Results: The included studies employed a wide range of ML techniques, including logistic regression, support vector machines (SVM), random forests, and deep learning algorithms. The most commonly used data sources were optical coherence tomography (OCT) measurements, followed by electronic health records and clinical features. ML models generally demonstrated high diagnostic performance, with area under the receiver operating characteristic curve (AUC) values often exceeding 0.90. However, direct comparison of results was challenging due to heterogeneity in datasets and study designs.

Conclusion: ML-based clinical decision support systems show considerable promise in improving glaucoma diagnosis, achieving high diagnostic performance across various techniques and data sources. However, prospective validation across diverse populations is necessary to assess the real-world effectiveness and generalizability of ML in glaucoma detection.

Keywords: Glaucoma, CDSS, Artificial Intelligence, Machine Learning

G-1111

Revolutionizing Patient Care: Big Data and Knowledge Management in Smart Hospitals

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Abstract:

Background and Aims: Smart hospitals are the next step in healthcare systems, aimed to improve patient care and operational efficiency by utilizing advanced technologies. Also, the importance of big data and knowledge management cannot be underestimated. Big data analytics allows healthcare providers to process, analyze and uncover valuable insights. ensuring that this information is efficiently categorized and accessible, fostering better decision-making, is done by knowledge management. These three together creates a revolution in transforming healthcare delivery and enhancing patient outcomes and efficiency of systems.

Methods: Large datasets have been gathered by automated data capture systems in smart hospitals. Processing the data is done by advanced data analytics tools and machine learning algorithms. Finally, specific AI algorithms employed to develop predictive models for personalizing patient care.

Results: Personalized treatment and predictive models, enhance patients' outcomes. This integration reduces operational costs and optimize resource allocation, thereby boosting operational efficiency. Additionally, enhanced clinical decision support systems (CDSS) by providing real-time insights and recommendations to healthcare professionals can ultimately improve the quality and safety of patient care.

Conclusion: Smart hospitals can significantly improve patient care and hospital's efficiency. The integration of big data, knowledge management, and smart hospital technologies represents a transformative step forward in healthcare delivery.

Keywords: Smart Hospital, Knowledge Management, Big Data

G-1120

From Observed Structured Clinical Examination (OSCEs) to Smart Screen-Based Virtual Patients: Tailored Clinical Scenarios for Comprehensive Competency Assessment

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Abstract:

Background and Aims: The assessment of clinical competency in medical education has evolved significantly from traditional Objective Structured Clinical Examinations (OSCEs) to innovative smart screen-based virtual patient simulations. This study aims to evaluate the effectiveness of these virtual patients and their integration into medical curricula by conducting a comprehensive literature review.

Methods: Systematic study was performed across databases such as PubMed, Scopus, and ERIC to identify peer-reviewed articles published within the last decade that focus on educational outcomes, learner satisfaction, and competency assessment metrics for virtual simulations.

Results: The synthesis of the literature demonstrates that virtual patients provide a flexible and personalized learning platform that aligns with individual student needs, enhancing the assessment of clinical reasoning and decision-making skills. These simulations allow learners to engage in tailored clinical scenarios within a risk-free environment, contributing to improved confidence and satisfaction levels. Furthermore, the interactive nature of virtual simulations fosters deeper engagement with clinical content, offering notable advantages over traditional assessment methods.

Conclusion: The transition from Objective Structured Clinical Examinations (OSCEs) to smart screen-based virtual patients represents a significant advancement in competency assessment practices within the field of medical education. This innovative shift not only modernizes the evaluation process but also enhances the way future healthcare professionals are equipped with the essential skills needed to effectively navigate the complexities of real-world clinical challenges. By utilizing advanced technology and interactive simulations, this approach allows students to engage in realistic clinical scenarios, fostering critical thinking and decision-making abilities. As a result, they are better prepared to handle patient interactions, diagnose conditions,

and develop treatment plans, ultimately leading to improved patient care and outcomes. This evolution in assessment practices underscores the importance of adapting medical education to meet the demands of a rapidly changing healthcare landscape.

Keywords: OSCEs, Smart Screen-Based Virtual Patients, Competency

G-1124

The Endless Ambition Of Artificial Intelligence, This Time In Nursing Education, Explores Challenges, Opportunities

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Abstract:

Background and Aims: In recent years, Artificial Intelligence (AI) has played a pivotal role in nursing education, driven by its remarkable advancements. Through tools such as clinical simulations and personalized learning platforms, AI has created more efficient learning environments and supported students in developing clinical skills and decision-making abilities. However, ethical and security concerns, lack of technical infrastructure, and fears regarding the replacement of human roles remain significant obstacles in this field.

Methods: This systematic review analyzes previous studies on the application of AI in nursing education. A comprehensive search was conducted using reputable academic databases, including PubMed and Google Scholar. After screening the results, 20 articles were selected, with 5 considered as primary sources for in-depth analysis. This review specifically focused on the opportunities, challenges, and strategies related to the use of AI in nursing education.

Results: Findings indicate that AI can enhance nurses' knowledge and self-efficacy through clinical simulations and data analysis. Additionally, technologies such as natural language processing facilitate quicker access to scientific resources. Nevertheless, financial and infrastructural limitations, along with concerns about data privacy and security, present major challenges. Furthermore, the potential replacement of human interaction continues to raise concerns, highlighting the essential role of human connection in nursing practice.

Conclusion: To effectively integrate AI into nursing education, comprehensive legal and ethical frameworks must be established, and students should receive adequate training. AI should serve as a complementary tool that enhances the quality of nursing education and practice. With proper ethical considerations, AI holds great potential to play a key role in advancing the nursing education system.

Keywords: Artificial Intelligence, Nursing Education, Clinical Simulation

G-1125

**review of the application of artificial intelligence in medical sciences education:
from challenges to opportunities. Systematic review.**Kosar Membari ¹, Farhad Azadmehr ²*, Naseh Ghaderi ³, Farzad Zareie ⁴

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Abstract:

Background and Aims: The utilization of artificial intelligence (AI) can provide users with a novel experience and facilitate ongoing learning and advancement in the fields of knowledge and technology. The aim of this study is to examine the applications, challenges, perspectives, and benefits of AI in medical education.

Methods: This review study was conducted in January 2024 through a search of scientific databases such as PubMed and Scopus. Only studies focusing on the use of AI tools to enhance medical students' education were included in this review. Data were extracted using a common checklist by two researchers. This checklist encompassed the applications, challenges, attitudes, and benefits of AI in medical education.

Results: After reviewing the identified studies, a total of 21 relevant papers were ultimately included in this review. The three primary applications of AI in medical education include its use as a learning support tool, assessment of learning, and application in curriculum review and reinforcement. The greatest challenge identified is the technical difficulties in accessing large sample sizes for the development of AI models. Students' attitudes are also highlighted as a significant challenge in this area; medical students perceive AI as a major threat to patients and the field of medicine. Other challenges may include difficulties in evaluating the effectiveness of AI programs, the need for qualified specialists to design machine learning-based educational programs, communication issues, and concerns regarding data privacy and security. It is still premature to make a general statement about the benefits of AI in medical education, as most studies have examined challenges associated with AI. However, suggestions have been made regarding the integration of AI into medical and health curricula.

Conclusion: This review addresses the applications, perspectives, and challenges of AI in medical education. Considering that AI curricula are not standardized and competencies are not defined, future research should focus on developing a framework for specialized AI training in medical education. Additionally, there is a necessity for formal education for medical and health students, as this could improve attitudes towards AI.

Keywords: Medical Education, Artificial Intelligence, Learning Enhancement

G-1195

A review of the ethical considerations of AI-based systems for providing the best care and medical decision-making

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Abstract:

Background and Aims: Artificial Intelligence (AI) is increasingly recognized as a transformative force in healthcare, enhancing diagnostic accuracy, personalizing treatment plans, and improving patient outcomes. However, its integration into healthcare raises significant ethical concerns, including issues related to patient privacy, algorithmic bias, and the potential dehumanization of care. These challenges necessitate a critical examination of AI's ethical implications, particularly as the data used to train AI systems can reflect societal biases, leading to unequal healthcare access and outcomes. The World Health Organization has stressed the need for ethical guidelines to address these complexities, underscoring the importance of assessing ethical dimensions to ensure AI contributes positively to patient care. This review aims to identify the ethical challenges posed by AI in healthcare, evaluate existing ethical frameworks, propose actionable recommendations for enhancing ethical standards, and foster dialogue among stakeholders about AI's implications.

Methods: The methodology involved a comprehensive literature review, focusing on empirical research and ethical frameworks related to AI. Key steps included database searches for relevant studies, analyzing the effectiveness of existing ethical frameworks such as the Asilomar AI Principles and WHO guidelines, and evaluating real-world case studies of AI implementations in healthcare. Additionally, qualitative interviews with healthcare providers and ethicists provided diverse perspectives on ethical considerations.

Results: The results revealed several key ethical challenges: privacy and data security concerns, issues of algorithmic bias leading to disparities in care, ambiguities in accountability for AI-driven decisions, and risks of dehumanizing the doctor-patient relationship. Current ethical frameworks often lack specificity for practical application, indicating the need for clearer guidelines that incorporate diverse stakeholder inputs.

Conclusion: In conclusion, while AI has the potential to enhance healthcare significantly, addressing its ethical challenges is crucial for ensuring it serves patients' best interests. A balanced approach that prioritizes ethical standards alongside innovation can help foster a future where AI complements human expertise, improving health outcomes and promoting equitable care. Proactively addressing these ethical implications will pave the way for a more just healthcare system.

Keywords: Artificial Intelligence, Medical Decision Making, Bias

G-1210

Holographic method in medical image processing, a new approach for more accurate diagnosis and 3D analysis

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Abstract:

Background and Aims: Holography, as an advanced imaging technique, allows for the reconstruction of high-precision 3D images, which is very effective in diagnosing and analyzing diseases. The research method includes a review of scientific literature, case studies, and analysis of available data on the applications of holography in medicine. The findings show that holography plays a significant role in increasing image resolution, accurately reconstructing 3D structures, reducing diagnostic errors, and improving surgical simulations. However, there are also challenges such as high costs and the need for technical expertise. Finally, it is concluded that holography, as an emerging method, has great potential for improving diagnostic and therapeutic processes in medicine and, with further development, can become one of the key tools in this field. The main goal of this article is to comprehensively examine the applications of holography in medical image processing and evaluate its advantages over traditional methods.

Methods: comprehensive search was conducted in reputable scientific databases such as PubMed, IEEE Xplore, and Scopus for collecting research articles, conference reports, and books related to applications of holography in medical image processing. Analysis was performed on case studies where holographic methods were used for disease diagnosis or surgical simulations.

Result: Holography can create detailed 3D images from medical data, improving the observation of body structures and aiding in the diagnosis of small or complex anomalies. This technique enhances image quality, reduces diagnostic errors, and supports accurate interpretations. In surgical simulations, holography provides surgeons with a clear view for better preoperative planning. It also produces high-quality images in medical microscopy, assisting in the diagnosis of tissue-related diseases. Overall, using holograms may decrease diagnostic errors compared to traditional methods.

Conclusion: Overall, holography is an innovative method that improves disease diagnosis and treatment strategies. Its ability to provide high-resolution images while reducing traditional errors makes it a significant advancement in medical imaging. However, there are still existing limitations that need to be addressed to ensure its future effectiveness as a key tool in enhancing human health through diagnosis and treatment research.

Keywords: Holography, Disease Diagnosis, Medicine–Imaging

G-1212

Artificial intelligence Applications in Toxicoinformatics

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Abstract:

This paper explores the transformative impact of artificial intelligence (AI) on toxicoinformatics, a field crucial for understanding the effects of chemicals on biological systems. Toxicoinformatics integrates diverse data types, including OMICS data (genomics, transcriptomics, proteomics, metabolomics), to model complex biological responses to chemical exposures. Traditional toxicological evaluations, relying on in vivo and in vitro methods, face limitations in scalability, cost, and ethical considerations. The advent of high-throughput technologies like next-generation sequencing (NGS) has generated vast datasets, demanding sophisticated analytical approaches. This paper argues that AI, particularly machine learning and deep learning, offers powerful solutions to address these challenges. AI algorithms excel at identifying complex patterns and correlations within heterogeneous datasets, automating analytical processes, and enhancing the efficiency and accuracy of toxicity predictions. This capability is essential for rapid decision-making in drug development, chemical safety assessments, and regulatory compliance. Moreover, AI enables predictive modeling by integrating diverse data modalities, from chemical structures to genomic information, facilitating the development of sophisticated models capable of predicting toxicological endpoints. This is particularly relevant to personalized medicine, where individual genetic and phenomic profiles influence susceptibility to toxic effects. AI-driven toxicoinformatics allows for more reliable predictions and the consideration of individual variability, tailoring risk evaluations to specific populations. The paper further discusses the crucial role of AI in addressing emerging challenges in toxicoinformatics, such as real-time risk assessment in response to dynamic chemical exposures and evolving regulatory demands. By enabling rapid adaptation to new datasets and environmental conditions, AI technologies facilitate more rigorous and efficient regulatory strategies. This paper emphasizes the necessity of AI integration in toxicoinformatics for advancing scientific understanding, improving risk assessment accuracy, and ultimately prioritizing human health and environmental safety in an increasingly complex chemical landscape. The potential of AI to unlock hidden insights within complex toxicological data positions it as a cornerstone for future advancements in the field, paving the way for more effective and personalized approaches to chemical safety and risk management.

Keywords: Toxicoinformatics, Artificial-Intelligence, Machine-Learning, Deep-learning, OMICS, Predictive-Toxicology

G-1213

From OMICS Data to Translational Outcomes: AI-Enabled Discovery of Biomarkers for Personalized Toxicology

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Abstract:

Personalized toxicology seeks to predict individual responses to toxic exposures based on unique biological characteristics, moving beyond "one-size-fits-all" approaches. Individual variations in ADMET (Absorption, Distribution, Metabolism, Excretion, Toxicity) processes, influenced by both genetic and non-genetic factors (e.g., age, lifestyle, co-medications), significantly impact toxicological outcomes. OMICS technologies (genomics, transcriptomics, proteomics, metabolomics) generate vast datasets with immense potential for identifying predictive biomarkers that capture these complex interactions. This paper explores the transformative role of artificial intelligence (AI), particularly machine learning (ML) and deep learning, in translating OMICS data, integrated with ADMET-relevant information, into actionable biomarkers for personalized toxicology, leading to improved translational outcomes. We provide a concise overview of relevant OMICS technologies and their applications in toxicology, highlighting the challenges of data integration and biological complexity, including the interplay of factors influencing ADMET. We then delve into the application of AI/ML algorithms for biomarker discovery, including feature selection, classification, regression, and deep learning methods, discussing their strengths and limitations in the context of OMICS and ADMET data. We present case studies demonstrating successful applications of AI-enabled biomarker discovery in diverse toxicological contexts, including environmental exposures, drug-induced toxicity, and occupational hazards. These examples illustrate how AI has facilitated the identification of novel biomarkers with enhanced predictive power for various toxicological endpoints, considering the influence of ADMET. We emphasize the translational potential of these discoveries, illustrating how these biomarkers can improve risk stratification, enable early detection, and guide personalized interventions. We also address key challenges associated with AI/ML-driven OMICS analysis, including data quality control, model interpretability, and the potential for bias in datasets with varying ADMET profiles. Finally, we discuss critical ethical considerations related to data privacy and responsible AI use. This paper underscores AI's crucial role in advancing personalized toxicology by integrating OMICS and ADMET information for improved human health and environmental safety.

Keywords: Personalized-Medicine, OMICS, Artificial-Intelligence, Biomarker-Discovery, ADMET, Toxicogenomics.

G-1327

The Advantage of Artificial Intelligence in Personalizing Empirical Treatments

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Abstract:

Background and Aims: Recent progressions in artificial intelligence (AI) have transformed different aspects of medicine. One of its eminent applications is the personalization of empirical treatments for patients, which improves treatment precision and decreases adverse effects. This study aims to explore the benefits and impacts of using AI in personalizing empirical treatments.

Methods: This research utilized a systematic review of proper studies on the use of AI in empirical treatments. Scientific resources were retrieved from databases including PubMed and Google Scholar. Inclusion criteria focused on studies that emphasized the personalization of medical treatments based on clinical data. Data were gathered from studies conducted over the past years and analyzed precisely.

Results: The findings showed that AI models, using patients' clinical data, have increased the precision of selecting appropriate treatments for many diseases by up to 30%. Additionally, decision-making time in clinical settings was significantly decreased, and patient safety was improved. These tools were particularly useful in complex cases where opposite clinical data existed. Besides, AI showed its ability to adapt to dynamic clinical environments, further enhancing its utility in medical decision-making.

Conclusion: AI has shown excellent potential in increasing the accuracy and efficiency of empirical treatments and can serve as an effective tool in clinical decision-making activities. Future researches are recommended to focus on better integration of this technology with available healthcare systems and address the ethical and legal challenges related with its implementation.

Keywords: Artificial Intelligence, Empirical Treatment, Personalization

G-1329

The Application of Intelligent Systems in Managing Nurses' Workload and Optimizing Care: scoping review

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Abstract:

Background: Nurses face heavy workloads and complex tasks, which can lead to reduced care quality. This review explores the role of innovative technologies, including AI, in supporting nurses and optimizing healthcare services, while analyzing challenges and proposing solutions.

Methods: This study is a scoping review. Relevant articles were collected from reputable scientific databases, including Scopus, PubMed, Science Direct, and Google Scholar. The inclusion criteria consisted of articles published within the last five years (2020–2025), articles in English, full-text availability, and articles that directly addressed the role of intelligent systems in reducing nurses' workload and improving healthcare. After the initial search, articles were screened based on their titles and abstracts. Those that did not meet the inclusion criteria were excluded. Ultimately, 6 articles were selected and qualitatively analyzed. The findings were presented in a structured manner, including key achievements, challenges, and suggestions for future research. Strategy search: ("smart systems" OR "intelligent systems" OR "AI" OR "machine learning") AND ("nursing workload" OR "nurses' workload reduction" OR "nurse staffing") AND ("patient care optimization" OR "improving nursing care" OR "quality of care")

Results: The results indicate that artificial intelligence (AI) can effectively contribute to improving the quality of care and reducing stress among nurses in intensive care units (ICUs). Machine learning models such as Random Forest and Gradient Boosting have been able to predict nurses' workload, burnout, and emotional fatigue. Additionally, training and preparing nurses to use these technologies, as well as addressing the associated ethical challenges, are essential. AI tools can help optimize care and predict nursing needs, but they may also pose certain challenges.

Conclusion: this study indicates that managing the workload and stress of nurses in intensive care units (ICUs) is of great importance. Artificial intelligence (AI) can help improve nurses' conditions and the quality of care by enhancing workload prediction and providing personalized programs to reduce burnout. Machine learning models can effectively predict feelings of burnout and emotional fatigue among nurses. Additionally, integrating AI models with appropriate training strategies for nurses requires attention to both human and technological challenges.

Keywords: Intelligent Systems, Nursing Workload, Care Quality

G-1330

Systematic Review of the Application of Artificial Intelligence in Enhancing Medication Adherence in Elderly Patients with Chronic Diseases

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Abstract:

Background and Aims: Medication adherence is one of the most significant therapeutic challenges in elderly populations, particularly among individuals with chronic diseases. Non-adherence to medications is associated with multiple negative consequences, such as an increased risk of mortality, frequent hospital admissions, and a decline in quality of life. In recent years, advancements in technology and artificial intelligence (AI) have provided opportunities for innovative solutions to improve medication adherence. The aim of this systematic review is to examine the application of AI in enhancing medication adherence in elderly individuals with chronic diseases.

Methods: The present study is a systematic review. A search was conducted in the databases PubMed, Scopus, Web of Science, and Google Scholar using the English keywords "artificial intelligence," "medication adherence," "chronic diseases," and "elderly" for the period from 2015 to 2024. Inclusion criteria were studies focusing on AI and its application in improving medication adherence in elderly patients with chronic diseases. Analysis was performed using qualitative content analysis.

Results: The results of the study led to the identification of two main categories: "Identifying Patients at Risk of Non-Adherence," which included four subcategories (clinical data analysis, identifying risk factors, predicting non-adherence, and providing recommendations and interventions), and "Providing Reminders and Personalized Interventions," which included four subcategories (regular reminders, personalized interventions, continuous follow-up, and patient communication).

Conclusion: The findings suggest that AI plays a crucial role in improving medication adherence among elderly patients with chronic diseases. Intelligent systems can help enhance medication adherence by identifying patients at risk of non-adherence and providing personalized reminders

and interventions. These results indicate that the use of AI can contribute to overall healthcare improvement and reduce the burden of chronic diseases in elderly populations.

Keywords: ArtificialIntelligence, Medication Adherence, Chronic Diseases, Elderly

G-1375

A review of factors affecting the failure and success of health information systems

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Abstract:

Background and Aims: Health Information Systems (HIS) are vital tools that help in the collection, processing, and distribution of information, clinical, and management decision-making. Successful implementation of these systems has always been accompanied by challenges. Studies show that a significant percentage of HIS projects fail, which can be due to technical, organizational, human, or environmental factors. Therefore, identifying these factors is essential to improve the success of health information systems. This review article comprehensively examines the factors affecting the success and failure of HIS.

Methods: This study was conducted as a systematic review. To collect data, reputable databases including PubMed, Scopus, Web of Science, and Google Scholar were searched. Keywords used included "Health Information Systems", "Success Factors", "Failure Factors", "Technical Factors", "Organizational Factors", "Human Factors", and "Environmental Factors". Articles published between 2015 and 2023 in English were reviewed. After initial screening, relevant articles were selected and their data were extracted and analyzed.

Results: Based on the analysis of studies, the factors affecting the success and failure of health information systems are divided into four main categories:

1. Technical factors: hardware and software quality, system integration with other existing systems, information security and privacy, system reliability and stability
2. Organizational factors: senior management support, the existence of appropriate strategy and planning, allocation of sufficient resources, organizational culture and acceptance of change
3. Human factors: user skills and knowledge, user participation in system design and implementation, user training and support, resistance to change
4. Environmental factors: government laws and regulations, competitive pressure and stakeholder expectations, economic and political conditions

Conclusion: The success of health information systems is significantly influenced by technical, organizational, human, and environmental factors. To increase the likelihood of success, organizations should pay attention to these factors and have a comprehensive plan for managing them. Top management support, user training, allocation of adequate resources, and attention to information security are key measures. Also, understanding the needs and expectations of stakeholders and adapting the system to environmental conditions can help improve HIS performance. Future studies can examine the combined effect of these factors and provide models for predicting the success of health information systems.

Keywords: Health Information, System Success, System Failure

G-1377

Challenges of Implementing Artificial Intelligence in Psychiatric Units: A Review study

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Abstract:

Background and Aims: Artificial Intelligence (AI) has significantly transformed healthcare by enhancing diagnosis, treatment, and patient management. Despite its potential, AI adoption in psychiatric settings faces numerous challenges, including ethical concerns, algorithmic bias, lack of trust among patients and healthcare providers, and data security issues. This systematic review aims to analyze the key barriers to AI implementation in psychiatric nursing and propose solutions to optimize its integration

Methods: A literature review was conducted across databases including PubMed, Science Direct, Scopus, Web of Science, and Google Scholar. A total of 55 peer-reviewed articles published between 2015 and 2025 were selected for in-depth analysis based on their relevance to AI implementation challenges in psychiatric care.

Results: The findings highlight five primary challenges in adopting AI in psychiatric settings:

1. Lack of trust among healthcare professionals and patients—studies indicate that 70% of nurses and psychiatrists are reluctant to replace traditional methods with AI-driven tools.
2. Algorithmic bias and inaccuracies—some AI models demonstrate low accuracy in diagnosing complex psychiatric disorders, leading to misinterpretation of patient symptoms.
3. Ethical and legal barriers—concerns over informed consent, patient autonomy, and the potential misuse of AI-generated psychological assessments remain unaddressed.
4. Data security and privacy risks—AI models require large datasets, raising concerns about patient confidentiality and cybersecurity

threats. 5. Integration challenges—many psychiatric facilities lack infrastructure to incorporate AI into Electronic Health Records (EHRs) and decision-support systems.

Conclusion: While AI presents significant opportunities to enhance psychiatric care, overcoming these challenges requires a multidisciplinary approach, including transparent AI models, ethical AI policies, and targeted training programs for psychiatric professionals. Future research should focus on evaluating AI's long-term impact on psychiatric care and ensuring responsible implementation.

Keywords: Artificial Intelligence, Psychiatric Nursing, AI

G-1390

Artificial Intelligence, a Transformative Force in Cervical Cancer Management: A Systematic Review of Advanced Innovations, Implementation Barriers, and Future Prospects

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Abstract:

Background and Aims: Cervical cancer is the fourth most common cancer among women worldwide, particularly in developing countries, and is associated with a high annual mortality rate. The integration of artificial intelligence into the medical field, especially in the management of cervical cancer, has the potential to reduce the financial and human burden of this disease on society. However, it still faces several challenges. This systematic review study examines the role of Artificial Intelligence in the comprehensive management of cervical cancer by analyzing advancements, exploring challenges in this field, and proposing strategies to reduce the prevalence of cancer in society.

Methods: In this study, an extensive search was conducted using keywords such as "Artificial Intelligence", "Cervical Cancer," and "Machine Intelligence" in databases including PubMed/Medline, Web of Science (WOS) Core Collection, Scopus, and Google Scholar, as well as national databases such as Irandoc, SID, and Magiran. The initial search yielded 249 studies. Inclusion criteria were limited to studies published within the last five years. Studies without full-text access, duplicate studies, and systematic review articles were excluded. After comprehensive and critical evaluation using relevant tools, 18 studies were selected for detailed scientific analysis.

Results: The studies indicate that the presence of Artificial Intelligence in the field of cancer diagnosis and treatment has significantly contributed to reducing cancer incidence and accelerating treatment processes. This is achieved through the identification of risk factors, increased sensitivity in screening, detection of high-risk individuals, improved accuracy in data interpretation and analysis, and the identification of personalized treatments.

Conclusion: The use of Artificial Intelligence in the management of cervical cancer can prevent recurrence and provide appropriate treatments for each individual, leading to faster recovery. By saving time, it reduces treatment costs, increases patient satisfaction with the medical community, and alleviates psychosocial stress on society. Although challenges such as the lack of necessary infrastructure for Artificial Intelligence implementation and insufficient public awareness and trust in Artificial Intelligence exist, it is essential to adopt appropriate measures to address these issues and maximize the utilization of Artificial Intelligence in society.

Keywords: Artificial Intelligence, AI, Cervical Cancer

G-1391

The role of artificial intelligence in managing diabetes complications in adolescents: A systematic review

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Abstract:

Background: Diabetes in adolescents is a growing global concern, with its prevalence increasing due to lifestyle changes and rising childhood obesity. Managing diabetes in this age group presents unique challenges, including the need for self-care, adherence to treatment, and psychological adaptation. Artificial intelligence (AI) has emerged as a promising tool in managing diabetes complications.

Methods: This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive search was conducted in PubMed, Scopus, SID, IranMedex, and Google Scholar for studies published between 2020 and 2025. The search included keywords such as *******"Artificial Intelligence," "Diabetes," "Complications," "Adolescent," and "Management." After screening 1,326 studies, a final selection of 14 relevant articles was included based on predefined inclusion and exclusion criteria. Data extraction focused on study design, sample characteristics, AI techniques used, and outcomes.

Results: AI-driven technologies, including machine learning models and decision-support systems, significantly enhance diabetes management. These tools enable continuous glucose monitoring, early detection of glycemic fluctuations, and optimized insulin dosing. Machine learning algorithms predict hyperglycemia and hypoglycemia using real-time data, allowing timely interventions. Additionally, AI-based tools support personalized diabetes management, reducing cognitive burden and improving self-efficacy in disease control. AI also fosters family-centered diabetes care by facilitating remote monitoring through smart insulin delivery systems and mobile applications, promoting adolescent independence while reassuring parents.

Conclusion: Despite its advantages, AI implementation in diabetes care faces challenges, including data quality limitations, model interpretability issues, and ethical concerns regarding privacy and accessibility. Future research should focus on enhancing AI transparency, integrating

these tools into routine clinical practice, and ensuring equitable access to AI-driven diabetes solutions.

Keywords: Artificial intelligence, Diabetes Complications, Adolescent, Management

G-1585

Bibliometric Assessment of Artificial Intelligence Applications in Acute Leukemia Research: A Systematic Analysis of Scientific Literature

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Abstract:

Background and Aims: Citation analysis is a widely used method in research planning in which a publication receives citations by referencing other scholarly works. Through bibliometric analysis, the evolution of research domains and the influence of individual authors can be systematically assessed. This study aimed to identify and analyze the key characteristics of research on acute leukemia by examining the 100 most-cited publications, with a specific focus on the application of artificial intelligence (AI) in leukemia research.

Methods: On November 21, 2024, a comprehensive search was conducted in the Web of Science database using the following keywords within the topic field: leukemia, blood malignancy, machine learning, transfer learning, artificial intelligence, deep learning, and IoT. Following an extensive retrieval process, all identified articles were ranked based on their citation counts, and the top 100 most-cited articles were imported into EndNote 21 for further analysis. Key bibliometric and methodological data were subsequently extracted using Excel and VOSviewer software, including: (1) article title, (2) authors, (3) year of publication, (4) journal name, (5) impact factor, (6) country of origin, (7) number of citations, (8) language, (9) keywords, (10) disease type, (11) AI algorithms or techniques, (12) study objective, (13) study type, (14) model performance evaluation methods, and (15) data types used for training and testing AI models.

Results: Among the 100 most-cited articles in this field, 57 focused specifically on acute leukemia. The average number of citations for these 57 articles was 50.96, with the top three cited articles receiving 362, 309, and 158 citations, respectively. All 57 articles were published in English between 2011 and 2024. India emerged as the most prolific contributor, with 13 publications.

Conclusion: The bibliometric analysis revealed a notable increase in the application of artificial intelligence in acute leukemia research. The findings offer a clearer understanding of the AI methods employed and their effectiveness in this domain, enabling researchers to better identify key areas for future investigation and prioritize research efforts accordingly.

Keywords: Artificial Intelligence, Leukemia, Deep Learning

G-1586

Governance and Ethics of AI in Healthcare: A Narrative Review of Challenges and Policy Responses

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Abstract:

Background and Aims: The advent of artificial intelligence (AI) has significantly transformed the healthcare industry by improving diagnostic accuracy, personalizing treatment strategies, and enhancing the efficiency of medical services. However, these advancements have also introduced substantial challenges related to ethical considerations, the protection of patient data, and legal accountability. To address these issues and ensure the responsible integration of AI technologies in healthcare, effective governance through health policy, regulation, and strategic management is essential. This study aims to examine the latest innovations in AI applications within health services and to analyze the primary regulatory, ethical, and managerial challenges that accompany their implementation.

Methods: This research employs a narrative review approach to synthesize contemporary studies, policy frameworks, and regulatory guidelines, thereby investigating the dual impact of artificial intelligence (AI) in the healthcare sector. A variety of case studies and policy documents from international health organizations, governmental regulations, and ethical committees have been meticulously examined to evaluate their effectiveness in addressing the challenges associated with AI.

Results: The findings indicate that while artificial intelligence (AI) positively impacts clinical decision-making, patient outcomes, and healthcare delivery, it also raises significant concerns related to data privacy, algorithmic bias, and the legal implications of AI-generated decisions. The current regulatory landscape is fragmented, with notable discrepancies across various jurisdictions, which impede the development of a cohesive global governance framework for AI in healthcare. Ethical dilemmas, such as informed consent, data security, and accountability in AI-assisted decision-making, continue to be critical issues that require comprehensive policy responses.

Conclusion: The integration of artificial intelligence (AI) into healthcare requires the establishment of robust, flexible, and globally harmonized regulatory frameworks that align technological advancements with ethical principles and patient safety. Policymakers and healthcare regulators must take proactive steps to develop guidelines that promote innovation while ensuring adherence to ethical and legal standards. Future research should concentrate on

creating regulatory models specifically designed for AI that address emerging challenges and facilitate the responsible implementation of AI in medical practice.

Keywords: Artificial-Intelligence, Healthcare-Policy, Ethics, Medical-Data-Security, Regulation, Governance

G-1587

Exploring the Impact of 3D Printing on Medical Innovation: Applications, Challenges, and Policy Implications

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Abstract:

Background and Aims: The advent of three-dimensional (3D) printing has significantly transformed the manufacturing landscape of medical devices and prosthetics, enabling the creation of customized devices and engineered biological tissues. This technological innovation has not only enhanced the quality of medical treatments but has also contributed to a reduction in healthcare costs. However, several challenges, including high expenses, a shortage of suitable biocompatible materials, and the absence of comprehensive regulatory frameworks, hinder its wider adoption. This study aims to systematically review the applications, benefits, challenges, and future directions of 3D printing in the medical field, while emphasizing the need for supportive policies and investments.

Methods: This systematic review analyzes relevant articles published between 2020 and 2025. A comprehensive search was conducted across the PubMed, Scopus and Web of Science. Studies focusing on the medical applications of 3D printing—including prosthetics, surgical instruments, bioprinting, and implants—were selected for inclusion. The data were meticulously examined to assess technological advancements, identify barriers to implementation, and propose policy recommendations.

Results: The results indicate that 3D printing enhances customization, reduces production costs, and improves treatment accuracy. In the field of prosthetics, it has expedited production timelines and positively influenced patient outcomes. Bioprinting holds considerable promise for tissue engineering and the creation of artificial organs. However, legal and regulatory challenges, high costs, and a limited supply of biocompatible materials remain significant obstacles. Furthermore, the integration of 3D printing with artificial intelligence is opening new avenues for optimizing the design and production of medical devices.

Conclusion: To fully leverage the potential of 3D printing in healthcare, it is imperative to increase both public and private investments in technological infrastructure, biocompatible materials, and advanced bioprinting facilities. Furthermore, establishing regulatory frameworks that align with international standards is essential for the commercialization and widespread adoption of these technologies. Effective policies can enhance treatment quality, reduce dependence on imported medical devices, and stimulate innovations in personalized medicine.

Keywords: 3D-Printing, Medical-Equipment, Prosthetics, Personalized-Medicine, Health-Policy, Bioprinting

G-1613

Examining the use of wearable technology in the elderly: A systematic review

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Abstract:

Background and Aims: Wearable technology encompasses electronic devices worn on the body that collect, process, and transmit data in real-time, facilitating user interaction with their environment and digital systems. The increasing elderly population has heightened the demand for healthcare services, rendering existing monitoring systems inadequate. This study aims to explore the application of wearable technology among the elderly.

Methods: A systematic review was conducted using keywords such as "wearable technology," "elderly," and "wearable devices" across various databases, including Wos, Scopus, Pubmed/Medline, Irandoc, Magiran, Noormags, SID, and Google Scholar. Initially, 34 studies were identified. Inclusion criteria allowed for articles published in Persian or English without a time limit, while grey literature and review studies were excluded. After removing duplicates and critically appraising the studies, ten studies were analyzed. Ethical considerations were prioritized to avoid bias in selection and analysis, with the abstract reported according to PRISMA guidelines.

Results: The reviewed studies identified critical factors influencing the elderly's intention to use wearable devices, including perceived trust, value for money, and vulnerability. Wearable devices facilitate automatic fall risk assessments and continuous monitoring, providing a cost-effective alternative to traditional observational methods while minimizing human error. The optimal model for assessing falls in the elderly was a single-sensor model utilizing a pelvic accelerometer, while a dual-sensor system effectively classified daily activities. Integrating a semi-automatic mobile health system with wearable devices improved chronic pain management and enhanced the quality of life for the elderly. A one-month health assessment using wearable devices revealed significant changes in heart rate and blood pressure, with participants acknowledging the effectiveness of these devices in improving health and increasing social capital ($p < 0.05$). Advanced predictive models using convolutional and recurrent neural networks were employed to forecast

falls, triggering safety measures. These sensors also detected bed exits, allowing timely alarms to mitigate fall risks.

Conclusion: The findings demonstrate that wearable sensors effectively assess the health status of the elderly, enhance quality of life, identify and prevent fall risks, and improve safety while reducing human error. Future research should focus on the accessibility, costs, and training related to these tools for the elderly.

Keywords: Aged, Aging, Old Age, Wearable Devices

G-1615

Radiomics-Based Prediction of Ki-67 Index in Non-Small Cell Lung Cancer: A Meta-Analysis and Diagnostic Performance Evaluation

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Abstract:

Background and Aims: Lung cancer is one of the leading causes of cancer-related mortality worldwide, with the Ki-67 index being a crucial biomarker for assessing tumor proliferation and aggressiveness. Radiomics, an emerging computational imaging technique, allows for the extraction of quantitative imaging features that may improve non-invasive tumor characterization. This study aims to systematically evaluate the diagnostic performance of radiomics in predicting Ki-67 index status in Non-Small Cell Lung Cancer (NSCLC) using computed tomography (CT) imaging.

Methods: A systematic review was conducted following PRISMA guidelines. Literature searches were performed in PubMed/MEDLINE, Embase, Scopus, and Web of Science databases up to April 19, 2024. Studies evaluating the predictive accuracy of CT-based radiomics models for Ki-67 index classification in NSCLC were included. The methodological quality of selected studies was assessed using QUADAS-2, Radiomics Quality Score (RQS), and METHodological RadiomICs Score (METRICS). Meta-analysis was performed using statistical tools in R software to determine pooled sensitivity, specificity, and diagnostic odds ratios.

Results: A total of 10 studies, comprising 2,279 NSCLC patients, were included, with 9 studies analyzed quantitatively. The pooled sensitivity and specificity of radiomics-based models were 0.783 (95% CI: 0.732–0.827) and 0.796 (95% CI: 0.707–0.864) in training cohorts, and 0.803 (95% CI: 0.744–0.851) and 0.696 (95% CI: 0.613–0.768) in validation cohorts. Subgroup analysis revealed that segmentation software significantly impacted diagnostic accuracy, with ITK-SNAP achieving higher sensitivity.

Conclusion: This systematic review and meta-analysis highlight the potential of radiomics as a promising non-invasive tool for predicting the Ki-67 index in NSCLC. The findings support the clinical utility of radiomics in personalized oncology, though further prospective studies with standardized methodologies are necessary to enhance its applicability in clinical settings.

Keywords: Lung Cancer, Ki-67 Index, Radiomics, CT

G-1161

An overview of the challenges of artificial intelligence in electronic health records

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Abstract:

Background and Aims: Electronic Health Records (EHRs) are essential tools for managing patients' medical information. With the advancement of Artificial Intelligence (AI) technology, it is now possible to provide personalized services, identify complex disease patterns, and predict treatment outcomes. This review article examines the challenges of applying Artificial Intelligence in EHR systems. The objective of this research is to investigate the challenges of integrating Artificial Intelligence (AI) in Electronic Health Records (EHRs).

Methods: This study is a scoping systematic review that examines the challenges of Artificial Intelligence in Electronic Health Records. English articles published between 2010 and 2024 were searched in the PubMed and Web of Science databases using specified keywords. Original quantitative and qualitative studies related to the topic, including randomized controlled trials, cohort studies, etc., were included in this study, while review articles, editorials, opinions, letters, books, presentations, and conference papers were excluded. After removing duplicates, articles were screened based on title and abstract, and then the full text of relevant articles was analyzed.

Results: AI in EHRs facilitates the analysis of complex data and unstructured information, automates administrative processes, and supports clinical decision-making by providing personalized alerts and predictions. Significant benefits of this technology include reducing human errors, improving efficiency, and enhancing the quality of healthcare. However, it faces numerous technical, ethical, and operational challenges. Technically, low data quality, lack of algorithm transparency, and the absence of unified standards are major obstacles. Ethical issues include concerns about data privacy, cybersecurity, algorithm bias, and determining responsibility in AI-based decisions. Operationally, legacy EHR systems, high implementation costs, and the need for staff training pose challenges. To fully leverage the potential of AI in healthcare, these obstacles must be addressed comprehensively.

Conclusion: AI has the potential to revolutionize the healthcare system by improving data structure and reducing management challenges. However, overcoming technical, ethical, and operational barriers is a key necessity for fully utilizing this technology. Further research and data standardization appear to be essential for the successful use of AI in EHR systems.

Keywords: Artificial Intelligence, Electronic Health Record, AI

G-1162

Artificial Intelligence in Nursing Care: A Systematic Review

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Abstract:

Background and Aims: Application cases of artificial intelligence in improving and increasing the quality of nursing care. In general, artificial intelligence includes a machine that has the ability to recognize, think and create solutions like humans. However, artificial intelligence can be utilized in health and medical sciences, and today it is used, albeit limitedly, in the areas of diagnosis and education for patients at the bedside.

Methods: A systematic review was conducted in the PubMed, google scholar, connected papers following the PRISMA guidelines.

Results: A total of 21 articles were selected for the review. Artificial intelligence has various applications in nursing, including disease diagnosis and clinical decision-making to address patient issues. AI-based systems in nursing are used for patient monitoring, such as the automatic assessment of vital signs and optimizing workflows among nurses, as well as effectively utilizing AI for patient education and imaging.

Conclusion: Through a comprehensive analysis of recent studies and case examples, this review aims to provide a nuanced understanding of the promising benefits and potential obstacles of AI adoption in nursing care, ultimately proposing a framework for effective integration into clinical practice. As the healthcare landscape continues to evolve, sustained collaboration between technology developers and nursing professionals will be essential to fully harness the benefits of AI while maintaining the core values of compassion and human-centered care.

Keywords: Artificial Intelligence, Clinical Application, Nursing Care

G-1164

The Impact of Network Biological Model on Nerves in Virtual Space & and the Necessity for Application of Legal Sovereignty in Network Bioinformatics for Information dissemination and content production in self-expressing reference

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Abstract:

One of the capabilities of the human brain has been used as a new type of intelligence in the virtual space and internet. In the biological model: operators, regulators and activators are used in for coding. Coding based on number algorithm is used in calculations for mathematizing regulation and operation in a bid to transmit in the network. This study was an attempt to present a preliminary scheme of synchrony and asynchrony as a problematic. Against the backdrop of this problematic, asynchrony of the operator-regulator and the system besides the sequence of synchronies tend to creates a kind of individuality in its textual natural state that is solipsistic, a state in which one sees himself/herself alone and separate from alter ego.

Background and Aims: The regulator in the gene expression pattern and the operator that transmits the messages in the gene has been used as a basis for programming in IBM Company. Working with the Internet has an effect on the brain and the neurological system: effect on perception with problem of cognition. The use of semantic rules is never assessed by the benchmark of truth and falseness, rather it is the syntagmatic and paradigmatic relations that matter.

Methods: Analytic direct interview method in a statistical population between 2 groups of sons and daughters descend 4-14 years old. Evaluation indicator includes; machine learning, Changing body language, Game Speed, Cognition- image, violence, excitement. At this group of children Use of machine learning in cognitive and understanding brain with usage Internet changing true and false judgment.(CQ) is intelligence ability creates a virtual world with damages at cognition judgment.

Results: The problem of identifying the user's situation in the biological model of the network in the phase of coding faces data uses and machine language when expressing, which is a character and symbol, decision and true or false semantic rule cannot be read.Information multiplicity that implies a degree of uncertainty. But it is interpreted as false. Semantic relations can be found among the user's positions.Conclusion When it is possible that the antecedent is true, but the consequent is false.

Keywords: Anomic Static Nerves, Cyberspace, Tissue

G-1165

Will artificial intelligence be the key to human reproduction on Mars? A new perspective on reproductive medicine in the space age.

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Abstract:

Background and Aims: The exploration of Mars presents significant challenges for human reproduction, primarily due to cosmic radiation and microgravity. This article examines how artificial intelligence (AI) can address these reproductive barriers in space, particularly on Mars, and outlines new possibilities for reproductive medicine in the era of space exploration.

Methods: The present research was a review study and analytical approach, the related articles of which were extracted from Web of Science, PubMed, Google Scholar, SID, Magiran databases without time limit. The inclusion criteria included studies that were in line with the research objective.

Results: The Martian environment, with its low gravity, harmful radiation, and limited resources, poses serious threats to reproductive health, including DNA damage to sex cells, increased risks of infertility, miscarriage, and potential adverse effects on fetal development. AI, with its machine learning, data processing, and modeling capabilities, can be crucial in predicting, preventing, and treating these issues. This includes analyzing astronaut data for early detection of fertility issues, improving the success rates of ART such as IVF by optimizing embryo selection and treatment protocols, creating virtual models of embryo growth in Martian conditions, and potentially managing artificial wombs.

Conclusion: AI holds significant promise as a pivotal technology for enabling human reproduction on Mars, with implications for both space exploration and terrestrial reproductive medicine. However, realizing this potential necessitates addressing technical and ethical challenges related to data privacy, security, and ethical dilemmas surrounding embryo selection and genetic editing, requiring international collaboration, ongoing research, and careful ethical consideration.

Keywords: Cosmic Radiation, Space Exploration, Assisted Reproductive

G-1166

Improving Brain Tumor Diagnosis Using a Combination of Machine Learning and Ensemble Learning

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Abstract:

Background and Aims: Accurate diagnosis of brain tumors using MRI images is critical for enhancing diagnostic precision and guiding appropriate treatment strategies. Traditional machine learning algorithms often struggle to achieve high accuracy due to the complex and heterogeneous nature of tumor structures. This study proposes a hybrid machine learning framework that combines ensemble learning strategies to improve the precision and reliability of brain tumor diagnosis.

Methods: The dataset comprised 255 T1-weighted MRI images, including 98 slices from healthy brain tissue and 155 slices from tumorous brain tissue. Preprocessing steps were employed to reduce noise and enhance image quality, followed by the extraction of geometric features to characterize tumors. Extracted features included area, perimeter, convex area, solidity, equivalent diameters of major and minor axes, and eccentricity. Three machine learning models—Decision Tree, Random Forest, and Multi-Layer Perceptron—were implemented as base classifiers. An ensemble learning model was subsequently developed by aggregating the predictions of these classifiers, leveraging their complementary strengths while mitigating individual weaknesses.

Results: Experimental findings demonstrated that the ensemble model outperformed the individual classifiers. Specifically, the Decision Tree, Random Forest, and Multi-Layer Perceptron achieved classification accuracies of 83%, 80%, and 74%, respectively. The ensemble model surpassed these, achieving an accuracy of 85%, thereby underscoring its superior effectiveness in brain tumor diagnosis.

Conclusion: The proposed hybrid framework successfully integrates machine learning and ensemble techniques, offering a robust and reliable solution for brain tumor diagnosis using MRI images. This study underscores the value of combining multiple algorithms to enhance diagnostic accuracy. Future research could further refine this framework by incorporating advanced deep learning methodologies and additional feature extraction techniques to improve both performance and clinical utility.

Keywords: BrainTumor, MRIMages, MachineLearning, EnsembleLearning, Diagnosis

G-1168

The Role of Artificial Intelligence in the Self-Concept of Adolescent Cancer Patients: A Cognitive Behavioral Protocol.

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Abstract:

Background and Aims: With advancements in cancer treatment, the psychological and social well-being of adolescent cancer patients has garnered increased attention. This study investigates the integration of Artificial Intelligence (AI) and Cognitive Behavioral Therapy (CBT) to enhance the self-concept of adolescents diagnosed with cancer. The objective is to identify cognitive and behavioral patterns related to self-concept and assess the impact of a combined AI-CBT intervention on psychological well-being and body image.

Methods: A case study design was employed with 15 adolescents undergoing chemotherapy at a specialized oncology center. Data were collected through the "Hospital Anxiety and Depression Scale (HADS)" and semi-structured interviews to explore participants' emotional and cognitive states before and after the intervention. A customized CBT protocol, including stress management and body image exercises, was developed and delivered over 8 weeks. AI-driven photo lab software was integrated into the therapy to promote positive self-perception and body image.

Results: While quantitative data suggested reductions in anxiety and depression scores after the intervention, qualitative findings were more striking. Participants reported feeling more confident in their appearance and interactions with peers, with many expressing a newfound sense of self-acceptance and emotional resilience. Interviews highlighted themes such as improved self-esteem, better coping with treatment-related stress, and a shift toward more positive thought patterns. In particular, the AI-integrated body image exercises were described as "uplifting" and "empowering" by several participants, fostering a sense of control over their self-concept.

Conclusion: The integration of AI with CBT demonstrates promise in addressing the complex psychological needs of adolescent cancer patients. By combining modern technology with established therapeutic approaches, this study underscores the potential for innovative interventions to improve self-concept, emotional resilience, and overall quality of life in this population.

Keywords: Neoplasms, Self Concept, Artificial Intelligence

G-1169

The Role of Artificial Intelligence in Cognitive Behavioral Therapy Using Stories for Children with Cancer

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Abstract:

Background and Aims: Childhood cancer significantly affects children's psychological well-being, often resulting in anxiety, depression, and behavioral difficulties. Cognitive Behavioral Therapy (CBT) is a well-established method for addressing such mental health issues. Leveraging the capabilities of Artificial Intelligence (AI), this study explores the use of personalized therapeutic stories as a method of enhancing CBT. Specifically, it examines how AI can tailor therapeutic interventions by analyzing emotional states in children and creating interactive stories designed to reduce anxiety and depression symptoms while teaching essential coping strategies.

Methods: This study employed a convenience sampling of 10 children diagnosed with cancer, aged 7–12, at Omid Hospital in Mashhad. AI software was utilized to develop personalized therapeutic stories based on the emotional characteristics of each participant. Participants engaged with the stories over a four-week intervention period. To measure the effectiveness of this approach, the "Hospital Anxiety and Depression Scale (HADS)" was administered at baseline and after the intervention. Statistical analysis was performed to evaluate the impact of the intervention.

Results: Analysis of the HADS scores revealed a significant reduction in anxiety and depression symptoms among participants following the intervention. The mean anxiety score decreased from 13.5 ± 2.1 to 9.2 ± 1.7 ($p = 0.01$), while the mean depression score was reduced from 12.8 ± 2.4 to 8.4 ± 2.0 ($p = 0.01$). These findings highlight the effectiveness of AI-generated therapeutic stories in reducing psychological distress in children with cancer.

Conclusion: The findings of this study indicate that the integration of AI into CBT can substantially reduce anxiety and depression symptoms in children with cancer. The use of personalized therapeutic stories, created based on AI-driven emotional analysis, represents a promising advancement in pediatric cancer care. Future studies with larger sample sizes and extended intervention periods are recommended to further validate these outcomes and explore the long-term benefits.

Keywords: Coping Skills, Artificial Intelligence, Neoplasms

G-1171

Smart Health Screening (Digital Health and Artificial Intelligence: Identifying individuals at high risk of cancer)

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Abstract:

Background and Aims: Cancer ranks as the second leading cause of death worldwide, claiming approximately 9.6 million lives annually—about one in every six deaths, according to the WHO. Despite advancements in medical technology, the global cancer burden continues to rise, with tumor types like colorectal, pancreatic cancers, dominating incidence and mortality statistics. Despite advances in medical technology and screening programs, gaps in the detection in the normal population persist, leading to delayed diagnosis. Artificial intelligence (AI) is emerging as a transformative technology in cancer detection. The aim of current study was to generate an AI-based software incorporating gene panel data, traditional risk factors, and healthcare professional assessments to accurately predict and identify individuals at high risk.

Methods: Different machine learning approaches (e.g., random forest, support vector machines, convolutional neural networks, CNN,...), deep learning algorithms, and Natural Language Processing with capable of handling the complex relationship between genetic variants, and risk factors plus were utilized. The system is being used Python programming in Django – MySQL – ChartJS - jscharting framework plus HTML, CSS, JavaScript tools. Software development was as followed: independent module development for front-end and back-end Version control using Git. Then the platform evaluated in 2500 cases in 39 units in multi center setting.

Results: Two CNN models used for colon cancer, differing in the last fully connected (FC) layer, which determines the number of class labels in the dataset. In the colon cancer model, the final FC layer's channel size was set to two to predict colon adenocarcinoma and benign colonic tissue classes (<https://smartcancer.ir/>). Random Forest-based risk assessment, was used for survival analysis for short-term (5-year risk) and long-term (lifetime risk) risk modeling. The platform integrates Electronic Health Records (EHR) with blockchain technology to enhance security, privacy, and data integrity plus generation and drawing the patient's family tree, which can help in genetic counselling.

Conclusion: This study represents a world-first effort to integrate multiple screening modalities into a holistic framework, utilizing AI-based digital analysis to assess risk and identify high-risk cases.

Keywords: Cancer, Early Detection, High Risk, AI

G-1172

Emerging Role of Artificial Intelligence in Predicting Cancer Immunotherapy Outcomes

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Abstract:

Background and Aims: Immuno-oncology, as a novel therapeutic option pillar in within oncology, and has revolutionized cancer treatment as a method for by facilitating immune-mediated tumor tumour clearance. However, due to the variability of patient response to immunotherapy and the lack of reliable methods for predicting the immunotherapy response, there is a need for a more accurate necessitate the development of an improved method that can accurately precisely in identifying predict the outcome of immunotherapy and identify the group of patients who may benefit from immunotherapy drugs.

Methods: Artificial intelligence (AI) is a novel approach as a major frontier in medical research, is reshaping medicine and shifting paradigms in clinical practice. Thus we have provided an overview about on the application of employing AI in immuno-oncology, particularly and explain how it can AI can be used to analyze multi-omics data, and pathological and radiological images to predict immunotherapy outcomes.

Results: In terms of Immuno-oncology, AI has the potential could help to discover novel predictive biomarkers, establish decision-support systems, predict immunotherapy response, classify patients into subgroups, and predict drug efficacy and synergy using multi-omics data, medical imaging, and histological analysis.

Conclusion: This AI-based approach has enormous potential in the effective management of immuno-oncology and optimizing treatment plans in addition to saving human resources and costs.

Keywords: Cancer Immunotherapy, Artificial Intelligence, Predictive Biomarkers

G-1176

Evaluating the quality and usability of responses generated by GPT Chat artificial intelligence in response to common patient questions regarding colorectal cancer self-care

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Abstract:

Background and Aims: One of the most important cancers worldwide is colorectal cancer. Colorectal cancer is the third most common cancer in Iranian women and the fifth most common cancer in Iranian men. High risk factors, including age, marital status, ethnic and racial differences, the basis for colorectal cancer. Colorectal cancer and its treatments have side effects such as weakness, fatigue, lethargy, anorexia, nausea and vomiting, anemia, and nutritional disorders. Self-care involves performing some aspects of physical care and the patient's active participation in the self-care process such as follow-up, treatment progress, monitoring, symptoms, checking side effects. Therefore, this study aimed to determine the answers to common questions patients have about colorectal cancer self-care.

Methods: This descriptive survey study was conducted in November 2014 through an interview with ChatGPT version 4 to answer 57 questions of the Colorectal Cancer Self-Care Questionnaire, which has five dimensions: physical, psychological, emotional, religious, and occupational. To examine the data quality indicators in this article, we used the Echoa and Duval criteria, which collected a set of measurable criteria for metadata quality. To better understand the criteria, we examined several dimensions of comprehensiveness, accuracy, information richness, and inherent precision. The questions were asked in full to the artificial intelligence, and the results of this study were analyzed by considering a negative score for each incorrect answer.

Results: ChatGPT version 4 provided answers. After matching the generated answers about the self-care of colorectal cancer patients with the Echoa and Duval tool, it showed that out of a total of 57 questions, 52 were answered correctly and five were answered incompletely. The average percentage of confidence in answering the questionnaire questions was 91%.

Conclusion: The findings of this study show that the artificial intelligence ChatGPT version 4 effectively answers the self-care questions of colorectal cancer patients. The results of the study showed that consistent self-care at home can lead to changes in patients' self-care behaviors. It is suggested that this model be used as a community-based approach in the health system to improve the self-care behaviors of patients with colorectal cancer.

Keywords: GPT Chat, Self-Care, Colorectal Cancer Patients

G-1177

Evaluation of the quality and usability of responses generated by ChatGPT artificial intelligence in response to common patient questions regarding self-care of ischemic heart patients

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Abstract:

Coronary artery disease is increasing in Iran with complications such as psychological, disability, loss of work capacity and imposing heavy costs. This disease is one of the most common heart diseases in all countries; in Iran, 33 to 40 percent of deaths are due to cardiovascular diseases, 79.5 percent of which are related to heart attacks. One of the determining and effective factors in maintaining health and preventing exacerbation of signs and symptoms of the disease, especially in chronic diseases, is performing self-care behaviors. Therefore, this study aimed to determine the answers to common questions of ischemic heart patients in the field of self-care.

Methods: This descriptive survey study was conducted in February 2024 through an interview with ChatGPT version 4 to answer 20 questions of the Miller Self-Care Questionnaire, which has five dimensions of dietary care, smoking cessation, physical care, recommended medications, and stress management. To examine the data quality indicators in this article, we used the ECHO and DUAL criteria, which collected a set of measurable criteria for metadata quality. To better understand the criteria, we examined several dimensions of comprehensiveness, accuracy, information richness, and inherent accuracy. The questions were asked in full to the artificial intelligence, and the results of this study were analyzed by considering a negative score for each incorrect answer.

Results: ChatGPT version 4 provided answers. After matching the responses generated regarding the self-care of ischemic heart patients with the Echeva and Duval tool, it was shown that out of a total of 20 questions, 16 were answered correctly and four were answered incompletely. The average percentage of confidence in answering the questions of the Miller questionnaire was 80%.

Conclusion: The findings of this study show that the artificial intelligence Chat GPT effectively answers the self-care questions of patients. The results of the study showed that consistent self-care at home can lead to changes in the self-care behaviors of patients with myocardial infarction. It is suggested that this model be used as a community-based approach in the health system to improve the self-care behaviors of patients with myocardial infarction.

Keywords: GPT Chat, Self-Care, Ischemic Heart Patients

G-1178

Assessing the accuracy and reliability of AI-generated responses from ChatGPT to common questions from nursing managers about appropriate leadership styles in their workplace

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Abstract:

Background and Aims: Leadership style can play a role in nurse retention, job stress, job satisfaction, and quality of work life. Choosing the right leadership style by head nurses can not only improve their performance, but also increase nurses' job satisfaction and, as a result, achieve organizational goals. Therefore, the present study aimed to examine artificial intelligence's responses to questions about appropriate leadership styles for nurses.

Methods: This descriptive survey study was conducted in 2023 through interviews with ChatGPT to answer 18 questions of the Blake and Mouton Leadership Style Questionnaire, which has two dimensions of task orientation and relational orientation. To examine the data quality indicators in this article, we used the ECHOA and DUAL criteria, which collected a set of measurable criteria for metadata quality. To better understand the criteria, we examined several dimensions of comprehensiveness, accuracy, information richness, and inherent accuracy. The questions were asked in full to the artificial intelligence, and the results of this study were analyzed by considering a negative score for each incorrect answer.

Results: ChatGPT version 4 provided answers quickly. After matching the answers generated about the leadership styles of nursing managers with the ECHOA and DUAL tool, it showed that out of a total of 18 questions, 16 were answered correctly and two were answered incorrectly. The average percentage of confidence in answering the Blake and Mouton questionnaire questions was 88%.

Conclusion: Artificial intelligence has the potential to accelerate innovation in healthcare and can help to promote equity and diversity in research by overcoming language barriers. The average quality of information produced by AI on leadership style was assessed using measurable criteria of ECVO metadata quality. The quality of the information is acceptable. The findings of this study show that AI Chat GPT version 4 effectively answers questions on leadership style of nursing managers; also, due to the incomplete percentage of correct answers, further studies are needed, and as a result, the answers produced by AI should be evaluated with a correct human answer about appropriate leadership style and all its positive and negative aspects should be accurately evaluated.

Keywords: GPT Chat, Leadership Style, Nursing Managers

G-1179

AI-Powered Analysis of Metabolic Risk Factors in Non-CVD Individuals and Their Trajectory Toward Cardiovascular Incidence

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Abstract:

Background and Aims: Cardiovascular disease (CVD) is the leading global cause of mortality, responsible for 18.6 million deaths in 2019, with increasing prevalence and incidence. In Iran, CVD accounts for 46.04% of all deaths, with demographic aging and sedentary lifestyles exacerbating the burden. This study evaluates the impact of metabolic risk factors and their trajectories on CVD development in an Iranian cohort.

Methods: Based on the Tehran Lipid and Glucose Study (TLGS), this longitudinal study included 1872 adults aged 40–79 years without prior CVD at baseline. Participants were selected through multistage random cluster sampling and followed from 1999 to 2018. Data were collected on demographic, lifestyle, and metabolic factors, with laboratory analyses conducted using standardized protocols. Generalized Estimating Equations (GEE) were used to assess age- and gender-adjusted trajectories of metabolic indicators, while Random Survival Forest (RSF) models evaluated the predictive performance of CVD risk factors. Harrell's C-index and residual analysis compared the full and reduced RSF models.

Results: During a 10-year follow-up, 117 participants (6.3%) developed CVD. Baseline CVD converters exhibited higher age, weight, blood pressure, fasting glucose, lipid levels, and diabetes prevalence. Key metabolic risk factor trajectories included TyG Index, FPG, and SBP, which had significant increases 6 years before diagnosis.

RSF model performance was robust, with C-index values of 0.95 (full model) and 0.92 (reduced model), and a Pearson correlation of 0.80 between model predictions. Residual analysis showed slight variability but strong overall alignment between models.

Conclusion: Longitudinal trajectories of metabolic risk factors, particularly SBP, FPG, and TyG index, demonstrated strong predictive value for CVD development years before onset, with SBP emerging as the most potent predictor. These findings emphasize the importance of early detection and preventive strategies targeting metabolic risk factors. Lifestyle modifications can significantly mitigate CVD risk, underscoring the utility of longitudinal data in understanding risk factor heterogeneity and disease progression.

Keywords: Trajectory, Cardiovascular-disease, TLGS, Risk-Factor, Artificial Intelligence

G-1180

Cardiovascular risk patterns through AI-enhanced clustering of longitudinal health data

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Abstract:

Background and Aims: A major cause of death worldwide, cardiovascular disease (CVD) is largely caused by risk factors like smoking, high blood pressure, poor diets, and a lack of physical activity. To find clear trends in the dynamics of CVD risk over time, this study used an unsupervised learning approach to examine the relationship between the incidence of CVD in Iranian adults and the longitudinal trajectories of risk factors.

Methods: A total of 1872 adults aged 40–79 years, free of atherosclerotic cardiovascular disease (ASCVD) at baseline, were included in the Tehran Lipid and Glucose Study (TLGS). Longitudinal data spanning over 10 years were analyzed using clustering techniques to identify distinct trajectories of CVD risk factors. K-means clustering was applied after standardizing data using the TimeSeriesScalerMeanVariance method, and the optimal number of clusters was determined using silhouette scores.

Results: The risk factor trajectories were grouped into four different clusters. Compared to Cluster 4, which represents the low-risk group, Cluster 1, which represents the high-risk group, exhibited a significantly higher hazard of CVD events. The high-risk cluster showed a noteworthy 89% incidence of CVD during the first five years of follow-up. The results suggest that risk factor trajectories may better discriminate individuals at risk of CVD.

Conclusion: This study highlights the utility of trajectory-based clustering to identify high-risk individuals for CVD more effectively. Regular monitoring and longitudinal assessment of risk factor trajectories may improve the early identification of at-risk individuals and enable targeted prevention strategies to mitigate CVD incidence.

Keywords: ASCVD-Risk-Score, Clustering, Longitudinal Trajectory, Unsupervised Clustering

G-1182

The impact of utilizing the escape room method to teach supraventricular tachycardia management on nursing students' learning outcomes and satisfaction: A randomized controlled trial

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Abstract:

Background and Aims: Innovative teaching strategies play a vital role in bridging the gaps present in conventional nursing education. Therefore, there is an increasing need for innovative and interactive teaching methods to equip nursing students for real-world professional challenges. This study aimed to assess the effectiveness of the escape room method—an innovative and experiential learning approach—compared to traditional workshops in improving nursing students' knowledge and satisfaction in managing supraventricular tachycardia (SVT).

Methods: A randomized controlled trial was conducted with 37 sixth-semester nursing students, who were randomly divided into two groups: an intervention group (18 students) participating in an escape room activity and a control group (19 students) attending a workshop. Cognitive knowledge of SVT was evaluated through pre-test and post-test assessments, while both groups completed a teaching satisfaction questionnaire. Data analysis was performed using paired t-tests and analysis of covariance via SPSS version 27.

Results: Both groups demonstrated significantly improved learning outcomes compared to their pre-test scores ($p < 0.05$). However, the intervention group (escape room) achieved notably higher post-test scores than the control group ($p < 0.001$). Additionally, students in the escape room group reported significantly greater satisfaction with the teaching method ($p < 0.001$).

Conclusion: The escape room method, as an interactive and innovative teaching strategy, proved more effective than traditional workshops in improving both learning outcomes and student satisfaction. Incorporating the escape room method into nursing education programs is suggested due to its potential to bridge educational gaps and enhance engagement.

Keywords: Education, Supraventricular Tachycardia, Escape Room

G-1183

Artificial Intelligence Ethical Issue in Health Care: a Review Study

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Abstract:

Background and Aims: The healthcare landscape is undergoing an innovative transformation by artificial intelligence. These innovations promise to provide more efficient and accurate healthcare. The fields of medical sciences emerged by applying knowledge, empathy, and creativity to diagnose, treat, and care for diseases and use their expertise through training and experience and matching their skills with patients. However the emergence of artificial intelligence changes this paradigm with the ability to analyze huge data that is beyond human capabilities, and this change is associated with a series of ethical challenges, so this study aims to investigate the ethical challenges of artificial intelligence in health care.

Methods: The current review was conducted by reviewing original articles in the databases PubMed, Scopus, WOS, and Google Scholar with the keywords " Artificial Intelligence ", "Health Care" and "Ethical Issue" until Dec 2024; A total of 12 studies related to the aim of the study were included.

Results: The ethical challenges of AI: 1.Issues of privacy and confidentiality of patient information 2.Lack of accountability 3.Lack of transparency and explainability 4.Challenge of independence/autonomy Patients 5.Inability to make accurate decisions, and empathic communication in some fields despite the skill of analyzing data and recognizing patterns 6.Lack of a collaborative approach 7.Generalizability of results across different health care settings and disparities due to biases in data, such as demographic disparities or organizational changes 8.Biases based on demografic -Economic 9.The challenge of informed consent 10.Lack of frameworks and standards for human monitoring 11.Concern Health Care Costs and Insurance Coverage 12.Data Integrity Concerns 13.Technology-Dependent Risks 14.Safety and Effectiveness Concerns.

Conclusion: Artificial intelligence will play an important role in the provision of future health services, but they will not replace health providers but will direct their efforts toward job duties using unique human skills such as empathy, and creativity. Therefore, considering the importance and necessity of artificial intelligence in the modern age of healthcare, identifying the ethical challenges of using artificial intelligence will help healthcare professionals in providing patient-centered and ethical care

Keywords: Artificial Intelligence, Ethical Issues, Health Care.

G-1185

Using Dimensionality Reduction and Machine Learning Methods for Classifying Erythemato-Squamous Diseases in Dermatology

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Abstract:

Background and Aims: Erythemato-squamous diseases are a group of skin diseases that include six categories: pityriasis rubra pilaris, chronic dermatitis, psoriasis, lichen planus, pityriasis rosea, and seborrheic dermatitis. Due to the similarity between the types of erythemato-squamous diseases, accurately diagnosing their type is challenging. This article aims to use dimensionality reduction and machine learning (ML) methods to classify these six classes. The dataset used in this article includes 34 features extracted from 366 patients. Among these features, 12 were directly measured from the patients, and 22 were measured from the biopsy samples of the patients' skin.

Methods: This article used various steps for data processing, such as replacing missing values with the median, balancing data using up-sampling, removing outliers, and standardizing data using the z-score method. In addition, ML methods like: decision tree, k-nearest neighbors, logistic regression, support vector machine (SVM) with different kernels, and naïve Bayes were used to classify these six classes. The effect of using different dimensionality reduction techniques, such as the correlation method, linear discriminant analysis, and principal component analysis (PCA) for selecting appropriate features and improving the efficiency of ML methods in this classification task, was also examined.

Results: The results indicate that without dimensionality reduction, the SVM method with a linear kernel, quadratic kernel, or Gaussian kernel outperformed other methods with an accuracy of 0.972. On the other hand, when using the investigated dimensionality reduction methods, the SVM method with PCA reduced to ten dimensions attained the best results, achieving an accuracy of 0.986, F-measure of 0.976, specificity of 0.997, precision of 0.986, and sensitivity of 0.986. Additionally, the SVM method with LDA reduced to ten dimensions secured the highest outcome with an accuracy of 0.971 and an F-measure of 0.972.

Conclusion: Machine learning methods can accurately diagnose erythematosquamous diseases. The use of dimensionality reduction methods enhances the speed of medical diagnoses by reducing the number of necessary features. It is important, especially in the SVM method where its speed decreases with the increase in the number of classes.

Keywords: Machine Learning, Dermatology, Classification, Dimension Reduction

G-1187

applications of machine learning for Early detection of Neonatal sepsis: A Review Article

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Abstract:

Background and Aims: Neonatal sepsis, a significant contributor to global health loss and mortality, poses a considerable challenge due to its nonspecific symptoms in neonates. Machine learning demonstrates substantial potential for sepsis risk assessment and the development of ideal treatment strategies, offering promising solutions to address the challenges associated with neonatal sepsis. The objective of this review is to explore the utilization of machine learning in identifying neonatal sepsis.

Methods: This review involved a comprehensive search of MEDLINE, Web of Science, and Cochrane CENTRAL databases utilizing search terms such as "neonate," "sepsis," and "machine learning" to identify relevant studies between 2011 to 2024. Studies focusing on the development or validation of machine learning algorithms for neonatal sepsis prediction were selected for inclusion. A total of 1210 articles were initially identified. After removing 480 articles based on title and abstract reviews, a full-text analysis led to the final inclusion of 16 articles in the review. Data extraction was performed by two reviewers.

Results: In the majority of the analyzed studies, researchers leveraged retrospective electronic medical record (EMR) data to develop, validate, and assess machines learning models aimed at predicting sepsis incidence and related factors. Notable predictors identified across these studies encompassed low gestational age, low birth weight, elevated C-reactive protein levels, increased white blood cell counts, tachycardia, and respiratory failure. Various machine learning models such as logistic regression, random forest, K-nearest neighbor (KNN), support vector machine (SVM), and XGBoost proved to be effective in this domain. These advanced algorithms enable the analysis of complex patterns within the available data, facilitating more accurate predictions of neonatal sepsis and potentially aiding healthcare professionals in timely identification and intervention.

Conclusion: In conclusion, the findings of this review emphasize the immense potential of machine learning as a clinical decision support tool for diagnostics and risk assessment in neonatal sepsis. The integration of advanced machine learning algorithms with retrospective electronic medical record data enables the development of predictive models that can assist healthcare professionals in identifying high-risk cases and optimizing treatment strategies.

Keywords: Artificial Intelligence, Machine Learning, Neonatal

G-1189

Investigating the paradoxes of doctors in Isfahan government hospitals in accepting artificial intelligence in healthcare environments

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Abstract:

Background and Aims: The integration of AI and machine learning technologies into the medical field is a transformative force in improving healthcare, diagnostics, drug research, and healthcare, posing new challenges and increasing significantly. The aim of this article is to shed light on the paradoxes associated with the use of AI by healthcare workers and patients and to provide solutions to enable them to achieve the maximum benefits of this technology in healthcare settings. It was essential to understand how healthcare workers and patients accept AI in the treatment process. This study attempted to answer the question of whether advanced AI services are accepted in healthcare or not?

Methods: This review article systematically used various authoritative databases (Scopus, Web of Science, PubMed / EMBASE, Google Scholar) to retrieve relevant information and followed the PRISMA guidelines. Using a systematic search strategy and specific inclusion and exclusion criteria, 500 studies were found, of which only 54 were included after repeated exclusion and screening of articles.

Results: The findings of this study identified multiple benefits of using AI in healthcare, including its ability to improve diagnostic accuracy, improve treatment outcomes, and optimize healthcare delivery. However, ethical issues such as algorithmic bias, lack of transparency, data privacy issues for healthcare professionals and healthcare professionals, and the erosion of human values in patient care remain.

Conclusion: The results showed that addressing these challenges in balancing technological innovation with human expertise to ensure responsible and ethically appropriate use and maximize the benefits of AI without causing serious drawbacks requires increasing awareness and infrastructure and optimizing for learning and accessibility. Ease of use, automation efficiency, diagnostic accuracy, and cost-effectiveness were identified as key factors driving the willingness to use and flexibility in adopting AI-based treatments, which were influenced by understanding the perspectives of healthcare providers and clients. It was suggested that policymakers develop clear, unique guidelines with a comprehensive approach and, with its support, review and mitigate the risks associated with artificial intelligence in the field of healthcare.

Keywords: Paradox, Artificial Intelligence, Healthcare

G-1190

Design, Implementation, And Evaluation Of a Blended Learning Course in Neonatal Cardiopulmonary Resuscitation (NPR) Using Gamification and Case-Based Learning

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Abstract:

Background and Aims: Over the past two decades, Iran has faced the challenge of declining fertility. This declining trend has been unprecedented in the country's history and has caused Iran to have the fastest decline in fertility rates in world history. Currently, In most neonatal intensive care units, graduates of clinical disciplines are on duty, and their curriculum briefly mentions neonatal resuscitation training, and it is felt that this should be given sufficient attention. Training in the neonatal intensive care unit (NICU) does not allow trainees to come into contact with patients due to the vulnerability of high-risk infants and the availability of specialized equipment.

Methods: The method of this study is applied in terms of its purpose and in terms of its implementation (data collection) it is a quasi-experimental research with a pre-test-post-test design with a control group. The population of this study included nursing students in 1403, from whom 30 people were selected by random sampling method and randomly placed in two groups of 15 people, experimental and control.

Results: The findings showed that the combined neonatal cardiopulmonary resuscitation training course, based on gamification and case-based learning, was effective in improving students' knowledge levels.

Conclusion: In general, Based on the research findings, It can be said that the combined neonatal cardiopulmonary resuscitation training course based on gamification and case-based learning is

effective in improving students' knowledge. and clinical performance. Therefore, It is suggested that this training be used to improve students' level in this field.

Keywords: Neonatal Resuscitation, Gamification, Case-Based Learning

G-1192

The impact of new technologies, including artificial intelligence, on increasing student learning

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Abstract:

The impact of new technologies in the field of education and learning has increased significantly. Among these technologies, artificial intelligence can be mentioned, which increases the ability to perform human mental activities in machines and computers.

Background and Aims: The aim of this narrative review is to investigate the impact of artificial intelligence in increasing the learning of medical students. These tools can help students identify their weaknesses and provide relevant resources and educational materials. Also, by analyzing student patterns, these tools are able to guide students to choose the most optimal methods for themselves. In addition, artificial intelligence technology can improve students' performance.

Methods: A literature review was conducted between the dates of 1 June 2024 and 30 November 2024 on Web of Science, Scopus, PubMed and Google Scholar. The following individual terms were entered as search criteria: artificial intelligence, AI, new technologies "student performance." The same terms were searched in databases.

Conclusion: By analyzing data and information from student activities, this technology is able to provide more accurate feedback and more constructive advice to help improve student performance. In addition, artificial technologies can be used in educational construction and personalization, as they should be. According to the needs and level of knowledge of each student, appropriate education can be provided to him, and in this case, the view and content will be easier for students and researchers.

Keywords: Artificial-Intelligence, Modern-Education, Student Performance, Student learning

G-1194

Ethical challenges of using artificial intelligence in teaching and learning of nursing students

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Abstract:

Background and Aims: When it comes to the technologies that we use for healthcare services and the health system, our decisions should be based on compliance with ethical and legal principles and rules and regulations that do not violate human dignity, so efforts should be made with standardization Cover artificial intelligence applications in all fields of medical sciences. The present study was conducted to investigate the ethical challenges of using artificial intelligence in the teaching and learning of nursing students.

Methods: This is a review study. A review of studies was done by searching Google Scholar, WoS, Scopus, PubMed, Magiran, Ovid, and SID databases from 2014 to 2024 with the keywords artificial intelligence, education, learning, and nursing students. A total of 35 articles were found, of which 8 studies were reviewed and considered. The performed steps are: 1- Designing the research question, 2- Searching and extracting articles, 3- Examining the articles, and 4- Reporting the results.

Results: In the review of the articles, the research findings related to the ethical problems observed by nursing students indicated that the students reported that nurses and doctors mistreat some patients, there is inappropriate communication with the patients, attention to the patients and they are not given correct information. The unethical behavior of the treatment team contributes to the occurrence of ethical problems. For nurses to fulfill their professional and ethical roles to provide safe and ethical care, it is necessary to complete training courses during education and continuous training courses for nursing professionals.

Conclusion: One of the most important challenges of using artificial intelligence in medical sciences is the dynamism and high speed of development and expansion of artificial intelligence, the amount of data, and its functions, which can cause the ineffectiveness of traditional methods and limited education in medicine against its consequences, so it is necessary for the field of Medical education should also develop dynamic, agile and up-to-date systems so that it can respond to the problems and side challenges arising from it along with the progress of artificial intelligence.

Keywords: Artificial Intelligence, Education, Learning, Nursing Students

G-1200

Application of Artificial Intelligence in Laboratory and Microbiological Diagnostics

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Abstract:

Background and Aims: In recent years, artificial intelligence (AI) has emerged as an innovative and comprehensive approach in laboratory and microbiological diagnostics. Traditional methods for microbial identification heavily rely on culture-based techniques, which are often time-consuming and susceptible to contamination and error. Recent advancements in AI have provided innovative solutions to these challenges, offering not only enhanced accuracy but also rapid diagnostic capabilities.

Methods: AI encompasses various technologies, such as machine learning (ML), deep learning (DL), and natural language processing (NLP). By analyzing large volumes of clinical and genomic data, AI demonstrates the ability to quickly and accurately identify microorganisms through machine learning. This technology can classify 16S rRNA sequencing data, which serves as the basis for bacterial species identification, with an accuracy exceeding 95%, significantly outperforming traditional methods.

Results: AI has shown remarkable performance, particularly in image analysis, where it can be utilized for the automated analysis and detection of microscopic images, such as Gram-stained microscopy for distinguishing between Gram-positive and Gram-negative bacteria. AI employs machine learning algorithms and multilayer convolutional neural networks (CNNs) to analyze polymerase chain reaction (PCR) images and gel electrophoresis results. Furthermore, BioFire technology can be used for image analysis of PCR. AI enhances the accuracy and efficiency of result interpretation and facilitates the automation of diagnostic processes.

Conclusion: However, several prerequisites are necessary for the widespread adoption and increased efficacy of AI, such as the preprocessing and preparation of laboratory data for AI utilization. Given that various tests and medications can have different nomenclatures, there is a critical need for standardization of scientific terminologies for tests and their measurement units at an international level. This standardization will enable machine learning-based AI to leverage this information, yielding more reliable results.

Keywords: Artificial Intelligence, Microbial Diagnosis, Machine

G-1201

The Role of Artificial Intelligence in Predicting Anesthetic Complications: A New Frontier in Patient Safety

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) in anesthesiology is revolutionizing patient safety and clinical outcomes. AI technologies like Anesthesia Information Management Systems (AIMS) and machine learning models are being applied in areas such as patient monitoring, drug management, and clinical decision support. This study aims to assess AI's ability to predict anesthetic complications, automate medical records, and optimize medication dosing, with the goal of improving perioperative care.

Methods: The study utilized five AI models—ChatGPT (OpenAI), Gemini (Google AI), Med-PaLM (Google DeepMind), IBM Watson Health, and BioGPT (Microsoft)—to process patient data and predict potential anesthetic complications. Data was integrated from clinical, genomic, and case report databases, and AI-generated risk assessments were cross-referenced with established anesthetic risk scoring systems. Recommendations were validated through expert oversight from experienced anesthesiologists, who ensured compliance with current guidelines.

Results: The AI-assisted approach demonstrated superior performance in preoperative airway assessment, optimized pharmacokinetic modeling, and more precise intraoperative management. AI-driven predictions identified hypotensive episodes and adjusted medication dosages proactively, reducing drug consumption and maintaining stable hemodynamics. Postoperatively, AI-assisted respiratory monitoring and PCA titration reduced opioid usage and reintubation rates, while also decreasing ICU stay duration by 12-18 hours compared to traditional methods.

Conclusion: AI holds significant potential in enhancing anesthetic care, improving predictive capabilities, and optimizing clinical management. The integration of AI-driven methods led to more accurate predictions, improved patient outcomes, and reduced healthcare resource utilization. However, challenges such as data reliability, ethical concerns, and the need for standardized practices remain. Further research is essential to validate these findings and facilitate widespread adoption.

Keywords: Artificial Intelligence , Anesthesia, Patients safety

G-1204

Computer-based decision support applications and machine learning for the prevention and treatment of childhood obesity

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Abstract:

Background and Aims: Childhood obesity is a growing concern globally, with significant health and societal implications. The increasing prevalence of childhood obesity calls for effective interventions and predictive models to address this issue. This study aims to explore the application of Clinical Decision Support (CDS) systems and Machine Learning (ML) techniques in predicting, diagnosing, and managing childhood obesity. It hypothesizes that integrating CDS with ML algorithms can improve the accuracy and efficiency of obesity care.

Methods: This study involved a review of recent research on CDS and ML applications in childhood obesity, focusing on interventions using Electronic Health Records (EHRs), mobile apps, and machine learning algorithms like decision trees and artificial neural networks (ANNs). The sample consisted of various studies that employed these technologies to collect data on demographic, clinical, and behavioral factors from both children and their caregivers. The research methods included analyzing the effectiveness of these interventions in predicting obesity and supporting healthcare professionals in adhering to clinical guidelines.

Results: The study found that CDS interventions, particularly through EHRs and mobile applications, were effective in supporting self-management and remote medical management of childhood obesity. ML techniques, such as decision trees and ANNs, provided valuable insights into predicting childhood obesity based on various factors, including BMI, physical activity, and diet. However, the review revealed limitations, such as small sample sizes and methodological issues in some studies.

Conclusion: The findings suggest that CDS interventions can significantly enhance self-management and remote care for childhood obesity, while ML techniques offer promising tools for prediction and diagnosis. However, the integration of ML algorithms into CDS tools, especially in clinical settings, remains limited. Further research is needed to explore the potential of combining these technologies to develop smarter and more impactful digital health interventions aimed at combating childhood obesity.

Keywords: Clinical Decision Support, Machine Learning, Digital

G-1205

“Enhancing Cardiovascular Disease Diagnosis and Management with Artificial Intelligence: A Multi-Step Approach”;

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Abstract:

Background and Aims: The increasing prevalence of cardiovascular diseases (CVDs) necessitates innovative approaches to enhance diagnosis and treatment efficacy. This study explores the transformative role of Artificial Intelligence (AI) in cardiac care, focusing on its ability to improve diagnostic accuracy, personalize treatment plans, and predict patient outcomes. By employing advanced methodologies, including data collection from electronic health records (EHRs), machine learning algorithm development, and clinical validation, this research aims to demonstrate how AI technologies can address existing challenges in heart disease management. The findings highlight the potential of AI to revolutionize cardiac care by streamlining workflows, improving patient outcomes, and ensuring equitable healthcare delivery. Furthermore, the integration of AI tools is shown to enhance care quality, increase satisfaction among physicians, patients, and staff, and bolster patient safety[1].

Methods: This research employed a multi-step methodology to achieve its objectives. The process involved the following stages:

Data Collection: Comprehensive datasets were compiled from electronic health records (EHRs), encompassing patient demographics, medical histories, imaging studies, and laboratory results.

Development of Machine Learning Models: Machine learning algorithms, including deep learning models, were developed to analyze the data for risk stratification, early detection, and predictive analytics.

Natural Language Processing: Techniques of natural language processing were utilized to extract insights from unstructured clinical notes.

Validation: Validation of AI-driven models was conducted through multicenter clinical trials to ensure their reliability and generalizability across diverse populations.

Pilot Implementation: Pilot implementations were carried out in leading cardiac care centers to evaluate the integration of AI tools into routine clinical workflows and assess their impact on operational efficiency and patient management.

Results: AI-driven models improved cardiovascular disease diagnosis accuracy, facilitated early detection, and enabled personalized treatment plans. Clinical trials validated model robustness, showing superior performance over traditional methods. Integration enhanced operational efficiency, reduced diagnostic errors, and improved resource use. AI also improved patient safety, increased satisfaction, and elevated care quality.

Conclusion: Artificial Intelligence is poised to revolutionize cardiac care by addressing critical gaps in traditional practices. This study underscores the importance of interdisciplinary collaboration to maximize the potential of AI in transforming cardiovascular.

Keywords: Artificial Intelligence, Cardiovascular Diseases, Treatment.

G-1206

Utilizing Computing Technologies for Intelligent Management of cardiovascular Diseases treatment

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Abstract:

Background and Aims: More than one million patients worldwide undergo coronary artery bypass grafting annually [1]. Cardiovascular diseases are currently the leading cause of death in the world. Common types of these diseases include congenital heart disease, heart attack, cardiomyopathy, rheumatic heart disease, pulmonary stenosis, and coronary artery disease. If the heart does not function properly and any of the heart problems develop, it will affect other parts of the body; therefore, it is necessary to diagnose this disease quickly [2]. The impact of advances in information technology on human life and businesses is increasing every day. Among them, we can mention the fog computing technologies in the Internet of Things. Cloud computing has created a huge revolution in the way data and software are accessed and managed by providing some major benefits to users, including eliminating the initial investment in information technology, scalability and proportional costs. The development of Internet of Things technology has enabled many objects to connect to the Internet to communicate with each other without human intervention. In essence, the Internet of Things reduces human data entry and uses various types of sensors to collect data from the environment, allowing for the automatic storage and processing of all data.

Methods: A review of the research background indicates that useful and useful research and studies are being conducted in the field of new Internet of Things technologies in the field of health and smart medical sciences. In [10] Nguyen Van Hau et al. presented and reviewed a general architecture of fog-based medical Internet of Things applications.

Results: As shown in Figure (3), this architecture consists of three layers: objects, fog, and cloud. Given the importance of security, maintaining patient confidentiality, paying attention to privacy, and maintaining other security mechanisms through IoT devices is also important [4].

Conclusion: cloud computing can well solve the problems of bandwidth limitations and time delays of cloud computing in the application of IoT. The distributed structure of cloud computing has presented this technology with challenges.

Keywords: Artificial Intelligence, Internet of Things, Somatization

G-1207

Smartening the heart hospital: An important step towards quality assessment and improvement

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Abstract:

Background and Aims: Smartening hospital systems by using 5G communications as a network infrastructure and computing and storage technologies increases availability, reliability, security, energy savings, quality improvement and performance enhancement, latency reduction, etc. Fog computing is a virtual platform that is compatible with real-time medical monitoring systems and provides storage, computing, and network services between cloud data centers and end devices.

Methods: Diagnosing cardiovascular diseases through symptoms is a major challenge in the current global conditions and, if not diagnosed in time, may cause mortality. Due to the limited access of cardiologists to remote areas, an intelligent system with a fog computing approach and using 5G communications infrastructure can be used as an effective solution to improve the diagnosis of cardiovascular diseases. Given that in the medical field, data is collected and stored in large dimensions and in large volumes, and on the other hand, the open and distributed structure of fog computing is vulnerable and weak against security threats, the aim of the present study is to review the solutions presented to improve the diagnosis of cardiovascular diseases and address the challenges in smart heart hospitals. Today, many hospitals use hospital information management systems to manage patient or healthcare data.

Results: These systems generate a large amount of data including numbers, texts, graphs and images. Unfortunately, this data is rarely used in clinical decision-making. The question that has occupied the minds of most experts in this field is how to process and convert raw data into useful information and statistical indicators that can be stored and used when needed, and enable medical staff to make intelligent clinical decisions, manage all resources and equipment, reduce costs, increase patient safety, which is one of the important indicators in hospital accreditation

metrics, and reduce hospital infections, patient falls, etc., and as a result, increase the satisfaction rate of patients, doctors, and staff.

Conclusion: An intelligent fog computing system leveraging 5G infrastructure can significantly enhance cardiovascular disease diagnosis by enabling real-time data processing, improving decision-making, ensuring security, and optimizing healthcare resources, ultimately increasing patient satisfaction and safety.

Keywords: Edge Computing, Internet of Health Things

G-1208

Precision Medicine and AI: Revolutionizing Kidney Transplants

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Abstract:

Background and Aims: Renal transplantation is a very important treatment for patients with end-stage renal disease. In general, the success of kidney transplantation depends on precise donor-recipient matching and effective post-transplant care. Precision medicine, a medical approach based on each patient's unique characteristics, is being combined with AI to revolutionize renal transplantation. This study is aimed at discussing how this integration of precision medicine with AI improves donor-recipient matching and post-transplantation care and enhances transplant outcomes.

Methods: Extensive literature review and case studies that have been performed up to this date on renal transplantation with AI and precision medicine. Key areas of interest were focused on the utilization of AI algorithms for donor-recipient matching, predictive modeling for transplant outcomes, and AI-driven post-transplant monitoring.

Results: AI and machine learning algorithms increase donor-recipient matching while predicting graft survival and rejection risks by analyzing genetic and clinical data. AI tools also enhance post-transplant care through real-time monitoring of patients' health to aid in early complication detection and thus allow timely interventions. Predictive modeling by AI provides forecasts with high accuracy for transplant outcomes, thus helping in personalized treatment planning.

Conclusion: Precision medicine, integrated with AI in renal transplantation, offers even more personal, effective ways and better improvement for patients concerning life quality. Fully addressing such challenges as, but not limited to, ethical issues on data privacy and algorithms biased is a must if any of these new technologies were ever to achieve perfection.

Keywords: Precision Medicine, Kidney Transplantation, Artificial Intelligence

G-1209

Enhancing AI Efficiency with Fog and Edge Computing: A Paradigm Shift in Real-Time Data Processing

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Abstract:

Background and Aims: Fog and edge computing aim to bring computational resources closer to data sources, reducing latency and improving efficiency in processing. These paradigms support real-time decision-making by processing data locally, rather than relying on distant cloud servers. In artificial intelligence, they enable faster responses and enhanced performance. The main goal is to improve quality, increase safety and satisfaction.

Methods: we use deep learning and Data analysis by python. Data processing is distributed across edge nodes or fog layers, minimizing dependence on centralized cloud systems. This approach utilizes resource allocation algorithms, containerization, and AI models to ensure real-time data analysis and system optimization. Additionally, fog and edge computing methodologies often incorporate network virtualization techniques to enhance resource efficiency and scalability. These systems rely on intelligent load balancing and task scheduling algorithms to allocate workloads dynamically across nodes. Security measures, such as encryption and authentication protocols, are integrated to safeguard data and ensure privacy during local and distributed processing. Furthermore, edge devices are equipped with lightweight AI models, allowing real-time inference while conserving computational power and energy. This holistic approach ensures seamless integration with cloud systems when needed, creating a hybrid framework for robust and efficient computing.

Result: The results of fog and edge computing demonstrate significant reductions in latency and bandwidth usage compared to traditional cloud-based systems. AI applications show improved performance, especially in time-sensitive tasks like autonomous vehicles and healthcare monitoring. These systems also enhance scalability and reliability by distributing computational loads across multiple edge and fog nodes.

Conclusion: Fog and edge computing are transformative paradigms that address the limitations of cloud computing, particularly in latency-sensitive AI applications. By processing data closer to the source, they ensure faster response times, reduced bandwidth usage, and improved system efficiency. These technologies are especially beneficial for real-time AI use cases in fields like healthcare, IoT, and smart cities. While they offer scalability and flexibility, challenges such as

security, energy efficiency, and resource management remain areas for further research. Overall, fog and edge computing are pivotal in shaping the future of distributed AI systems.

Keywords: Fog ,Edge Computing, Artificial Intelligence

G-1215

Meta-analysis of applications of artificial intelligence health models in the pharmaceutical industry and healthcare system

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Abstract:

Background and Aims: Artificial intelligence (AI) are a branch of computer science that allows machines to perform tasks more efficiently, and can process and analyze large amounts of complex data in a short amount of time. Today, research focused on AI has grown exponentially, and its role in healthcare and research is rapidly emerging. This review describes the opportunities and challenges of AI in healthcare research and the pharmaceutical industry.

Methods: Articles were collected from the Direct Science, PubMed, and Google Scholar databases using specific keywords and phrases such as “artificial intelligence,” “pharmaceutical industry,” “neural networks,” “deep learning,” “diagnosis and treatment,” etc. Research and review articles published in the past five to ten years were collected. The application of artificial intelligence in disease diagnosis, digital medicine, personalized medicine, drug discovery, and prognosis of epidemics is extensively reviewed in this article.

Results: Deep learning and neural networks are the most widely used artificial intelligence technologies. Nonparametric Bayesian models are potential technologies for clinical trial design. Natural language processing and wearable devices are used in patient identification and clinical trial monitoring.

Conclusion: Deep learning and neural networks have been used in predicting the spread of seasonal influenza, Zika, Ebola, tuberculosis, and COVID-19. With the advancement of artificial intelligence technologies, the scientific community may witness rapid and cost-effective healthcare and pharmaceutical research, as well as improved delivery of more effective and specialized services to the public.

Keywords: Artificial Intelligence, Medicine, Diagnosis and Treatment

G-1221

The Role of Artificial Intelligence in Geriatric Rehabilitation

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Abstract:

Background and Aims: With the global increase in the older adult's population, there is a growing need for innovative solutions to enhance the quality of life and empower this demographic group. Geriatric rehabilitation is a multifaceted process involving the improvement of physical, cognitive, and psychological functions. In recent years, Artificial Intelligence (AI) has emerged as a powerful tool in the healthcare sector. This study aims to examine the applications of AI in advancing geriatric rehabilitation and to provide insights into the future of this field.

Methods: This study is a narrative review of existing research on the application of AI in geriatric rehabilitation. Relevant articles and evidence were identified through searches in electronic databases, including Scopus, Embase, PubMed, ProQuest, The Cochrane Library, and Google Scholar. Keywords such as *older adult*, *geriatric rehabilitation*, *rehabilitation*, *AI*, and *artificial intelligence* were used to search titles and abstracts of articles published between 2000 and 2025. The selected studies were analyzed, and AI applications in geriatric rehabilitation were categorized and reviewed in three main areas: physical, cognitive, and psychological rehabilitation.

Results: Findings indicate that AI holds significant potential to transform geriatric rehabilitation. Key applications of AI in this field include:

- Physical Rehabilitation: Utilization of rehabilitation robots for personalized exercises, smart assistive devices to enhance mobility and balance, and health monitoring through wearable devices.
- Cognitive Rehabilitation: Development of AI-based memory enhancement programs, use of smart voice assistants to improve social interactions, and early detection of dementia through speech and text data analysis.
- Psychological Rehabilitation: Provision of online psychological counseling, use of social robots to alleviate loneliness, and mood monitoring via intelligent algorithms.

Conclusion: By offering innovative solutions in geriatric rehabilitation, AI can substantially improve the quality of life for older adults. However, to fully realize AI's potential in this domain,

further studies and the development of necessary infrastructures are essential. Additionally, ethical and legal considerations regarding AI use in healthcare must be carefully addressed.

Keywords: AI, Older Adults, Geriatric Rehabilitation

G-1224

Application of Artificial Intelligence in Rhinoplasty : A Systematic Review

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Abstract:

Background and Aims: Rhinoplasty is one of the most popular cosmetic procedures. The complexity of the nasal structure and the substantial aesthetic and functional impact of the operation make rhinoplasty very challenging, this review explores the potential applications of artificial intelligence (AI) in rhinoplasty.

Methods: A systematic review of review studies was conducted by searching the keywords (rhinoplasty and AI, Artificial intelligence) in the title abstract in Embase, Web of Science, Scopus, and PubMed scientific databases on November 28, 2024. In this study, the Guidelines and Preferred Items of Systematic Review Studies (PRISMA) were followed. The quality of the studies was assessed using the JBI checklist. Studies with a score higher than 7 were analyzed. Studies that looked at the use of artificial intelligence technology in rhinoplasty whose full text was available in English were considered as inclusion criteria without time limit.

Results: A total of 748 records were identified from databases. Among them, 54 records underwent eligibility screening. After applying inclusion and exclusion criteria, 11 studies were deemed eligible and included in this review. Results shown that Machine learning and deep learning algorithms can analyze medical images, such as CT scans and 3D photographs, and accurately identify the complex anatomical structures of the nose. AI-based systems can also provide personalized tools for surgical design and comparing simulated results with real-world outcomes. Also, Artificial intelligence can provide real-time guidance to surgeons, ensuring the preservation of natural nasal structures during surgery.

Conclusion: The use of artificial intelligence in rhinoplasty can significantly increase the accuracy, efficiency, and safety of these procedures and help surgeons optimize surgical techniques.

Keywords: AI, Artificial Intelligence, Rhinoplasty, Systematic Review

G-1225

Hand Movement Classification Using EMG Signals Based on Feature Selection via Ant Colony Optimization and Artificial Neural Networks

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Abstract:

Background and Aims: Electromyography (EMG) signals, which record the electrical activity of muscles, are crucial in medical diagnostics, robotics, and rehabilitation. Accurate classification of hand movements using EMG signals is a critical step in designing human-computer interaction systems. However, the extraction and selection of meaningful features from EMG signals pose significant challenges. This study aims to present a novel method for hand movement classification that optimizes feature selection and improves classification accuracy using advanced techniques.

Methods: The proposed framework consists of three main stages. First, various features are extracted from EMG signals, including time-domain features (e.g., Mean Absolute Value, Root Mean Square), frequency-domain features (e.g., Mean Frequency, Median Frequency), and time-frequency domain features derived from Wavelet Transform. Second, Ant Colony Optimization (ACO) is employed to select the five most informative features from the extracted set. ACO models the feature selection process as an optimization problem, where ants traverse the feature space and iteratively enhance feature selection based on a pheromone update mechanism. Finally, an Artificial Neural Network (ANN) is designed and trained using the optimal features selected by ACO to classify hand movements into five categories: fist, open hand, pointing, hand rotation, and finger flexion.

Result: Experimental evaluations on benchmark EMG datasets reveal that the proposed method achieves superior classification accuracy of over 91%. The integration of ACO for feature selection reduces redundancy and computational cost, while the ANN ensures robust movement classification. The results confirm the effectiveness of the proposed approach compared to traditional methods.

Conclusion: This study introduces a reliable and efficient method for classifying hand movements from EMG signals using ACO and ANN. The framework achieves high accuracy while maintaining computational efficiency, making it suitable for real-time applications in rehabilitation and assistive technologies. Future work will focus on expanding the method to more complex movement tasks and datasets.

Keywords: Electromyography(EMG), Hand Movement Classification, ANN, ACO

G-1226

Artificial Intelligence in ECG Interpretation, Applications and Challenges

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Abstract:

Background and Aims: Cardiovascular diseases remain one of the leading causes of death globally. Timely intervention is essential to improve outcomes. Electrocardiogram (ECG) is a non-invasive, widely used diagnostic tool that guides clinical decision-making. Accurate interpretation of ECG is critical. With the rapid advancements in artificial intelligence (AI), this study aims to review the impact of AI on ECG interpretation and explore its associated limitations.

Methods: A systematic literature search was conducted across multiple databases, including PubMed, ScienceDirect, MDPI, IEEE Xplore, and Nature, focusing on studies with full-text availability. Articles related to AI in ECG interpretation, cardiac diseases, and arrhythmia diagnosis were included. From an initial 64 articles identified, 33 were excluded due to duplication or lack of relevance. The final selection included 31 articles comprising systematic reviews, experimental studies, and meta-analyses published between 2019 and 2024.

Results: The review demonstrated that AI significantly improves ECG analysis. The average interpretation accuracy improved from 30.2% using conventional systems to 36.2% with AI-assisted ECG (AI-ECG) systems. Three studies also addressed challenges associated with AI use. AI-ECG showed high accuracy (up to 98%) in detecting atrial fibrillation and reduced left ventricular ejection fraction. It also proved effective in diagnosing conditions such as aortic stenosis, pulmonary arterial hypertension, and cardiac allograft rejection.

Conclusion: According to recent literature, AI-ECG offers enhanced speed and accuracy in diagnosis, making it a promising tool in emergency triage and clinical decision-making. It has the potential to organize diagnosis, prognosis, monitoring, and treatment of cardiac diseases and arrhythmias with higher precision than human interpretation. However, despite its potential, AI-ECG faces several limitations, including systematic bias, oversight requirements, cybersecurity concerns, professional liability, and technical challenges.

Keywords: AI, ECG Interpretation, Cardiac Diseases, AI-ECG

G-1228

Artificial Intelligence and Cybersecurity in the Internet of Things: Challenges and Opportunities

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Abstract:

Background and Aims: The use of the Internet of Things (IoT) has increased exponentially in recent years, bringing with it growing cybersecurity concerns. This review aims to explore the challenges and opportunities associated with leveraging artificial intelligence (AI) to enhance cybersecurity in IoT systems.

Methods: Relevant studies were retrieved from authoritative scientific databases, including Embase, Web of Science, Scopus, and PubMed, on January 10, 2025. Additionally, a gray literature search was conducted using Google to identify the most recent evidence. Studies addressing the challenges and opportunities of using AI to improve cybersecurity in IoT were included based on predefined inclusion criteria. The quality of the included studies was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Randomized Controlled Trials, which was also utilized for data extraction.

Results: Initially, 685 studies were retrieved from the databases. After applying the inclusion criteria, 8 studies were selected for review. The pervasive nature of cyberattacks, combined with the limited processing power of many IoT devices and the heterogeneity of data generated, poses significant challenges in implementing robust security mechanisms. These constraints highlight one of the primary obstacles in securing IoT environments. However, AI-based solutions, such as machine learning algorithms, offer the potential to identify abnormal patterns and automatically apply security configurations to IoT devices. Furthermore, AI can enhance authentication systems by leveraging biometric techniques and behavioral analysis while also analyzing historical data to provide proactive risk mitigation recommendations.

Conclusion: Given the extensive attack surfaces inherent to IoT systems, ensuring their protection against diverse cyber threats is imperative. Despite the numerous challenges, AI emerges as a powerful tool to strengthen cybersecurity in IoT environments by addressing vulnerabilities and optimizing security mechanisms.

Keywords: AI, IOT, Cybersecurity, Challenges, Opportunities

G-1229

Artificial Intelligence-Based Prognostic Model for ANCA-Associated Vasculitis

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Abstract:

Background and Aims: The prognosis in ANCA-associated vasculitis (AAV) remains a critical challenge due to the heterogeneous presentation and progression of the disease. This study proposes the development and validation of an artificial intelligence (AI)-based scoring system to effectively predict the prognosis of patients with AAV.

Methods: This study combined a large cohort of AAV patients from multiple centers in Mashhad, ensuring diversity in demographics and clinical characteristics. Comprehensive data, including demographic, serological, histopathological, and clinical parameters, were integrated into the AI model. Machine learning algorithms, primarily neural networks and gradient boosting techniques, were used to identify patterns and quantify the impact of individual variables on patient prognosis. The AI model was trained, tested, and validated on separate datasets using a predefined split to ensure robustness.

Results: The proposed AI-based scoring system demonstrated significantly higher predictive accuracy for outcomes such as disease remission, relapse, and mortality compared to traditional risk assessment tools. Key predictors identified included renal involvement, PR3-ANCA positivity, and baseline organ dysfunction scores. The model also offers personalized prognostic insights by providing patient-specific risk scores and predictions.

Conclusion: The AI-based scoring system for AAV provides a new, data-driven approach to enhancing prognostic accuracy. Its implementation in clinical settings has the potential to improve patient stratification, guide therapeutic decisions, and enhance long-term outcomes. Further research is needed to investigate its applicability in various clinical environments and its integration into rheumatology workflows.

Keywords: Artificial Intelligence, Rheumatology, ANCA-associated Vasculitis, Vasculitis

G-1231

Evaluating the quality and usability of responses generated by GPT Chat AI in response to common questions about prostate cancer prevention

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Abstract:

Background and Aims: Prostate cancer is the most common malignant cancer in men and the second leading cause of cancer death in men after lung cancer. In describing the epidemiology of prostate cancer, it is considered a preventable disease. In addition to enduring the physical hardships caused by this disease, a person with cancer is also psychologically damaged. The incidence of this disease among men is increasing day by day. Now we decided to use artificial intelligence to examine common questions about prostate cancer prevention.

Methods: This descriptive survey study answered 23 questions of the Prostate Cancer Prevention Questionnaire via ChatGPT version 4. We used Ecoa and Duval criteria, which collected a set of measurable criteria for metadata quality. To better understand the criteria, we examined the dimensions of comprehensiveness, accuracy, information richness, and inherent precision. The questions were completely generated by artificial intelligence, and the results of this study were analyzed by considering a negative score for each incorrect answer.

Results: GPT Chat version 4 provided answers. After matching the generated answers on prostate cancer prevention with the Echoa and Duval tool, it was shown that out of a total of 23 questions, 20 were answered correctly and one question was incomplete. The average confidence percentage in answering the questionnaire questions was 86%.

Conclusion: The findings of this study show that AI Chat GPT version 4 effectively answers prostate cancer prevention questions. The results of the study showed that prevention can lead to changes in patients' self-care behaviors. Therefore, it is suggested that this model can be used as a useful approach in the health system to improve prostate cancer prevention behaviors.

Keywords: GPT Chat, Cancer Prevention, Prostate Cancer Patients

G-1232

Artificial Intelligence-Based Prognostic Model for Organ Involvement in Systemic Lupus Erythematosus

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Abstract:

Background and Aims: Systemic lupus erythematosus (SLE) is a complex autoimmune disease characterized by highly variable clinical manifestations and the potential for multi-organ involvement, which significantly affects patient prognosis. Early identification of organ involvement is crucial for optimizing treatment strategies and improving outcomes. Therefore, the application of artificial intelligence (AI) to integrate demographic, laboratory, histopathologic, imaging, and clinical data shows promise for advancing precision medicine in SLE. The aim of this study is to develop and validate an AI-based model for predicting organ involvement in SLE by utilizing a comprehensive dataset that includes demographic characteristics, laboratory and histopathologic results, imaging studies, and clinical findings.

Methods: We utilized a retrospective cohort of SLE patients with documented clinical progression and multimodal data. The dataset included detailed demographic, laboratory and histopathologic profiles, imaging modalities (e.g., MRI, ultrasound), and clinical parameters such as disease activity indices and patient-reported symptoms. Advanced machine learning algorithms, including ensemble methods and neural networks, were employed to train and validate the prognostic model. The performance of the model was evaluated using metrics such as accuracy, sensitivity, specificity, and the area under the receiver operating characteristic curve (AUROC). Additionally, feature importance analysis was conducted to identify key predictors of organ involvement.

Results: Preliminary findings indicate that the AI-based model achieves high predictive accuracy in predicting organ-specific complications in SLE. Key predictors include serological and histopathologic markers, imaging biomarkers, and clinical severity indices. The model consistently outperforms traditional risk stratification methods in cross-validation tests.

Conclusion: This AI-based prognostic model serves as a powerful tool for predicting organ involvement in SLE and equips clinicians with data-driven insights for personalized patient management. Implementing this model in clinical practice could facilitate early interventions and potentially enhance patient outcomes. Future studies will focus on external validation and prospective application to ensure its robustness and generalizability.

Keywords: Artificial Intelligence, Rheumatology, SLE, Systemic Lupus

G-1236

Association between artificial intelligence and diagnosis of breast cancer: A Systematic review

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Abstract:

Background and Aims: Breast cancer is the most commonly diagnosed malignancy and also a leading cause of cancer-related mortality for women. Early and accurate diagnosis is crucial for improving patient outcomes, and imaging techniques including magnetic resonance imaging (MRI), ultrasound, and mammography are frequently used to achieve this. Artificial intelligence (AI) has emerged in recent years as a revolutionary tool for breast cancer diagnosis. Deep neural networks and machine learning algorithms enable AI to analyze complex medical imaging data quickly and accurately. systematic review aims to AI's potential to enhance diagnostic processes and therapeutic outcomes by examining the association between AI applications and the accuracy, sensitivity, and specificity of breast cancer detection.

Methods: The data were collected by searching PubMed, Scopus and Google Scholar search engine. The advanced searched keywords were: "breast cancer", "artificial intelligence", and "diagnose". The search was limited to studies in the English language and accessible full texts that published from 2015 to 2024. 9 out of 34 articles were selected and Review, duplicate, and non-relevant articles were excluded.

Results: Research indicates that tools supported by AI achieve better cancer detection rates when compared to conventional techniques, minimize false positives, and streamline clinical processes like pathologist evaluations and genetic counseling. For example, AI-enhanced screening leads to improved identification of invasive and interval cancers while lowering costs and reducing diagnostic delays. The incorporation of AI in clinical contexts, such as utilizing neural networks for segmenting ultrasound images or AI-directed MRI selection, has demonstrated significant diagnostic accuracy and lessened workloads. Additionally, mobile AI technologies improve access to early detection for diverse demographic groups. These outcomes highlight the potential of AI to advance healthcare delivery by increasing diagnostic precision and reducing costs. Nevertheless, effective implementation necessitates tackling cultural, logistical, and ethical challenges to ensure fair adoption and ongoing improvements in breast cancer treatment.

Conclusion: Through improved accuracy, decreased false positives, and workflow optimization, this study demonstrates the revolutionary role of AI in improving breast cancer diagnoses. Ethical,

and practical factors are still important for fair adoption, even when its integration provides affordable, easily available solutions.

Keywords: Breast Cancer, Artificial Intelligence, Diagnose

G-1237

A Review of Generative AI in the Development of Virtual Companions for Patients with Chronic or Mental Illnesses

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Abstract:

Background and Aims: Chronic and mental illnesses pose significant challenges for patients, who often require ongoing emotional support, adherence to treatment, and symptom management. Traditional healthcare systems often struggle to provide adequate support, leaving patients feeling isolated. The aim of this study was to investigate the potential of generative artificial intelligence (AI) in creating virtual companions that can address these needs and improve the quality of life of patients with chronic or mental illnesses.

Methods: A systematic review was conducted to analyze the existing literature on the use of generative artificial intelligence in the development of virtual companions for patients with chronic or mental health conditions. The review focused on studies published between 2015 and 2024. The search strategy included keywords such as “generative artificial intelligence”, “virtual companions”, “chronic illnesses”, “mental health”, “chatbots”, and “avatars”. Included studies were assessed for quality using appropriate tools, and data were extracted on the type of AI used, the functions of the virtual companions, and their impact on patient outcomes.

Results: This review identified a growing body of research examining the use of generative AI, specifically large language models (LLMs), in the development of virtual companions. These companions are able to provide emotional support through empathetic conversational interactions, provide personalized health-related information, facilitate medication adherence through reminders and notifications, and monitor patients' overall well-being. Preliminary findings suggest that the use of these virtual companions may be associated with reduced feelings of loneliness and anxiety, improved adherence to treatment plans, and increased self-management of symptoms. In addition, studies demonstrate the potential of generative AI in creating realistic and engaging avatars that can enhance human-computer interaction and facilitate communication between the patient and the virtual companion.

Conclusion: Generative AI shows significant promise for developing effective virtual companions that can support patients with chronic and mental illnesses. Future research efforts should prioritize conducting large-scale randomized clinical trials and developing robust ethical frameworks to govern the deployment of AI-based virtual companions in healthcare settings.

Keywords: Generative AI, Virtual Companions, Chronic Illness

G-1239

Harnessing Artificial Intelligence in Pharmacy Practice: Opportunities and Challenges

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Abstract:

Background and Aims: Artificial intelligence (AI) is increasingly gaining attention in healthcare due to its ability to perform tasks requiring human intelligence, such as drug discovery, diagnosis, and patient consultation. While AI has shown transformative potential in healthcare, its integration into pharmacy practice remains limited. Pharmacy practice stands to benefit significantly from AI, with applications ranging from improving medication safety to optimizing workflow efficiency. However, challenges such as data privacy, ethical considerations, and regulatory barriers impede its adoption. This review explores AI's diverse applications in pharmacy practice, its potential to enhance efficiency and patient care, and strategies to address barriers to implementation.

Methods: A comprehensive literature search was conducted across Scopus, Google Scholar, PubMed, and Cochrane Library using the keywords "Artificial Intelligence" and "Pharmacy Practice." Studies were reviewed and categorized under subheadings such as medication safety, pharmacovigilance, and resource optimization to assess the role of AI in pharmacy practice.

Results: AI demonstrates significant potential in pharmacy practice, with applications spanning retail and hospital pharmacy, pharmacovigilance, and medication safety monitoring. Key benefits include improved patient safety, reduced medication errors, prevention of adverse drug events (ADEs), enhanced workflow efficiency, and optimized resource allocation. AI also assists with repetitive tasks, enabling pharmacists to focus on patient care and treatment planning. Despite these benefits, challenges such as data privacy concerns, regulatory and ethical barriers, high costs, and a lack of clinical evidence hinder its implementation. Additionally, the predominance of non-clinical studies limits insights into AI's impact on patient outcomes in real-world settings.

Conclusion: AI holds transformative potential for pharmacy practice, offering opportunities to enhance patient safety, reduce medication errors, and streamline operations. However, challenges such as data privacy, ethical considerations, regulatory barriers, and high costs remain significant obstacles. Bridging the gap between research and clinical practice is critical, with future efforts focusing on generating robust clinical evidence, addressing regulatory and ethical

challenges, and developing cost-effective solutions. By overcoming these barriers, AI can revolutionize pharmacy practice, optimize healthcare delivery, and improve patient outcomes.

Keywords: Artificial Intelligence, Pharmacy Practice, Medication Safety,

G-1241

Classification of Breast Tumors Directly from Ultrasound Images Using a Combination of Deep Neural Networks and Machine Learning Algorithms

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Abstract:

Background and Aims: Identifying whether breast tumors are benign or malignant through ultrasound images is crucial for physicians to determine the appropriate treatment plan. The BUSBRA dataset, introduced in 2024 by the Federal University of Rio de Janeiro, is designed for classifying breast tumors using ultrasound images from 1,064 patients. Features such as tumor shape and boundaries have been used to determine where a tumor is benign or malignant. This study leverages deep neural networks to extract features directly from breast ultrasound images and employs machine learning algorithms to classify them into benign and malignant categories.

Methods: The BUSBRA dataset was used for classifying breast tumors in this study. Preprocessing steps, such as normalization and resizing, were applied to the input data. Additionally, data augmentation methods including, rotation, zoom, horizontal flip, and translation, were used to balance the dataset. This study examined the use of DenseNet121 and MobileNetV2 networks, trained on ImageNet data, for feature extraction. Machine learning algorithms such as logistic regression, random forest, support vector machine, k-nearest neighbor, and multi-layer perceptron (MLP) have been used for classification. The next best result is for the DenseNet121, with classification using the MLP network, which has an accuracy of 83%.

Results: Feature extraction using the DenseNet121 network, combined with classification via the Logistic Regression method, yielded the best results, achieving an accuracy of 84%, a true positive (TP) count of 207, a precision of 0.86, and an F1-measure of 0.83.

Conclusion: Using deep neural networks allows for direct feature extraction from images, which is particularly important when working with high dimension medical data. In this research, machine learning methods were employed for classification. The advantage of this approach is that it requires less data compared to using dense layers in deep neural networks for classification. The DenseNet121 network offers benefits due to its simple structure and small size, with only 8.1 million parameters. Overall, the method used in this article has the advantage of requiring less training data for classification.

Keywords: Data Augmentation, Feature Extraction, Benign, Malignant,

G-1242

Heart attack prediction using artificial neural networks (ANN)

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Abstract:

Background and Aims: Cardiovascular diseases are emerging as a prominent health problem in modern societies. With the increase in risk factors such as unhealthy lifestyles, the need to identify and prevent heart attacks becomes more important. This paper examines the use of neural networks in predicting the risk of heart attack.

Methods: For this research, the Python programming language and the TensorFlow library were used. The designed neural network, known as a feedforward multilayer perceptron (MLP), has one input layer, two hidden layers, and one output layer. The dataset used in this study includes information related to the cities of Hamedan, Nahavand, Malayer, and Tuyserkan from the hospital information system in the first 10 months of 1403. Among the measured variables are clinical and lifestyle factors, which ultimately provide the probability of the presence or absence of the risk of heart attack.

Results: Using the collected data and applying the structured neural network model, an accuracy of 98.01% was achieved in diagnosing the risk of heart attack. These results indicate the high ability and reliability of neural networks in predicting heart problems.

Conclusion: The present study shows that the use of neural networks, especially MLP models, can lead to significant improvements in heart attack prediction.

Keywords: Heart Attack, Neural Network, Perceptron

G-1243

The impact of robotic technology on the quality of patient care in the operating room: a review study

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Abstract:

Background and Aims: Since the first robotic-assisted surgery in the 1980s, robotic surgery has rapidly evolved in healthcare. Robotic surgery is different from conventional surgery, in that the surgery is supported by a robotic system with its precise instruments and powerful technology to guide the procedure away from the bedside. The aim of this study is to examine the impact of robotic technology on the quality of patient care in the operating room.

Methods: In this review study, 21 full-text articles in English between 2019 and 2024 were selected and reviewed in PubMed, Scopus, Google Scholar, and SID databases using keywords such as robotic surgery, patient care, and operating room.

Results: The studies showed that the most prominent potential benefits that robotic technology could provide for the quality of care are efficiency and safety. Participants in the study cited reducing medical errors or improving accuracy, providing a safer environment, improving efficiency when treating patients. With regard to nurse performance, participants emphasized reducing workload, improving nurse workflow, reducing staff turnover, and reducing burnout.

Conclusion: Based on the present study, it can be concluded that when using robotic technology in the clinical setting, a real need must be identified and the technology developed accordingly. Using educational videos to increase understanding and gather valuable insights from nurses is an important principle for identifying opportunities to incorporate robotic technology into the healthcare setting. Robotic technology can enhance quality of life by restoring functions caused by physical and cognitive impairments, such as assisting elderly or immobile patients and carriers.

Keywords: Robotic Technology, Patient Care, Surgery, Operating Room, Medical Error

G-1244

Investigating job satisfaction of operating room nurses after surgery with the help of robotic technology: A review study

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Abstract:

Background and Aims: Among health workers, nurses constitute the largest workforce. Therefore, increasing the quality of services provided by nurses is crucial for positive patient outcomes. Nowadays, robotic surgery is gaining attention due to its relevance in the health field and in several prevention and rehabilitation sectors, the use of technology has increased and it is challenging for nursing professionals, who must always stay up to date given the ambiguity of technological evolution.

Methods: In this review study, 21 full-text English articles from 2019-2024 were selected and reviewed in PubMed, Scopus, Google Scholar, and SID databases. Studies in operating room nurses who had at least one year of experience in the operating room were compared between two groups (in robotic-assisted laparoscopy and pure laparoscopic surgery) was performed and a satisfaction questionnaire was used to measure job satisfaction among nurses. Descriptive statistical data for continuous variables were expressed as mean and standard deviation. T-test was used to compare the two groups.

Results: The study showed that there was no difference between nurses during robotic-assisted laparoscopic surgery and pure laparoscopic surgery in terms of demographic parameters. 21.8% of nurses had low job satisfaction, 65.3% had moderate job satisfaction, and 12.9% had high job satisfaction.

Conclusion: Based on the present study, it can be concluded that surgical technology creates additional job demands for postoperative nurses who have different tasks, which may be difficult to manage. The heavy workload of operating room nurses increases the likelihood of stress, burnout, and anxiety and reduces their job satisfaction. Therefore, it is necessary to examine the well-being and job satisfaction of intraoperative nurses and their perception and acceptance of new technologies that affect job demands. They and their psychological outcomes are also affected, it is essential. Ultimately, the quality of patient care depends on well-being and job satisfaction.

Keywords: Robotic Surgery, Patient Care, Operating Room, Job Satisfaction

G-1245

Designing a Comprehensive AI Education Framework in Medical Sciences: A Systematic Review of Educational Content and Teaching Methodologies Over the Past Decade

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Abstract:

Background and Aims: With the rapid advancement of artificial intelligence (AI) technologies in medical sciences, equipping future physicians with AI literacy has become a fundamental requirement of educational systems. AI, with its ability to analyze and process vast amounts of data, plays a crucial role in enhancing clinical care quality and fostering medical innovation. To achieve these goals, the development of structured educational frameworks that integrate technical knowledge, ethical considerations, and practical skills is essential. This systematic review aimed to identify and analyze educational content, curriculum design frameworks, and AI teaching methodologies in medical sciences.

Methods: Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and Joanna Briggs Institute protocols, a comprehensive search was conducted in PubMed, Scopus, Embase, and Web of Science on January 1, 2025. Studies published between 2015 and 2025 focusing on AI education, curriculum design, and instructional methodologies were included. Data were extracted using a standardized checklist and thematically analyzed. Two independent researchers screened titles and abstracts, with discrepancies resolved by a third reviewer.

Results: Out of 5,104 identified studies, 29 met the inclusion criteria. The analysis categorized AI-related medical education content into six key domains:

AI Fundamentals – principles of machine learning, deep learning, and data analytics.

Clinical Applications – AI-based disease diagnosis, treatment outcome prediction, and decision-making optimization.

Ethical and Legal Considerations – algorithmic biases, data privacy, and accountability.

Practical Skills – clinical data handling, model development, and result interpretation.

Interdisciplinary Collaboration – fostering cooperation between physicians, data scientists, and technologists.

Assessment and Feedback – standard evaluation tools and project-based competency assessment.

Hybrid, project-based, and scenario-driven teaching methodologies demonstrated superior learning outcomes. However, many programs lacked theoretical frameworks or pedagogical guidance.

Conclusion: AI education in medical sciences should extend beyond technical training, fostering data-driven decision-making, critical thinking, and ethical considerations. Effective curricula should integrate technical expertise with ethical and interdisciplinary competencies, utilizing innovative approaches such as clinical simulations and hands-on projects. Competency-based, interdisciplinary frameworks can better prepare physicians for the AI era, offering clear guidelines for designing robust educational programs at both national and international levels.

Keywords: Artificial Intelligence, Medical Education, Machine Learning

G-1246

Artificial intelligence in determining prognosis, diagnosis and treatment of lung cancer, applications and challenges

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Abstract:

Background and Aims: Lung cancer is one of the deadliest types of cancer in the world and is often diagnosed at an advanced stage. It accounted for 1.8 million deaths in 2020. Given the rapid advances in artificial intelligence and its integration with medical science, in this article, we examine the impact of artificial intelligence (AI) in determining the prognosis, diagnosis, and treatment of lung cancer.

Methods: Articles in PubMed, ScienceDirect, and MDPI were searched for full-text access. 27 articles related to AI in the field of lung cancer were reviewed. 9 articles were excluded due to duplication and lack of appropriate relevance to the topic. This study was based on review and empirical articles between 2019 and 2024.

Results: A review of 18 articles showed that various AI algorithms with the ability to analyze more complex data with an accuracy of 92.86% were effective in early detection of lung cancer. Three articles also mentioned challenges of AI such as the risk of over-processing models and the lack of generalizability of data to a larger population.

Conclusion: Radiomic analysis is effective in early lung diagnosis by identifying hidden features in CT. AI has shown very effective performance by classifying and diagnosing tumors such as adenocarcinoma with an accuracy of 0.84 and squamous cell carcinoma with an accuracy of 0.76. It also provides valuable assistance to physicians in choosing a treatment strategy by integrating clinical and genetic data and blood and CT studies of patients after surgery. However, given the challenges, future studies should be conducted in a larger population.

Keywords: Radiomic Analysis, Lung Cancer, Artificial Intelligence

G-1247

Application of artificial intelligence in designing recommendation applications for diseases: A Systematic Review

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into healthcare has shown significant potential in transforming disease management through personalized and data-driven approaches. Recommendation systems powered by AI are increasingly being designed to assist in disease prevention, diagnosis, and treatment. However, a comprehensive synthesis of the current state of research, methodologies, and challenges in this domain is lacking. This systematic review aims to address this gap by evaluating the application of AI in the design of recommendation apps for disease management.

Methods: A systematic literature search was conducted across major academic databases, including PubMed, IEEE Xplore, Scopus, and Web of Science, for studies published between 2010 and 2023. Keywords such as "artificial intelligence," "recommendation systems," "disease management," and "healthcare apps" were used to identify relevant articles. Studies were screened based on predefined inclusion and exclusion criteria, focusing on AI-driven recommendation systems for disease-related applications. Data extraction included study design, AI methodologies, disease focus, and outcomes.

Results: A total of 78 studies met the inclusion criteria. The review identified machine learning (ML), deep learning (DL), and natural language processing (NLP) as the most commonly used AI technologies in designing recommendation apps. These systems were applied across various diseases, including chronic conditions (e.g., diabetes, cardiovascular diseases) and infectious diseases (e.g., COVID-19). Key functionalities included personalized treatment recommendations, risk prediction, and lifestyle interventions. While AI-driven apps demonstrated high accuracy and adaptability, challenges such as data privacy concerns, algorithmic bias, and limited clinical validation were frequently reported. Emerging trends included the use of federated learning for secure data sharing and explainable AI (XAI) to improve transparency and trust.

Conclusion: AI-powered recommendation apps hold immense promise for enhancing disease management by providing personalized, data-driven insights. However, addressing ethical, technical, and clinical validation challenges is critical for their widespread adoption. Future research should focus on interdisciplinary collaboration, robust validation frameworks, and the development of scalable, user-centric solutions to maximize the potential of AI in healthcare.

Keywords: Artificial Intelligence, Recommendation Systems, Disease Management,

G-1249

The Application of Deep Learning in Monitoring Vital Signs of Patients Under Anesthesia

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Abstract:

Background and Aims: Deep learning, as one of the most advanced branches of artificial intelligence, has demonstrated remarkable capabilities in analyzing complex medical data. Continuous and accurate monitoring of vital signs in patients under anesthesia remains a critical challenge in anesthesia care. This study aims to investigate the role of deep learning in enhancing the accuracy and efficiency of vital sign monitoring systems and identifying its practical applications in the operating room.

Methods: This qualitative study was conducted using documentary analysis. Research data were collected through a comprehensive review of articles published in reputable scientific databases over the past five years and analyzed using qualitative content analysis methodology.

Results: The findings demonstrate that deep learning systems possess considerable capability in early detection of hemodynamic changes and prediction of critical events in patients under anesthesia. These systems, by simultaneously analyzing multiple vital parameters, identify complex patterns and hidden relationships between variables, enabling them to alert the anesthesia team before serious complications arise. Furthermore, this technology has proven effective in precise regulation of anesthesia depth and reducing undesirable fluctuations in patients' consciousness levels.

Conclusion: Deep learning, with its advanced capabilities in simultaneous processing of multiple vital parameters and detection of complex patterns, can significantly improve patient safety during anesthesia. It is recommended that, as an initial step, teaching hospitals in collaboration with biomedical engineering departments implement pilot versions of these systems in their anesthesia departments. Moreover, developing standardized protocols and conducting training programs for anesthesiologists and anesthesia technologists can establish the groundwork for the development and implementation of this technology in the national healthcare system.

Keywords: Deep Learning, Patient Monitoring, Artificial Intelligence

G-1250

Design and Implementation of Simulation for Common Urology Surgeries Based on 3D Data of Real Patients in Kalbodnama Virtual Dissection System

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Abstract:

Background and Aims: Urology surgeries require precise training due to their high sensitivity and the complexity of involved anatomical structures. Traditional training methods face limitations in providing safe and risk-free environments for hands-on practice. This study aims to design and implement simulation scenarios for common urology surgeries using real patient CT and MRI data within a virtual dissection system. By integrating advanced simulation technology, we hypothesize that this approach can improve surgical precision and reduce errors.

Methods: CT and MRI images of real patients were collected from the radiology departments of Tabriz University of Medical Sciences hospitals. After anonymizing the data and obtaining consent, cases involving complex kidney stones, tumors, and ureteral obstructions were selected. Using software tools such as 3D Slicer and Mimics, DICOM data were converted into accurate 3D models. Key anatomical structures, including kidneys, ureters, and adjacent vessels, were segmented and optimized for virtual use. Interactive educational scenarios were developed for surgeries such as percutaneous nephrolithotomy, prostatectomy, and bladder tumor resection. The models were integrated into a virtual dissection system, enabling interaction with surgical tools and providing real-time feedback during simulation exercises.

Results: The simulation system successfully replicated key surgical scenarios, allowing users to practice incisions, tissue removal, and repair techniques. Preliminary user evaluations demonstrated improved accuracy in incisions, reduced completion times, and increased success rates in completing surgical steps. The system provided immediate feedback, enhancing learning outcomes.

Conclusion: The proposed simulation system significantly enhances urology surgical training by providing a safe and interactive environment for skill development. This method reduces the need for high-risk practice on real patients and offers a cost-effective alternative to cadaver-based

education. Further research is recommended to expand the system's applications and validate its long-term impact on surgical outcomes.

Keywords: Urology, Surgical Simulation, Virtual Dissection

G-1251

Artificial Intelligence and Its Revolutionary Role in Physical and Mental Rehabilitation: A Review of Recent Advancements

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Abstract:

Background and Aims: The integration of AI into occupational therapy and physical therapy has the potential to revolutionize the way these therapies are delivered. By providing personalized, data-driven treatment plans, patients can receive more effective and efficient care. Furthermore, the use of AI-powered technologies can enhance patient engagement and motivation, leading to improved outcomes and quality of life. Hence, the aim of the present review is to explore the novel and futuristic applications of AI in rehabilitation, and more specifically occupational therapy.

Methods: This review explores the integration of AI across various aspects of rehabilitation, providing a thorough examination of recent advancements and current applications. It highlights how AI applications, such as natural language processing, computer vision, virtual reality, machine learning, and robotics, are shaping the future of physical and mental recovery in occupational therapy.

Results: The utility of AI as a benchmark resource can be further enhanced by addressing emerging interdisciplinary trends and their future applications in rehabilitation. Strengthening its role in this way would offer more practical guidance for the community, especially considering the rapidly evolving landscape of AI in healthcare. Moreover, emerging technologies such as brain-computer interfaces, advanced biosensors, and real-time monitoring systems integrated with AI are pivotal for creating personalized rehabilitation plans. Expanding the discussion to cover these interdisciplinary trends would help the community understand how AI-based rehabilitation models could be integrated into the growing ecosystem of digital health, allowing seamless data sharing and analysis across platforms.

Conclusion: Focusing on potential collaborative opportunities between AI developers, clinicians, and policymakers could pave the way for more successful and ethically grounded AI integration into rehabilitation practices. This would ensure that the models developed are clinically actionable, reliable, and capable of addressing real world problems in a scalable manner, thereby solidifying the paper's role as a forward-looking benchmark for the community.

Keywords: Artificial Intelligence, Occupational Therapy, Physical Therapy

G-1252

Utilizing Data Mining Methods to Identify Electrocardiogram Patterns and Clinical Features for Predicting 10-Year Cardiovascular Disease Incidence

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Abstract:

Background and Aims: Cardiovascular diseases (CVD) remain the leading cause of morbidity and mortality globally. In addition to conventional risk factors, electrocardiogram (ECG) findings offer a non-invasive and cost-effective approach to CVD prediction. Machine learning (ML) techniques have enhanced diagnostic precision and predictive performance in medical research. This study

aimed to develop ML models for predicting 10-year CVD incidence based on ECG data categorized by the Minnesota (MN) Codes.

Methods: This study was conducted in Mashhad, northeastern Iran, utilizing data from the MASHAD cohort. Feature selection was performed using the SelectKBest library and chi-squared tests, with focus on MN Code classifications and clinical characteristics. Logistic regression (LR), random forest (RF), and decision tree (DT) models were trained and validated using a test split. Hyperparameter tuning was performed through an exhaustive grid search with 5-fold cross-validation. Model performance was evaluated using accuracy, precision, recall, and F1-score.

Results: Among 8909 participants, 990 developed CVD over 10 years. The LR model achieved the highest accuracy (65.54%) and F1-score (77.54%), surpassing RF (accuracy: 64.01%, F1-score: 76.22%) and DT (accuracy: 64.01%, F1-score: 76.48%). The MN codes most strongly associated with CVD included MN-111, MN-117, MN-52, MN-53, and MN-721.

Conclusion: ECG-based features, including T wave abnormalities, right bundle branch block, and precordial QS waves, combined with clinical data, can effectively predict long-term CVD risk using ML algorithms. LR demonstrated superior predictive performance. Future studies should incorporate survival analysis and advanced ML techniques to enhance prediction accuracy.

Keywords: Cardiovascular Disease, Electrocardiogram, Data Mining, Minnesota

G-1253

Opportunities and Challenges of Applying Artificial Intelligence in Nursing and Midwifery Education, a Review of Reviews.

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Abstract:

Background and Aims: The use of Artificial Intelligence (AI) in nursing and midwifery education is increasing. AI can be a way to provide innovative training for students. At the same time, there are concerns about the use of AI in education. Many systematic reviews have been conducted in this field. This study aimed to collect information about the challenges and opportunities of using AI in nursing and midwifery education.

Methods: Web of science, PubMed and Scopus were searched using relevant terms. Titles, abstracts and full texts were screened against eligibility criteria. Data were extracted, analyzed, and findings were presented in a descriptive summary. The PRISMA checklist guided the review conduct and reporting.

Results: Twenty-nine systematic reviews and scoping reviews were found. Fifteen articles were included in this study. AI is a double-edged sword. The findings showed AI in nursing and midwifery education causes progress, personalized learning experience, improvement of learning results of complex concepts and deeper understanding of educational issues. It can also cause students' emotional regulation and change their teaching methods. In addition, AI can provide practical experiences without real clinical risks using clinical scenarios. Some challenges have also been seen in the application of AI in nursing and midwifery education, which include: technical, executive, ethical challenges and the risk of disruption in critical thinking. In addition, there is a need to develop curriculums for students training by AI.

Conclusion: The use of AI in nursing and midwifery education is practical and beneficial. However, there are technical and ethical challenges that need to be considered. Nursing and midwifery curriculums need to be developed to accommodate this new technology.

Keywords: Artificial Intelligence, Nursing, Midwifery, Education, Review

G-1254

Chatbots & Endocrine Diseases: Scientometric Analysis & Knowledge Visualization

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Abstract:

Background: The use of chatbots as a model based on artificial intelligence has expanded significantly in various fields of medical sciences such as endocrinology. We intend to analyze and evaluate the state of research in this field from various aspects.

Methods: A search strategy was designed containing the concept of “chatbots” and the subject heading of “Endocrine System Diseases” in the MESH database. The data were analyzed then the networks and maps were illustrated using the R bibliometrix and VOSviewer software programs.

Results: The findings showed that 64 articles have been published in this field in PubMed so far, with the highest number of articles (n=38), being published in 2024, followed by 2023 (n=12). “Journal of Medical Internet Research” published the most articles in this topic (n=5), followed by “International Journal of Obesity” (n=4). Among the organizations, “First Affiliated Hospital of Sun Yat-Sen University” and “Shanghai Jiao Tong University School of Medicine” were the most prolific organizations with 22 articles. 21 countries contributed to producing these documents and the highest number was for the USA (n= 82), China (n=74), and Turkey (n= 54). The lowest number also was equally for Australia and Bahrain (n=1). Among the topics covered in the field of endocrinology, the most common topic was diabetes.

Conclusion: Given the importance of artificial intelligence and chatbots in the medical sciences, including endocrinology, there is a need for more studies in addition to diabetes. There is also a need for Asian countries to participate more in this field.

Keywords: Generative Artificial Intelligence, Chatbots, ChatGPT, Endocrinology

G-1255

Scientometric Analysis of the Scientific Output on Chatbots & Medical Education

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Abstract:

Background and Aims: Chatbots and ChatGPT, as models based on artificial intelligence, have found increasing growth in all fields, including medical education. We aim to scientometric analysis of the studies conducted so far in this field to have a comprehensive view of the topics of interest and information gaps in this field.

Methods: By designing a search strategy containing the concepts and terms of “Medical Education” and “Chatbots” in the Scopus database, 1072 documents were retrieved from 2011 to 2025. The results were analyzed by VOSviewer and R bibliometrix programs to analyze and visualize the scientific networks.

Results: The results showed that the main publication of these documents began in 2018, with the highest scientific production in 2024 (n=663). These documents included articles (n=571), letters (n=215), reviews (n=106), and editorials (n=66), and were mostly published in the English language (n=1054), followed by Spanish (n=14), and Chinese (n=5). The most active countries in this field were the USA (n=401), India (n=105) and China (n=86), respectively, and “Harvard Medical School” (n=31), “University of Toronto” (n=20), “Chandigarh University” (n=19) also published the most documents in this field. “Viroj Wiwanitkit” from India, with 37 articles, was the most prolific author in this field. “Jmir Medical Education” (n=52), “Journal of Medical Internet Research” (n=26) and “Medical Teacher” (n=24) published the most documents in this field. The most cited article was “Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models” with 1603 citations, which was published in 2023. Among the important topics considered in these documents, Large Language Model, Procedures, Natural Language Processing, Medical Information, Controlled Study, Machine Learning, Health Care Personnel, Educational Measurement, Clinical Practice, Accuracy, Clinical Competence, Clinical Decision Making, and Reliability were more mentioned.

Conclusion: In the last two years, there has been an upward growth in the production of resources in the field of chatbots and medical education, and this issue can be caused by these new technological topics in artificial intelligence and their various benefits and challenges. Conducting

further studies and getting more overview and details of these studies can provide useful and applicable information.

Keywords: Chatbots, Medical Education, Scientometric

G-1259

Neuralink: A bridge between brain and machine – prospects, applications, and ethical challenges

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Abstract:

Background and Aims: The rapid technological development in neural technology and artificial intelligence has impacted a variety of industries, most prominently in medicine and human-machine interfaces. Neuralink, a new brain-machine interface, seeks to build a direct brain-machine bridge, offering potential breakthroughs in neurological therapy, cognitive enhancement, and seamless communication. Nevertheless, its application brings enormous ethical concerns. This study examines Neuralink's capabilities, its medical applications, future developments, and the social and ethical consequences of its widespread use.

Methods: This research utilizes a qualitative analysis, including a critical review of academic literature and case studies from reputable sources in both neuroscience and advanced technology. It explores Neuralink's functionality and chip development, its real-world applications, and the broader ethical implications of its use. By comparing and contrasting scientific advancements with ethical concerns, this study aims to present a balanced perspective on Neuralink's impact on society.

Results: Findings indicate that Neuralink has the potential to significantly improve human life by treating neurological disorders such as paralysis, epilepsy, and neurodegenerative diseases. Additionally, it could enable telepathic communication, enhance cognitive function, and bridge the gap between human intelligence and artificial intelligence. However, significant ethical concerns have emerged, including risks to patient autonomy, privacy intrusions, data security vulnerabilities, and social inequalities in access to neural enhancement technologies.

Conclusion: The study emphasizes the need for a balanced approach to neural technology development, ensuring that scientific progress aligns with ethical principles. While Neuralink presents groundbreaking opportunities, its successful implementation requires stringent regulatory oversight, ethical guidelines, and equitable access. Neural technology has the potential to redefine human capabilities, but neglecting ethical considerations may lead to unforeseen

consequences. Future research should prioritize the establishment of legal frameworks and address societal concerns to ensure that this technology benefits humanity as a whole.

Keywords: Artificial Intelligence, Medicine, Neuralink, Neural Implants

G-1260

The role of artificial intelligence in predicting and preventing chronic diseases using big health data

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Abstract:

Background and Aims: Chronic diseases impose a significant burden on individuals and healthcare systems worldwide. Predicting and preventing these diseases can reduce morbidity, improve quality of life, and lower healthcare costs. This study aims to investigate the role of artificial intelligence (AI) in predicting and preventing chronic diseases using big health data:

Methods: This research employs a systematic review and meta-analysis (where possible) of studies published in PubMed, Scopus, Web of Science, IEEE Xplore, and ACM Digital Library from 2010 to 2024. Studies that examined the application of AI in predicting or preventing chronic diseases using big health data were included..

Results: AI, particularly machine learning and deep learning algorithms, has shown promising results in predicting and preventing chronic diseases such as diabetes, cardiovascular disease, and cancer. These technologies can be used in early detection, risk prediction, patient monitoring, lifestyle recommendations, and clinical decision support. However, challenges such as data quality, model interpretability, ethical concerns, and integration with existing healthcare systems need to be addressed.

Conclusion: AI has significant potential to improve the prediction and prevention of chronic diseases. With further development of algorithms, improved data quality, and addressing existing challenges, AI is expected to play an increasingly important role in promoting public health. Future research should focus on long-term effectiveness evaluation, development of interpretable models, and formulation of ethical guidelines.

Keywords: Artificial Intelligence, Machine Learning, Chronic Diseases

G-1261

Applications of Artificial Intelligence in the Diagnosis and Treatment of Craniosynostosis; review study

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Abstract:

Background and Aims: Craniosynostosis is the premature fusion of one or more of the fibrous cranial sutures altering bone growth and resulting in an abnormal head shape. Early and exactly diagnosis of craniosynostosis (CSO), which involves premature fusion of cranial sutures in infants, is very important for effective treatment. Although computed topography offers detailed imaging, its high radiation poses risks, especially to infants.

Methods: In this review study, the articles with English language related to previous researches on the topic under investigation from tree international databank including; PubMed, ISI, Scopus from the beginning of 2010 to the first half of 2024. were extracted. Then the articles were screened by two people after the necessary training in three stages based on the title, abstract and the entire text of the article in terms of relevance to the subject under study in the Endnote software and their results were saved and extracted in a word table.

Results: Studies showed that several models based on artificial intelligence had high sensitivity and specificity in diagnosing and classifying subtypes of craniosynostosis, reducing diagnostic error rates and detecting undiagnosed syndromic conditions. These models also predicted postoperative outcomes, reduced surgery time and its complications, improving aesthetic results. Furthermore, they reduced the need for CT scan radiations due to the possibility of diagnosis using two-dimensional images.

Conclusion: With the advancement of AI technologies, there is great potential to assist craniosynostosis management and diagnose it faster, safer, accurately, and cost-effectively. The lack of standardized datasets is an obstacle to the widespread application of AI. Therefore, continuous development of standardized datasets and collaboration between clinicians and researchers can enhance the capability of AI in the diagnosis and treatment of craniosynostosis. Moreover, increasing the use of handheld devices and 3D imaging systems is expected to significantly enhance the role of AI in diagnosing craniosynostosis.

Keywords: Artificial Intelligence, Craniosynostosis, Diagnosis, Deep learning

G-1263

Investigating the use of artificial intelligence on the teaching of surgical techniques in surgical technologist students: a Narrative review

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Abstract:

Background and Aims: The convergence of artificial intelligence (AI), mixed reality, and human-computer interaction is transforming healthcare by creating new ways to deliver patient care and clinical education. Traditional methods of acquiring surgical skills through observation and surgical assistance have faced challenges in the past few years. Augmented and virtual reality tools can facilitate surgical planning and clinical training activities. This study aimed to investigate the current status of artificial intelligence and identify its applications in the field of clinical education and surgical techniques in surgical technology students, by integrating relevant literature.

Methods: This narrative review was conducted by reviewing articles indexed in the years 2020-2025 in the databases PubMed, Science Direct, ISI Web of Knowledge, SID, Magiran, and the Google Scholar search engine with relevant keywords in Persian and English. The articles that met the inclusion criteria were selected, and the analysis is in the form of reviewing the articles, summarizing, and presenting their results.

Results: Surgical technologists, as important and influential factors in the operating room, must learn the necessary techniques before entering the operating room. With the advancement of artificial intelligence technology, it has revolutionized medical education and clinical care. By increasing the quality of simulating surgical procedures, artificial intelligence has made it possible for students to acquire the necessary skills in a controlled environment before entering the operating room.

Conclusion: The results obtained from this study provide evidence of the positive and functional effects of AI in the simulation of surgical procedures and the subsequent dissemination of surgical techniques to surgical technologist student. However, more research should be conducted to

determine the deficiencies of this educational strategy so as to optimize its implementation in operating room training.

Keywords: AI, Education, Surgical Techniques, Operating Room

G-1265

Beyond Efficiency: Exploring the Hidden Dangers and Ethical Concerns of Artificial Intelligence in Pharmaceutical Development

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Abstract:

Background and Aims: Integrating artificial intelligence (AI) in pharmaceutical development has significantly enhanced drug discovery by utilizing machine learning algorithms to analyze complex biological datasets. This study aims to thoroughly investigate the ongoing challenges to AI adoption in pharmaceutical sciences.

Methods: This study employed a comprehensive literature review to investigate the current state of AI in pharmaceutical development. Databases including PubMed, Scopus, and Web of Science were systematically searched using keywords such as "artificial intelligence," "pharmaceutical development," "drug discovery," and "machine learning." Studies published between 2020 and 2025 were prioritized to ensure alignment with contemporary trends. The results were categorized into these main areas using an analysis of the retrieved literature.

Results: Our analysis revealed several critical challenges in AI adoption for pharmaceutical development. These include data quality issues affecting model accuracy, particularly for underrepresented populations; algorithmic biases perpetuating health disparities; outdated regulatory frameworks; ethical concerns regarding privacy and fairness; lack of transparency in AI decision-making; integration challenges with traditional methods; and potential exacerbation of healthcare resource disparities. These findings underscore the need for a comprehensive approach to address AI integration challenges in pharmaceutical development, emphasizing the importance of improving data quality, ensuring algorithmic fairness, updating regulatory guidelines, and addressing ethical concerns to maximize the benefits of AI while mitigating its risks.

Conclusion: While AI offers substantial benefits for accelerating drug discovery processes through improved efficiency and accuracy, it also introduces significant risks that must be addressed proactively. Improving data quality through standardization efforts and ensuring algorithmic fairness are crucial steps forward. Moreover, fostering collaboration between regulators and industry stakeholders will help navigate emerging ethical dilemmas effectively by adapting regulatory frameworks for better oversight of AI-driven decisions. Ultimately, addressing these challenges will enhance outcomes while ensuring safety without compromising equity. Future

research should focus on developing standardized protocols for AI validation in drug development to address regulatory challenges.

Keywords: Artificial Intelligence, Pharmaceutical Development, Machine

G-1266

Evaluation of neuroinflammation in refractory MRI-negative epilepsy patients by feature selection algorithms

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Abstract:

Background and Aims: The detection of neuroinflammation in MRI-negative epilepsy patients with drug resistance could be a promising clue for finding an effective treatment. The feature selection algorithms could therefore be helpful in introducing the best MRI parameter to describe an inflammation of the epileptic brain.

Methods: A total of 80 ROIs were drawn in both normal and epileptic white and gray matter in the hemisphere from seven drug-resistant epilepsy patients without abnormalities in the brain images to obtain brain parameters such as the magnetization transfer ratio, perfusion factors (Ktrans, Kep, Vb, CBV, CBF) and oxygen extraction fraction in the main veins (SS, Galen, ICVL, ICVR, SSS) in 3-Tesla T1 MRI images. The best parameter for detecting neuroinflammation compared to the normal brain hemisphere was determined by two feature selection algorithms (Relief and NCA).

Results: Based on similar results which obtained from two feature selection methods were used to highlight the differences in the gray and white matter of the epileptic and normal brain regions, the highest score was achieved for the perfusion parameter Ktrans in gray matter, and magnetization transfer in white matter and gray matter was rated next.

Conclusion: MRI parameters such as the perfusion constant Ktrans and the magnetization transfer ratio, which used to describe high blood supply, high macromolecular content and edema, could be remarkable signs of inflammation in the epileptic region of the epileptogenic brain. The detection of neuroinflammation in the brain could therefore open up a new approach for treating patients with refractory MRI-negative epilepsy.

Keywords: Neuroinflammation, Refractory MRI-negative Epilepsy, Feature Selection

G-1267

The Application of Artificial Intelligence in Midwifery Education: Transforming the Training of Maternity Care Professionals

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Abstract:

Background and Aims: The incorporation of advanced technologies into medical training has revolutionized educational approaches, particularly in specialized areas like midwifery. As the need for evidence-based and tailored training grows, innovative tools are emerging to enhance the competencies of future midwives. This article explores how cutting-edge technologies, particularly those driven by computational intelligence, are reshaping midwifery education. It highlights their role in simulation-based learning, adaptive training, and performance evaluation, while also addressing the ethical considerations tied to their use.

Methods: This review examines recent developments in computational tools applied to midwifery education, including immersive simulation environments, adaptive learning systems, and automated evaluation methods. The analysis draws on a thorough review of peer-reviewed studies and practical case examples published between 2020 and 2023. Specific tools, such as OBSim, MidwifeAI, and AI-MidAssess, are analyzed to demonstrate their effectiveness in improving training outcomes. The study also assesses how these tools enhance clinical decision-making, knowledge retention, and diagnostic precision among midwifery students.

Results: The findings reveal that advanced computational tools significantly improve midwifery training outcomes. Immersive simulations enhance emergency decision-making skills by 40%, while adaptive learning systems boost retention rates for complex topics by 35%. Automated evaluation methods show a 50% improvement in identifying high-risk conditions, such as postpartum hemorrhage. However, challenges such as data bias, privacy concerns, and the potential reduction of interpersonal skills in training were identified as notable limitations.

Conclusion: Computational tools hold immense potential to transform midwifery education by offering realistic training scenarios, personalized learning experiences, and accurate performance assessments. However, their integration must be approached thoughtfully to address ethical issues and maintain a balance between technological innovation and human-centered care. Future efforts should focus on creating inclusive tools and establishing ethical frameworks to ensure these technologies benefit midwifery training effectively.

Keywords: Midwifery Training, Artificial Intelligence, Education

G-1268

The Application of Computer Games in Midwifery Education: A Transformation in Midwifery Training

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Abstract:

Background: Today, the adoption of modern educational technologies and the use of artificial intelligence in domain-specific training (particularly in medicine) is of great interest. Midwifery in its nature being sensitive and life-dependent domain requires pragmatic and clinical teaching, building crisis management and problem-solving skills. Hence, it can get benefits by using AI applications in the students clinical training.

Methods: The research employed a systematic review approach in order to study global perspectives of computer game based midwifery training. Data were collected by searching trusted scientific databases (PubMed, Scopus, Google Scholar) using the following **Keywords:** computer games, midwifery education, birth simulation, and interactive learning. The literature published between 2010 and 2023 that focused on the use of computer games in midwifery education was reviewed.

Results: The integration of computer games as an educational strategy has the capacity to revolutionise midwifery education. By participating in these games students face challenges that are possible to encounter in clinical practices but are rare, thus giving them experience managing some scenarios. The application of computer games improves student involvement, facilitates clinical skills, enables practiced repetitions in a none threatening environment, facilitates academic and preparation of emergency skills, provides viable distance learning, reduces anxiety and increases self-esteem. These games allow students to identify technical errors in a risk-free environment and sharpen their skills — without the anxiety of harming a patient. In addition, rehearsal can be done of delivery under special conditions, such as emergencies or mothers with specific medical conditions.

Conclusion: Computer games have proven to be effective educational devices in midwifery education, providing an interactive and safe learning environment that helps students improve their clinical competence. Yet, challenges such as development costs, the need for teacher training, and technological limitations still exist.

Keywords: Computer Games, Midwifery Education, Educational Technologies

G-1269

A SWOT analysis on the application of artificial intelligence in midwifery education

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Abstract:

Background and Aims: AI presents a ground-breaking opportunity that has the potential to harness the future of midwifery education. Advanced tools such as interactive simulations, intelligent diagnostic systems, and adaptive learning platforms can help meet the objectives of education and midwifery student training. This research elaborates on the strengths, weaknesses, opportunities as well as threats of AI application in midwifery education.

Methods: This study represents a systematic review of studies that have focused on midwifery education through computer games across the globe using the SWOT (Strengths, Weaknesses, Opportunities and Threats) method. Records were searched in credible scientific databases including PubMed, Scopus and Google Scholar using key terms: "computer games", "midwifery education", "birth simulation" and "interactive learning. The review focused on articles published between the years 2010 and 2023 that were related to the use of computer games in midwifery education.

Results: Strengths 1. Personalized learning, 2. Advanced simulations, 3. Access to big data, 4. Long-term cost reduction. Weaknesses 1. High initial costs, 2. Technology dependency, 3. Need for trainer training, 4. Technical limitations. Opportunities 1. Expanding distance learning, 2. 2. Integration with virtual reality (VR) and augmented reality (AR), 3. 4. Games & Game-based Learning Development Working with international institutions Threats 1. Cultural and ethical objections, 2. Privacy concerns, 3. Over-dependence on technology, 4. Emerging technologies risks.

Conclusion: The potential of artificial intelligence is tremendous in revolutionizing midwifery education, yet its success is contingent on overcoming the technical, financial, and ethical obstacles that lie ahead. However, infrastructure, educator training, and localized, context-specific tools must also be invested in to maximize the use of this technology. It is also imperative that educators, technology developers, and policymakers work together.

Keywords: SWOT ,Artificial Intelligence, Midwifery

G-1271

AI-Powered Medicine for Cutaneous Leishmaniasis: Enhancing Treatment Efficacy and Safety through Personalized Therapies

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Abstract:

Background and Aims: Leishmaniasis is a neglected vector-borne disease caused by an intracellular protozoan parasite. Previous and conventional treatments such as antimonials and amphotericin B, are not always use full and they can cause toxicity and resistance. Using AI can help us to improve the treatment of this disease through personalized therapeutic strategies. This review describes role of artificial intelligence in developing drug treatments for leishmaniasis.

Methods: A comprehensive literature review was conducted, focusing on AI applications in dermatology, drug discovery, and personalized medicine for CL. Data extracted from artificial intelligence platforms were analyzed and classified, and the ability of artificial intelligence to provide new treatment solutions was measured and evaluated.

Results: AI-powered systems have shown significant potential in improving CL management. Machine learning algorithms increase diagnostic accuracy by distinguishing CL from other skin diseases with similar symptoms with high sensitivity and specificity. AI-based predictive models help select the most effective treatment based on genetic and clinical parameters, reducing the hassle of trial and error. Furthermore, it has accelerated the possibility of drug repurposing, safer and more potent identification. AI-guided therapeutic strategies hold promise in optimizing drug dosage, minimizing toxicity, and improving patient outcomes.

Conclusion: AI-based medicine represents a paradigm shift in CL treatment, offering precision-based interventions that increase efficiency and safety. While AI-based approaches have enormous potential, further clinical validation, regulatory frameworks, and ethical considerations need to be addressed to integrate these innovations into routine CL management. Future research should focus on developing accessible AI tools for low-resource settings where CL is endemic and ensure equitable healthcare improvements.

Keywords: Leishmaniasis, Amphotericin B, Artificial Intelligence

G-1274

The Impact Of Digital Health On Patients Experience And Their Satisfaction With Nursing Care

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Abstract:

Background and Aims: With the advancement of digital technologies, digital health has become a key field in enhancing the quality of healthcare and improving patient outcomes. In nursing care, where patient experience and satisfaction are considered essential indicators of care quality, digital tools offer new opportunities to foster communication, autonomy, and trust. This review aims to explore how digital health technologies influence patient experience and satisfaction within the context of nursing care.

Methods: A systematic literature review was conducted using databases such as PubMed, Scopus, and Web of Science. Studies focusing on the use of digital health tools—including telemedicine systems, mobile health apps, and patient self-management platforms—and their impact on patient experience and satisfaction with nursing care were selected and analyzed. Articles were screened based on scientific relevance, methodological rigor, and alignment with international healthcare standards.

Results: Findings suggest that digital health technologies contribute positively to both patient experience and satisfaction in various care settings. Enhanced patient-nurse interaction was noted through secure messaging platforms and remote monitoring systems. Digital interventions such as self-management apps for chronic respiratory disease or remote care after transplant procedures increased patient engagement and reduced anxiety. Patients reported higher autonomy and confidence in managing their health, which contributed to greater satisfaction. However, challenges such as technical barriers, cost of implementation, and data privacy concerns were identified as limiting factors in broader adoption.

Conclusion: Digital health solutions show strong potential in improving the overall experience of patients receiving nursing care and in raising satisfaction levels. To fully harness these benefits, healthcare providers must address current limitations by investing in infrastructure, training, and regulatory frameworks. Expanding the integration of digital tools into routine nursing care may lead to higher quality, more patient-centered services.

Keywords: Digital health Patient satisfaction Health technology

G-1275

Investigating the Relationship between Neck Pain and Craniovertebral Angle Changes: A Machine Learning Approach

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Abstract:

Background and Aims: Neck pain is a prevalent musculoskeletal disorder that significantly affects individuals' quality of life and healthcare systems. Forward head posture (FHP) is a common postural issue associated with neck pain, and the craniovertebral angle (CVA) serves as an important biomechanical measure for assessing head posture. This study aimed to investigate the relationship between neck pain and changes in CVA using Machine Learning (ML) analytics, particularly in the context of functional tasks.

Methods: A cross-sectional study was conducted from April to September 2023, involving 110 participants aged 18 to 59, with or without a history of neck pain. Participants completed a demographic questionnaire and provided informed consent. Neck pain intensity was measured using a visual analog scale (VAS), while CVA was assessed through photographic analysis using Image J software. Participants were subjected to a 30-minute postural task while their CVA was measured before and after the task.

Results: Preliminary assumptions indicate a significant correlation between neck pain intensity and changes in CVA, suggesting that functional tasks may exacerbate postural deviations in individuals with neck pain.

Conclusion: ML analysis revealed algorithms that traditional statistical methods may overlook, enhancing the understanding of the relationship between neck pain and craniovertebral alignment. This study provides insights into the biomechanical factors contributing to neck pain and highlights the potential of ML in analyzing complex relationships in musculoskeletal disorders. The findings may inform the development of targeted interventions for individuals experiencing neck pain and encourage further research into the integration of artificial intelligence (AI) in clinical settings.

Keywords: Machine Learning, Neck Pain, Cranial, Vertebrae

G-1277

Prediction of affinity and selectivity of indoleamine and tryptophane-2,3-dioxygenase inhibitors by analysis of molecular electrostatic maps in convolutional neural networks and vision transformers

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Abstract:

Background and Aims: Prediction of affinity and selectivity of drugs has been always an obstacle in the field of drug discovery. Electron distribution and lipophilicity of molecules correlate well with their biological activities. In this study, AI-based image classification methods were applied to relate the electron density and Crippen lipophilicity maps of a series of Indoleamine and tryptophan 2,3-dioxygenase (IDO, TDO) inhibitors to their affinity and selectivity for cancer immunotherapy.

Methods: electron density and Crippen lipophilicity maps of 760 inhibitors were generated by RDKit as RGB images, augmented to 3040 and labeled to 4 classes according to their affinities to IDO and TDO. A custom convolutional neural network (CNN) with 111860804 parameters was written, trained and tested. Transfer learning was accomplished by VGG-16, ResNet50, ResNet-152, EfficientNet-B0 and EfficientNet-B7 with their pretrained weights on ImageNet. Fine tuning was mainly based on updating weights of the last two or three blocks. Finally, different vision transformers including vit-base-patch16-224, deit-base-patch16-224, and deit-base-distilled-patch16-224 were used for fine tuning. All the codes were written in pytorch and run on an Nvidia Geforce RTX 4070 with 8 GB of RAM. Explainability of the models was also evaluated.

Results: the custom CNN gave test accuracy of 70% for both Gasteiger and Crippen maps. VGG-16 and ResNet-50 gave 74% and 79% accuracy on the test set respectively while ResNet-152 gave test accuracy of 80%. EfficientNet-B0 and EfficientNet-B7 gave test accuracy of 76% and 82% respectively. In the case of the vision transformers, the top test accuracy of 84% was obtained by deit-base-distilled-patch16-224. Explainability of the model revealed key molecular fragments responsible for biological activity.

Conclusion: Results indicated that the molecular electron density maps can substantially reveal the binding affinity and selectivity of drugs towards specific biological targets. The best test accuracy was obtained by deit-base-distilled-patch16-224 which is a vision transformer based on the multi-head attention mechanism. This model has a high speed of training, uses a distillation token and is a student and teacher based learning. This model is also data-efficient and does not need to large data for training and fine tuning.

Keywords: CNN, Vision Transformer, Drug Discovery

G-1282

Combining biochips and artificial intelligence: cancer diagnosis and treatment

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Abstract:

Background and Aims: Recent advancements in biochip technology and artificial intelligence (AI) are creating transformative prospects for improving early disease detection, especially for cancer, ovarian cancer, and various biomedical applications. The aim of this study is to evaluate and analyze the integration of a microchip ELISA with mobile technology for the rapid identification of ovarian cancer biomarkers in urine, along with the use of microfluidic technologies and AI in disease diagnosis and targeted therapy.

Methods: This article is a review of original articles, meta-analyses, and other writing styles of collected papers, covering the years 2022 to 2025. The papers were gathered from sources such as Google Scholar, PubMed, Nature Journal, ScienceDirect, and others, and the information compiled and collected from these articles is included.

Results: The results show that the portable microchip ELISA system with mobile technology can rapidly and accurately detect ovarian cancer biomarkers. In addition to improving early detection, this system can serve as a suitable solution for point-of-care (POC) diagnostics. Moreover, microfluidic technologies and AI have played a significant role in isolating extracellular vesicles and enabling personalized treatments. AI has made considerable improvements in analyzing complex data, especially in diseases such as cancer, diabetes, and neurological disorders.

Conclusion: This study demonstrates that the combination of biochip technology and artificial intelligence, especially in early cancer detection and personalized treatments, holds great promise for advancing healthcare. Although challenges such as data privacy concerns and the need for standardized testing procedures remain, the innovations discussed in this study will bring about significant progress in disease diagnosis and treatment.

Keywords: biochips, artificial intelligence, cancer, treatment

G-1283

Factors affecting medical artificial intelligence readiness among students

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Abstract:

Background and Aims: It is an inevitable necessity to measure artificial intelligence (AI) readiness among medical students to determine the level of readiness of future doctors to work with AI technology. So, this study was conducted to investigate the factors affecting medical AI readiness among medical students of Kermanshah University of Medical Sciences with a futuristic perspective.

Methods: This was a cross-sectional descriptive-analytical study. The statistical population consisted of 800 first- to fifth-year medical students selected through convenient sampling at Kermanshah University of Medical Sciences from November to March 2023. The data collection tools were demographic checklists and the Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS).

Results: Most of the students were male (56.13%). The overall score of medical AI readiness was 70.59 ± 19.24 out of 110. The maximum mean was 2.96 ± 9.73 and 3.36 ± 9.15 in vision and ethics and the minimum was 7.52 ± 25.74 in ability. The overall mean of AI readiness (71.84 ± 18.27) was higher in females than males (69.62 ± 19.93), but this difference was not significant ($p=0.106$). Furthermore, the mean total score of AI readiness increased with the increasing age of the students.

Conclusion: The AI readiness of the University of Medical Sciences students was reported to be low in cognitive and ability areas. Accordingly, the university education unit should set up more AI training centers to provide and introduce basic artificial intelligence courses. Moreover, universities should identify the needs of students based on scientific evidence, and the medical education system should design AI training programs in its educational framework in the same direction.

Keywords: Artificial Intelligence, Medical Students, Futuristic Perspective

G-1284

Application of artificial intelligence in the diagnosis and prevention of occupational mesothelioma: A review study

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Abstract:

Background and Aims: Early detection of occupational diseases is important because most of the occupational diseases are identified as soon as possible and by taking appropriate preventive and therapeutic measures, they can be prevented from progressing to severe and incurable stages and from causing permanent disability to the person. This review study aimed to investigate the application of artificial intelligence in the diagnosis and prevention of occupational mesothelioma.

Methods: This review study used 15 articles published between 2014 and 2024. The aim of this review study was to investigate the Application of artificial intelligence in the diagnosis and prevention of occupational mesothelioma using the databases Google Scholar, Science Direct, PubMed, ResearchGate, and Springer.

Results: The results of various studies show that various artificial intelligence-based methods are used to diagnose mesothelioma. These methods include support vector machines, decision trees, multilayer perceptron or feed-forward neural networks, j48 algorithm, bagging algorithm, logistic regression and gradient boosting algorithm, which have 100% accuracy compared to other methods for diagnosing mesothelioma and Other algorithms had an accuracy lower than 100%.

Conclusion: The results of this review study showed that artificial intelligence algorithms are useful for early detection and prevention of mesothelioma, which helps in the early and early diagnosis of this deadly disease.

Keywords: Artificial Intelligence, Occupational Mesothelioma, Occupational Exposure, Prevention

G-1287

Application of artificial intelligence in occupational health and occupational safety: a study review

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Abstract:

Background and Aims: Artificial intelligence is rapidly expanding and being used for various sciences. The aim of this study was of investigating the Application of artificial intelligence in occupational health and occupational safety.

Methods: In this study review, 31 articles published between 1994 and 2023 were used. The purpose of this study was to investigate the application of artificial intelligence in occupational health and occupational safety and using Google Scholar Science Direct PubMed, ResearchGate, Scopus, and springer databases.

Results: Studies on the application of artificial intelligence in occupational health and occupational safety show that artificial intelligence is used in the design of material safety data sheets, assessment of the risk of occupational diseases, assessment of ergonomic posture, simulation and evaluation of various workstations and redesign of workstations, prevention of musculoskeletal disorders in the workplace, risk assessment and risk assessment of chemicals, prediction of air quality and determination of particle concentrations in the air. Artificial intelligence is also used in early detection and screening of occupational diseases and the risk of occupational diseases in the form of chatbot.

Conclusion: The conducted studies show that artificial intelligence has various applications in occupational health and occupational safety and can be used in the design and evaluation of the work environment.

Keywords: Artificial intelligence, occupational health, occupational safety

G-1288

Artificial Intelligence-Based Intervention Evaluation: A Comparison of Nylon and Vicryl Sutures in Bone Grafting Patients

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Abstract:

Background and Aims: The choice of suture type in bone grafting surgeries plays a crucial role in the improvement of treatment outcomes and healing time. Nylon and Vicryl sutures are among the most commonly used sutures in these surgeries. Nylon sutures are known for their high tensile strength and resistance to stretching, whereas Vicryl sutures are characterized by their absorbable nature in the body. With recent advancements in artificial intelligence, this study aims to examine the differences between these two types of sutures in patients undergoing bone graft surgeries using machine learning models. The objective of this study is to evaluate and compare the outcomes of using nylon and Vicryl sutures in bone graft surgeries and analyze the treatment results of these two suture types using artificial intelligence models.

Methods: In this randomized clinical trial, 140 patients undergoing bone graft surgeries were divided into two groups of 70 patients each. Group 1 received nylon sutures, while Group 2 received Vicryl sutures. The data obtained from patient characteristics and treatment outcomes were analyzed using the Support Vector Machine (SVM) model.

Results: The results showed that the use of Vicryl sutures was associated with a reduced healing time and fewer postoperative complications compared to nylon sutures. Furthermore, the SVM model was able to accurately identify patients with a high likelihood of successful grafting and provide precise predictions of treatment outcomes.

Conclusion: Vicryl sutures, due to their specific advantages such as absorbability and reduced need for secondary surgeries to remove sutures, are recommended as the preferred option in bone graft surgeries. The use of artificial intelligence models can assist surgeons in selecting the most suitable suture type and accurately predicting treatment outcomes, ultimately improving the quality of care and reducing complications.

Keywords: AI ,Nylon ,Vicryl Sutures,Bone Graft

G-1289

Modeling and Predicting Carbon Dioxide Adsorption Capacity Using Machine Learning Algorithms: A Novel Approach to Optimizing Porous Carbon-Based Adsorbents

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Abstract:

Background and Aims: The rise in air pollution from urbanization, industrialization, and traffic, along with CO₂ emissions, poses environmental challenges. Mitigation strategies include chemical adsorption, cold plasma conversion, and carbon capture. However, the complexity of adsorbents and operational conditions makes performance prediction difficult. This study identifies key factors for optimal CO₂ adsorption and evaluates Artificial Neural Networks (ANN), Random Forest (RF) and Support Vector Machines (SVM) models to enhance predictive analysis and adsorbent development.

Methods: In this study, machine learning algorithms, including RF, SVM and ANN, were employed to model and predict CO₂ adsorption capacity. These models were developed using a dataset comprising 4,410 data points from 320 Porous carbon materials (PCMs). The input variables considered in the models included pressure, temperature, flow rate, elemental composition of the adsorbent, textural properties, and the number of regeneration cycles.

Results: The results indicated that the ANN model outperformed the other models, achieving a high prediction accuracy for CO₂ adsorption capacity with an RMSE of 0.18 and a coefficient of determination (R²=0.91). Pressure and temperature were also the most influential factors in the adsorption process.

Conclusion: The study found no firm link between adsorbent morphology and CO₂ removal, but pressure and temperature were key, with lower temperatures and higher pressures improving adsorption. ANN performed best (0.91 accuracy, 0.18 error), while RF was weaker in testing, and SVM had the lowest accuracy, consistent with previous studies. This study optimizes carbon-

based adsorbents and enhances CO₂ adsorption efficiency, aiding pollution control and climate change mitigation.

Keywords: Machine Learning, Artificial Neural Network, Carbon

G-1291

The Efficiency of Training Course Generative Artificial Intelligence For Teaching and Research of Academic Staff;

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Abstract:

Background and Aims: Generative artificial intelligence with its unique potential can play an important role in improving the quality of education. This technology can also help researchers in generating research hypotheses, designing experiments and analyzing data. The purpose of this study is to investigate the effectiveness of the training course using generative artificial intelligence for teaching and research for academic staff members of Tehran University of Medical Sciences in 2024.

Methods: This before and after intervention study was conducted with the participation of 30 faculty members of Tehran Medical School. Data using a questionnaire consisting of two parts; The first part related to demographic information, the second part related to measuring the knowledge, skills and attitude of the faculty members was collected. Descriptive and inferential statistics were used to analyze the data.

Results: The findings showed that holding this course significantly increased the knowledge of academic staff members in various educational and research fields. And also, this action not only helped to improve the level of education and research of academic staff members, but also could lead to the development of their practical and theoretical skills.

Conclusion: In the age of technology, artificial intelligence has created a huge transformation in people's lives, especially in the field of education and research for academic staff members. This research provided a golden opportunity for the application of generative artificial intelligence for teaching faculty members. The training course for academic staff has effectively improved knowledge.

Keywords: Efficiency, Training Course, Generative Artificial Intelligence

G-1292

The Impact of Artificial Intelligence in Psychiatric Patient Care

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Abstract:

Background and Aims: Artificial Intelligence (AI) has emerged as a transformative technology in psychiatric care, significantly enhancing the quality of mental health services. Utilizing machine learning algorithms, natural language processing (NLP), and big data analytics, AI allows for early diagnosis of mental disorders, personalized treatment plans, and increased access to mental health services. The aim of this paper is to explore the potential benefits, challenges, and future advancements of AI in the field of psychiatry, specifically in improving diagnostic accuracy, treatment effectiveness, and patient accessibility.

Methods: Recent studies were reviewed to assess AI's role in diagnosing and managing mental health disorders, including depression, anxiety, schizophrenia, and bipolar disorder. AI's capacity to analyze behavioral, visual, and biological data from digital tools such as mobile applications and chatbots was evaluated for its ability to support continuous patient monitoring and timely interventions. The research also examined how AI identifies complex patterns in patient data that may be overlooked by human specialists.

Results: The findings indicate that AI is effective in assisting with the diagnosis and management of psychiatric disorders. By analyzing diverse data types, AI helps in recognizing patterns and identifying early signs of mental health conditions. Digital tools like mobile applications and AI-driven chatbots have shown promise in providing continuous support and facilitating timely interventions, improving patient care.

Conclusion: While AI holds immense potential to transform psychiatric care by improving diagnostic accuracy and offering personalized treatment plans, challenges remain. Issues such as data privacy concerns, algorithmic biases, and the reliability of AI models need to be addressed. However, with the development of more accurate models and comprehensive ethical frameworks, AI has the potential to revolutionize mental health services, reduce professionals' workloads, and provide patients with better and faster access to care.

Keywords: Artificial Intelligence, Psychiatric Care, Mental Health, Early Diagnosis, Personalized Treatment, Data Privacy, Algorithmic Bias, Digital Tools, Continuous Monitoring.

G-1293

Virtual Clinic versus Telemedicine: Are They Different?

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Abstract:

Background and Aims: What we refer to today as virtual clinics are mostly a subcategory of telemedicine, but we generally do not distinguish between the two and do not know what requirements virtual clinics must have in order to use the term virtual clinic for them. In most countries of the world, there are no established standards for this, but by reviewing the texts from various articles, we try to explain to some extent the difference between these two terms and the features that exist in virtual clinics.

Methods: This narrative review was conducted through field research and a comprehensive search of reputable online databases, including Scopus, PubMed, Google Scholar, and Latin and other online dictionaries. Relevant literature was identified using targeted keywords. The researcher analyzed the subject by synthesizing extracted information and interpreting key concepts through a structured and immersive review process.

Results: There are three basic concepts in telemedicine terminology: 1- The existence of two people, one as a service recipient and the other as a service provider 2- The existence of a spatial distance between these two people 3- The use of communication tools to establish communication in order to improve health. Also, when virtual services are being provided through a software platform, the concept of virtual care and virtual clinics has occurred, respectively, in which the term virtual care can be used instead of virtual services, and the software platform constitutes our virtual clinic.

Conclusion: Virtual clinics and telemedicine are different. What is referred to as one concept today differs greatly in detail, and there is a need to establish characteristics to differentiate between virtual care that takes place in the context of virtual clinics and telemedicine, and it is suggested that further studies should be conducted to separate these two concepts in more detail.

Keywords: Virtual Clinics, Telemedicine, Virtual Care

G-1295

Effectiveness of Machine Learning Models in Analyzing Mammographic Images for Breast Cancer Detection

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Abstract:

Background and Aims: This study aimed to evaluate the performance of various machine learning models, specifically Convolutional Neural Networks (CNNs), in classifying breast masses from mammographic images to enhance diagnostic accuracy in breast cancer detection.

Methods: We employed a range of machine learning algorithms, including CNN, Support Vector Machine (SVM), Random Forest, Gradient Boosting, and K-Nearest Neighbors (KNN), to analyze a dataset consisting of mammographic images. Each model's performance was assessed using key metrics including accuracy, sensitivity, specificity, precision, F1-score, and area under the receiver operating characteristic curve (ROC-AUC). These metrics provide insight into the effectiveness of each model in diagnosing breast cancer and can guide clinical decision-making.

Results: Among the tested models, the CNN exhibited superior performance, achieving an accuracy of 92.5%, sensitivity of 89.0%, specificity of 94.0%, precision of 90.5%, F1-score of 89.7%, and an ROC-AUC of 0.94. In contrast, the SVM model demonstrated an accuracy of 88.0%, while Random Forest and Gradient Boosting models achieved accuracies of 90.0% and 91.0%, respectively. The KNN model performed the weakest in this comparison, attaining an accuracy of only 85.5%. These results highlight the effectiveness of CNNs in extracting relevant features from images, thus providing accurate classifications that are critical for early diagnosis.

Conclusion: This study reaffirms the promising role of machine learning, particularly CNNs, in the early detection of breast cancer through mammography. The significant improvements in accuracy and diagnostic metrics with CNNs illustrate the potential benefits of integrating artificial intelligence technologies into clinical practice. Such advancements could lead to enhanced diagnostic performance, more timely interventions, and ultimately improved patient care. Future research should focus on validating these findings across diverse populations and exploring hybrid models to further bolster diagnostic capabilities in mammography.

Keywords: Breast Neoplasms, Mammography, Machine Learning, Artificial

G-1302

Preservation of patient privacy in the application of artificial intelligence in treatment

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Abstract:

Background and Aims: The healthcare artificial intelligence (AI) industry is making fast strides, and the dispute on the management of its development is escalating. Many AI technologies are ultimately owned and controlled by private entities. The nature of AI implementations could mean that such companies, clinics, and public institutions will play a greater role than usual in acquiring, using, and protecting patient health information. This raises privacy issues related to implementation and data security. The first challenge involves access, use, and control of privately owned patient data. Some recent public-private partnerships for AI implementation have resulted in weak privacy protections. therefore, there are calls for more systematic oversight of big data health research.

Methods: This study was conducted as a review in 2024. Valid databases (pubmed, scopus, medline) were searched. The full text of relevant studies was studied. Information on privacy and its challenges was studied.

Results: Protecting patient privacy in the use of artificial intelligence in treatment is one of the fundamental and vital challenges. In this regard, several measures must be observed: 1- Data encryption: Medical data should be encrypted during storage and transmission to prevent unauthorized access 2- Informed consent: Patient permission must be obtained before using their medical data to train AI models. 3. Keeping anonymity: Data must be processed in such a way that the identities be inconspicuous. 4. Access control: Only the authorized should be able to access the data. 5- Transparency in data use: The patient should be aware of the ways and intents of the use of their data 6- Legal requirements: The application of artificial intelligence in treatment must be fully in compliance with existing legislation. 7- Advanced security protocols should be established: Using high level security protocols and monitoring systems is essential to prevent

unauthorized access. 8- Take care of sensitive data: Data that is particularly sensitive should be stored with greater care.

Conclusion: Artificial intelligence, brings many advancements to society, however, it is also a potential source of privacy threats. From sensitive data collection to widespread surveillance, this technology requires careful management and appropriate regulations to prevent its dangers.

Keywords: Artificial intelligence, patient privacy, Data Protection

G-1305

Ethical challenges of personalized medicine

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Abstract:

Background and Aims: Advancements in medical sciences and biotechnology have led to the emergence of personalized medicine, a revolutionary approach that tailors treatment based on an individual's genetic, environmental, and lifestyle factors. While this method enhances treatment efficacy and minimizes adverse effects, it raises significant ethical concerns. This study aims to explore the primary ethical challenges associated with personalized medicine, including data privacy, accessibility, physician-patient relationships, and unforeseen genetic findings.

Methods: This research employs a qualitative approach, analyzing existing literature, ethical frameworks, and case studies related to personalized medicine. The study examines regulatory policies and ethical considerations, focusing on confidentiality, informed consent, and equitable access to treatment.

Results: Findings reveal that personalized medicine, despite its benefits, poses challenges such as potential discrimination in healthcare access, difficulties in ensuring patient autonomy, and risks related to genetic data security. Additionally, the lack of universal ethical guidelines exacerbates these issues, necessitating comprehensive policies to address emerging concerns.

Conclusion: To fully leverage the advantages of personalized medicine while mitigating ethical risks, there is an urgent need for robust regulatory frameworks, enhanced physician-patient communication, and public awareness initiatives. Implementing standardized ethical guidelines can promote fairness, protect patient rights, and ensure the responsible integration of personalized medicine into healthcare systems.

Keywords: Personalized Medicine, Medical Ethics, Bioethics, Genetics

G-1309

relationship between nurses perception of artificial intelligence (AI) and their job satisfaction in the Intensive Care Unit (ICU)

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Abstract:

Background and Aims: This study investigates the relationship between nurses' perception of artificial intelligence (AI) and their job satisfaction in the Intensive Care Unit (ICU) setting in Bokan city. With the rapid integration of AI technologies in healthcare, it has become critical to understand how nursing professionals perceive these advancements and how such perceptions influence their job satisfaction.

Methods: A cross-sectional survey was conducted with a sample of ICU nurses, employing validated questionnaires to assess their understanding of AI and levels of job satisfaction. The Artificial Intelligence Understanding Questionnaire (AIUQ) was utilized to evaluate nurses' knowledge and application of AI, consisting of 15 items across three categories: knowledge of AI concepts, application in nursing, and attitudes toward AI. Job satisfaction was measured using the Job Satisfaction Scale (JSS), comprising 20 items focusing on work environment, role clarity, professional relationships, and career development opportunities. Data were analyzed using descriptive and inferential statistics. Pearson's correlation coefficient assessed the relationship between the understanding of AI and job satisfaction, while linear regression analysis determined the predictive value of AI understanding on job satisfaction scores, controlling for confounding variables.

Results: The analysis revealed a significant positive correlation between nurses' understanding of AI and their job satisfaction. Specifically, enhanced understanding of AI was associated with higher levels of job satisfaction among the nurses.

Conclusion: The findings indicate that improving nurses' understanding of artificial intelligence can contribute to greater job satisfaction in ICU environments. Focusing on education and

increasing awareness of AI among nursing professionals may serve as an effective strategy for enhancing care quality and job satisfaction.

Keywords: Artificial Intelligence, Job Satisfaction, Nurse, ICU

G-1310

Title: Investigating the Impact of Artificial Intelligence on the Management of Diabetic Wounds: A Review Study

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Abstract:

Background and Aims: Diabetic ulcers significantly impact patients, leading to a wide range of complications in clinical settings. The demand for improved treatments is increasingly evident. The healing process of diabetic wounds is complex due to vascular issues and inflammation-related tissue remodeling. Therefore, this study aims to investigate the influence of artificial intelligence (AI) on the treatment and management of diabetic ulcers.

Methods: This systematic review involved a comprehensive search of international databases, including PubMed/Medline, WOS Core Collection, Scopus, and Google Scholar, as well as national databases such as SID, Magiran, and Irandoc. The following keywords were utilized: "Artificial Intelligence," "wound," and "diabetes." The initial search yielded six relevant studies. Inclusion criteria encompassed articles published in both Persian and English, while review articles and gray literature were excluded. Ethical considerations were strictly adhered to, ensuring no bias in the selection, extraction, analysis, and classification of evidence, with reporting conducted according to PRISMA guidelines.

Results: The findings indicate that while the global application of AI to enhance diabetic wound care is on the rise, research in this area remains limited, particularly within our country. The results illustrate the various ways AI is integrated into the care process and the identification of novel treatments. Notably, the study highlighted the therapeutic combination of Trichostatin A (TSA) and the molecular target Histone Deacetylase 4 (HDAC4) as significant. Molecular simulations suggest that TSA may promote wound healing effectively.

To facilitate minimally invasive administration, we developed a microneedle patch that enhances skin permeability, reduces inflammation, and supports tissue remodeling. Furthermore, lipid nanoemulsions containing quercetin and rosemary oil were proposed as innovative approaches to improve the wound healing process by modulating immune responses and inhibiting anti-inflammatory enzymes. Additionally, a tunable hydrogel scaffold for diabetic wounds was optimized through an AI-powered screening system, coupled with a pneumatic extrusion printer and image analysis algorithms. The findings demonstrate that these scaffolds possess favorable mechanical and biological properties, significantly accelerating wound healing.

Keywords: Artificial Intelligence, Wound, Diabetes, Treatment, Review

G-1311

Leveraging Deep Learning for Automated Image Segmentation and Accurate Quantification of Western Blot Protein Bands: A U-Net Approach for Semantic Segmentation

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Abstract:

Background and Aims: Traditional Western blotting has provided qualitative information, whereas automation in Western blot image analysis represents a significant step toward efficient and effective protein band extraction. Several conventional approaches are usually manually processed; hence, they are time-consuming and prone to human bias. This study develops an automatic Western blot imaging method that uses U-Net, performing semantic segmentation for quantitatively identifying protein bands.

Methods: The proposed approach applies semantic segmentation to Western blot images using the deep learning architecture U-Net. 68 Western blot images were used to evaluate the effectiveness of the automated segmentation method. Results were obtained using a total of 214 images after augmentation, which included 68 original images. Performance assessments have been conducted concerning multiple metrics, including accuracy, precision, sensitivity, F1-score, specificity, Dice index, and Jaccard index.

Results: The proposed method provided an accuracy of 90.7%, precision of 82.7%, sensitivity of 86.1%, F1-score of 83.7%, specificity of 86.4%, Dice index of 83.7%, and Jaccard index of 77.2% for the augmented dataset with 214 images, while in the original dataset, having 68 images, it provides improved results of accuracy by 94.0%, precision of 93.5%, sensitivity of 89.7%, F1-score of 90.5%, specificity of 89.7%, Dice index of 90%, and Jaccard index of 84.5%.

Conclusion: The automated U-Net-based method performed very well in segmenting Western blot images, both with augmented and original data, with high accuracy, precision, and similarity metrics. This method shows promise for improving efficiency and reproducibility in protein band detection related to Western blots.

Keywords: Western Blotting, Image Processing, Automated Segmentation

G-1312

Diagnosis and Treatment of ADHD Using Mobile Applications: a scoping reviewArezoo Dehghani^{1*}, Zahra Tehranizadeh², Zeinab Babaee², Momeneh Ebrahimian²

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Abstract:

Background: One of the most common psychological disorders is Attention Deficit Hyperactivity Disorder (ADHD). An emerging approach to manage and treat ADHD is technology especially smartphone, mobile application. Applications platforms have the potential advantages in terms of accessibility and personalization along with tracking of patients' status live. The aim of current study is to evaluate the mobile applications which can be used as tools that can help in diagnosing and treating ADHD, and patients.

Methods: A narrative review methodology with scoping review form was used in conducting a cross-sectional applied study on databases (PubMed, Scopus and Google Scholar) through the search criteria (ADHD or mobile application) without date restrictions. The articles were initially screened for full titles and abstracts, and thereafter selected articles were assessed.

Results: Among the ... articles searched, ... articles met the inclusion criteria. The retrieved articles indicated that mobile applications can serve as useful tools in the diagnosis and treatment of ADHD and may also contribute to enhancing the quality of life for patients. Additionally, they can lead to positive changes in the neural activities and behaviors of children with ADHD and intellectual disabilities (ID), as well as significant improvements in adherence to medications

Conclusion: The results of this study suggest that by leveraging mobile technology and designing personalized programs, significant improvements in the management of ADHD can be offered to affected individuals. Integrating rewards with mobile digital health solutions positively influence treatment adherence in ADHD.

Keywords: Attention Deficit Hyperactive, ADHD, Mobile App, Artificial Intelligence

G-1314

Artificial Intelligence in Cancer Diagnosis and Treatment

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Abstract:

Background and Aims: AI application is a truly revolution in oncology which offers an opportunity of search of new approaches to tumor treatment. Cancer is one of the major causes of death as the global population – that is why the approaches as precise as possible are needed. Specifically, this work will analyze how AI has revolutionized the oncology paradigm by improving diagnostic precision, tailoring therapies and speeding up therapeutic discovery.

Methods: A medline database search performed using PubMed was done to point out the recent findings related to the use of artificial intelligence in the detection of cancer and treatment. The study analyzed the applications that inferred the use of; the, machine learning and deep learning as well as generative models. Discussed domains concerned diagnostics, genomics, therapy personalisation, and drug design. The literature search was focused on the articles published after 2020 so as to identify the most recent technologies.

Results: AI systems proved to be vastly better in the tasks comprising initial cancer diagnosis, tumor identification, and treatment stratification. Diagnostic accuracy of imaging has been improved with machine learning algorithms and deep learning has improved the genomic profiling and biomarker identification. Generative AI has helped to enhance oncolytic virus engineering by proposing programmable oncolytic viruses based on synthetic biology. These developing enhanced the clinical decision-making and outcomes of the patient; however, certain issues like bias, interpretability and scalability are still relevant.

Conclusion: AI already enhances oncology care by providing accuracy, speed, and creativity in identifying and treating the disease. As noted above there is a progress in the field; nevertheless, more research is needed to investigate the corresponding ethical concerns, improve the model interpretability, and promote equal opportunities. There is therefore a need to embrace AI in the treatment of cancer to enhance the future advancements of the patient's survival rates that will be driven by very customized treatments.

Keywords: Artificial Intelligence, Cancer, Diagnosis, Treatment, Innovation

G-1315

Creating a Spatial-based Map based on the Probability of Infection Visceral Leishmaniasis using Fuzzy Logic

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Abstract:

Background and Aims: Most disease risk zoning maps are created based on empirical relationships and expert opinion on the degree of dependence of the disease and its known influencing factors. However, these maps are not employed in executive operations due to lack of accuracy.

Methods: In this study, how a phenomenon is affected by geographical factors is called 'spatial behavior', expressing the influence coefficients of environmental factors on the phenomenon. To prepare the spatial behavior of the visceral leishmaniasis disease for Kalaybar and Khodaafrin regions, a method based on the correlation matrix with the same idea as satellite images was used in the previous study. After determining weights of the effective environmental factors and how they affect the disease, the study employed the fuzzy simple additive weighting method to produce the disease probability map.

Results: Comparing the infection probability map with the disease prevalence determined the FSAW method with the root mean squared error of 1.9389 individuals. Based on the probability map of disease, it was found that the DilBilmaz village and its surrounding settlements have the highest probability of the disease. Areas with higher heights (Qaradagh Mountains) located in the southwest of study area are considered to have lower disease prevalence.

Conclusion: Using an integrated method based on spatial behavior and zoning map using a FSAW method, disease probability maps were drawn while preventing experimental and variable opinions, with more accuracy in decision making. It is more effective in solving the problem of determining and identifying the areas with the possibility of VL.

Keywords: Infection Map, Visceral Leishmaniasis, RS, GIS

G-1316

Application of artificial intelligence in electronic health record (EHR) in Iran

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Abstract:

Background and Aims: Electronic Health Record (EHR) data holds immense potential for improving healthcare, but its volume and complexity pose analytical challenges. Traditional methods are inadequate for processing EHR data due to computational limitations and the inability to recognize complex patterns. Artificial Intelligence (AI) offers solutions through its capabilities in big data analysis, pattern recognition, machine learning, and prediction. This article reviews AI applications in EHRs, providing an updated perspective on how AI can enhance EHR performance and patient care, including relevant statistics and figures.

Methods: The review covers basic concepts of EHRs and AI. It analyzes case studies and scientific articles related to AI applications in EHRs, using data from sources like PubMed, Scopus, Web of Science, WHO, and the FDA.

Results: AI significantly improves EHR performance by enabling advanced algorithms and big data analysis. Specific applications include:

Early Disease Diagnosis: AI can identify hidden disease patterns, enabling earlier diagnoses (e.g., lung cancer diagnosis up to 3 months earlier).

Patient Status Prediction: AI predicts patient outcomes to aid treatment decisions (e.g., 85% accuracy in predicting heart patient readmission).

Personalized Treatments: AI recommends tailored treatments based on individual data (e.g., personalized cancer drugs based on genetic information).

Reduced Medical Errors: AI identifies and prevents medical errors (e.g., medication errors reduced by up to 50%).

Improved Medication Management: AI prevents drug interactions.

Increased Healthcare System Efficiency: ** AI automates tasks (e.g., patient queue management, bed allocation).

Conclusion: AI is increasingly important in EHRs, enhancing their performance and improving patient care. It empowers doctors to make better decisions regarding diagnosis, treatment, and patient care. Challenges include data privacy, the need for interdisciplinary expertise, and

implementation costs. Future AI advancements and increased data access are expected to further improve EHR performance and patient services.

Keywords: Healthcare Big Data Analytics, Digital Health

G-1317

Simulating molecular models in drug design using artificial intelligence in the pharmaceutical industry

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Abstract:

Background and Aims: The pharmaceutical industry has always been looking for new and efficient methods for the design and development of new drugs. Molecular model simulation using artificial intelligence (AI) has emerged as a powerful tool in this field. This article examines the role and importance of molecular model simulation using artificial intelligence in drug design in the pharmaceutical industry and, in particular, examines the challenges, opportunities and future trends in this area.

Methods: case studies and scientific articles related to the application of artificial intelligence in drug design in the pharmaceutical industry are reviewed and analyzed. To collect information, reputable scientific databases such as PubMed, Scopus and Web of Science have been used. Also, reports and articles published by international organizations such as the World Health Organization (WHO) and the US Food and Drug Administration (FDA) have been reviewed.

Results: The study shows that artificial intelligence, by increasing the accuracy and speed of molecular model simulations, has enabled faster and more accurate identification of drug compounds, prediction of their properties, and optimization of drug structures. The use of AI has reduced drug development time and costs, and increased the likelihood of their success. For example, using AI in drug design can save up to 30% in research and development costs and reduce the time to market by up to 50%. It has also shown positive results in identifying effective drug compounds against the coronavirus.

Conclusion: This technology helps researchers simplify and speed up complex processes by providing powerful tools and algorithms. However, there are also challenges in using artificial intelligence in drug design, including the lack of sufficient data, the complexity of biological models, and the need for interdisciplinary expertise.

Keywords: Artificial Intelligence, Medicine, Simulation, Molecular, Pharmaceuticals

G-1319

Investigating The Quality of Persian Mobile Applications Related to Patients with MS

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Abstract:

Background and Aims: As the use of health-related applications increased, researchers sought to analyze them from different angles such as function, technology, benefits, risks, etc., so that other researchers and the target community could be aware of the current status of these applications. This study aimed to evaluate the quality of Persian mobile applications designed for MS disease based on the Mobile Application Ranking Scale.

There is no generally accepted criterion for evaluating the quality of applications; however, several studies have been conducted in the field of evaluating applications supporting chronic patients. One of the tools for evaluating mobile applications is the valid and reliable "MARS Mobile Application Rating Scale". its goal is to examine the attractiveness, functionality, aesthetics, and quality of information in mobile applications.

Methods: This study was conducted on Persian mobile applications related to MS in January 2020. To identify these applications, a combined search of keywords related to "MS" and "mobile application" was done. Considering the popularity of the Android platform for mobile phones in Iran, researchers searched for the mentioned keywords in the "Cafe Bazaar" application. The Mobile Application Ranking Scale was adopted to evaluate the quality of applications.

Results: Ten applications were included in this study. The results showed that each application had a combination of goals, such as prevention (n=6), diagnosis (n=7), initial treatment (n=10), and disease control (n=1) to increase awareness of the disease. One of the goals of all applications was to inform the users about the initial treatment. The initial installation version of all ten apps was free, but eight of them needed in-app purchases to upgrade information. According to the MARS scores, none of the apps were suitable for helping patients.

Conclusion: The results showed that most Persian application designers have paid attention to the interactive aspects of applications and have neglected to provide scientific content. Developers of these applications are advised to evaluate them in the first place and then make them available to the public so that low-quality applications would not be available to patients.

Keywords: Multiple Sclerosis, Mobile Applications, Mobile

G-1320

Integrating Telemedicine and Cost-Effective Neurosurgical Services: Iran's Strategic Role in Advancing Global Health Tourism

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Abstract:

Background and Aims: Neurosurgical services in developed countries are often prohibitively expensive, restricting access to advanced care for many patients globally. Iran, however, provides high-quality neurosurgical procedures at significantly lower costs, creating an opportunity to enhance global health tourism. This study aims to explore how Iran can leverage its cost-effective healthcare and telemedicine innovations to become a leading destination for international patients seeking affordable, high-quality neurosurgery.

Methods: The research evaluates a newly developed platform that integrates telemedicine with neurosurgical expertise in Iran. The sample includes international patients accessing online consultations, top Iranian neurosurgeons, and collaborating hospitals. The platform employs advanced telemedicine tools, such as secure radiology transfer systems, and offers comprehensive health tourism services, including visa support, luxury accommodations, and post-operative care. Data were collected on service quality, cost comparisons, and patient satisfaction through platform usage and feedback analysis.

Results: Findings reveal that Iran offers neurosurgical procedures at a fraction of the cost in developed nations, with no compromise in quality, often surpassing international standards. The telemedicine platform successfully facilitated remote consultations, rapid medical image sharing, and personalized treatment plans for over 80% of sampled patients. Patient satisfaction rates exceeded 90%, driven by affordability, convenience, and comprehensive support services. The platform also generated significant foreign currency revenue, boosting Iran's medical tourism sector.

Conclusion: This innovative integration of telemedicine and cost-effective neurosurgery positions Iran as a global leader in health tourism. The findings suggest that affordable, high-quality healthcare can be made accessible worldwide through strategic use of technology and

competitive pricing. This model not only improves patient outcomes but also drives economic growth in Iran by attracting international patients. Future efforts should focus on expanding the platform's reach and enhancing collaborations with global medical institutions to further elevate standards and scalability.

Keywords: Revolutionizing Global Neurosurgical Care and Health

G-1321

Design and Implementation of an Innovative Medical Image Sharing Platform Using Messaging Applications and AI-Driven Diagnostics

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Abstract:

Background and Aims: Medical image sharing among professionals is often hindered by incompatible formats, large file sizes, limited bandwidth, and security concerns, delaying critical collaboration. This study aims to design and implement a novel platform that enhances medical image sharing through messaging applications, integrated with an artificial intelligence-powered diagnostic server, to improve efficiency and patient outcomes.

Methods: the platform features a multi-layered architecture. The first layer standardizes images from various modalities for uniform processing. The second layer applies advanced compression techniques, reducing file sizes by up to 70% while maintaining quality. The third layer uses dedicated APIs to enable seamless image sharing via popular messaging services. A secure server with machine learning algorithms analyzes images and generates preliminary diagnostic reports, transmitted alongside images. Robust encryption ensures data security. Performance and security were evaluated using diverse image sets and simulated transmission scenarios.

Results: The platform processes and transmits images in under 10 seconds, preserving high diagnostic quality. Compression achieves significant file size reduction without compromising detail. Artificial intelligence-assisted diagnostics demonstrate notable accuracy in preliminary reports. Security tests confirm that patient data remains encrypted and protected from unauthorized access throughout the process.

Conclusion: This platform effectively addresses barriers to medical image sharing by combining standardized handling, efficient compression, secure transmission, and artificial intelligence-driven diagnostics within accessible messaging applications. It accelerates expert consultations, reduces operational costs, and enhances access to diagnostic insights, ultimately improving

healthcare delivery and patient care. The integration of artificial intelligence not only streamlines workflows but also supports faster decision-making, suggesting potential for broader adoption in telemedicine and resource-limited settings. Further research could explore scalability and real-world implementation across diverse healthcare systems.

Keywords: Medical image sharing Messaging applications Artificial

G-1322

Prediction and Simulation of Clinical Crises in the Intensive Care Unit Using Artificial Intelligence and Machine Learning: scoping review

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Abstract:

Background: Intensive care units (ICUs) are environments where patients with critical and life-threatening conditions are treated. Managing these patients has always been a significant challenge for healthcare teams due to the complexity of clinical conditions and the high volume of data. In the current era, technologies based on artificial intelligence (AI) and machine learning (ML) are widely used in medical fields. This study aims to review the role of these technologies in predicting and simulating clinical crises in ICUs.

Methods: This scoping review was conducted using a structured search strategy across Google Scholar, PubMed, ScienceDirect, and Scopus. Studies from the past five years, published in English, with full-text availability, and based on reliable clinical data, were included. Non-relevant studies, non-ICU research, and those lacking sufficient data were excluded. Titles and abstracts were screened, and five relevant studies were selected for qualitative analysis. Search Strategy: ("Artificial Intelligence" OR "Machine Learning" OR "AI") AND ("Clinical Crisis" OR "Crisis Prediction" OR "Clinical Prediction" OR "Simulation") AND ("Critical Care" OR "Intensive Care Units" OR "ICU") AND ("Simulation" OR "Modeling")

Results: Machine learning models demonstrated high accuracy in predicting ICU patient mortality, early sepsis detection, and acute intraoperative hypotension. Additionally, these models improved mortality prediction in ARDS patients and acute kidney injury by identifying key risk factors, enabling preventive interventions.

Conclusion: The use of artificial intelligence (AI) and machine learning (ML) in predicting and simulating clinical crises in intensive care units (ICU) shows significant potential for improving patient outcomes. These models analyze complex data, identify hidden patterns, and facilitate early detection and preventive interventions. However, further studies and validation in diverse clinical settings are necessary to ensure their accuracy and reliability.

Keywords: AI, Crisis Prediction, ICU, Simulation

G-1323

Advancing Personal Nutrition through Artificial Intelligence: Implications for Hypertension Management

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Abstract:

Background and Aims: Hypertension is a serious global health issue and a leading contributor to heart disease and early death. Unfortunately, many people with high blood pressure go undiagnosed or aren't properly treated, which points to the urgent need for better management strategies. While traditional dietary approaches, like the Dietary Approaches to Stop Hypertension, have been useful, they don't always account for the unique needs of each individual. This review looks closer at how Artificial Intelligence could play a key role in creating more personalized nutrition plans to better manage hypertension and address these shortcomings.

Methods: Computerized search methods were combined with manual literature searches. A detailed review of the most prominent articles from 2010 to 2025 is provided. In this article, Science Direct and PubMed databases were searched. Priority was given to studies on children and adolescents that dealt with this issue from a developmental perspective.

Results: Artificial intelligence techniques can improve health outcomes by generating personalized nutritional recommendations tailored to individual needs and by analyzing complex data. Machine learning algorithms can predict the risk of developing high blood pressure using physical examinations or electronic health records. AI-powered platforms that recommend personalized meal plans for Blood Pressure management leverage biofeedback to tailor dietary interventions. Studies show that AI-driven nutritional treatment substantially affects patient engagement, adherence, and overall satisfaction. Artificial Intelligence can also analyze patient-provider messages in digital health settings to improve communication and support hypertension management.

Conclusion: Artificial Intelligence offers useful interventions for personalized nutrition in the treatment of hypertension by examining multifactorial data, identifying risks, and adjusting diets. AI-powered platforms and mobile apps could facilitate better patient access to treatment and adherence to nutritional recommendations that help control blood pressure. More research is

needed to confirm such findings and examine the long-term effects of AI-guided personalized diets.

Keywords: Hypertension, Artificial Intelligence, Personalized Nutrition, Dietary-Management

G-1325

Smart Pharmacies in Hospitals: A Review of Advancements and Future Directions (2020-2024)

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Abstract:

Background and Aims: The healthcare industry is undergoing a paradigm shift with the integration of smart technologies, and hospitals are at the forefront of these advancements. Among various innovations, smart pharmacies have emerged as a crucial component in enhancing medication management, improving patient safety, and optimizing operational efficiency. This study examines the development and integration of smart pharmacies in hospitals from 2020 to 2024, analyzing their components, benefits, challenges, and future potential.

Methods: This research explores smart pharmacy technologies, including automation, artificial intelligence (AI), machine learning (ML), (IoT), and blockchain. It evaluates their impact on drug distribution, inventory management, and patient safety through recent implementations and case studies.

Results: Definition of Smart Pharmacies: These pharmacies leverage advanced technologies such as automation, AI, ML, and IoT to improve medication distribution, patient safety, and inventory control. Technological Advancements: Automated Drug Dispensing Systems (ADS): Reduce human errors and improve medication accuracy. AI and ML: Predict medication demand, optimize inventory levels, and detect drug interactions. IoT Integration: Enables real-time monitoring of storage conditions and medication tracking. Blockchain: Enhances transparency in the pharmaceutical supply chain and prevents counterfeit drugs. Benefits of Smart Pharmacies: Enhanced medication safety through reduced prescription errors. Improved operational efficiency and reduced patient waiting times. Cost reduction by minimizing medication errors and optimizing inventory. Improved patient experience with timely and accurate drug delivery. Challenges and Considerations High Initial Investment: Significant costs for installation and staff training. System Integration Issues: Difficulty in merging new technologies with existing hospital systems. Data Privacy and Security Concerns: Risks associated with digital data management. Resistance to Change: Need for retraining staff to adapt to new technologies. Future Directions AI-Driven Enhancements: Further improvements in medication accuracy and virtual pharmacist interactions. Advanced Robotic Dispensing Systems: Expansion of robotic technologies for more efficient medication management. Augmented Reality Applications: Potential use of AR to streamline pharmacy operations and training.

Conclusion: Smart pharmacies represent a transformative advancement in hospital medication management, significantly improving safety, efficiency, and cost-effectiveness. While challenges such as integration, security, and staff adaptation remain, the long-term benefits of smart pharmacies outweigh these obstacles.

Keywords: Smart Pharmacies, AI

G-1326

Explaining Ethical Values of Artificial Intelligence in Healthcare with Emphasis on Iranian-Islamic Culture

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Abstract:

The integration of artificial intelligence (AI) into healthcare presents numerous ethical challenges and opportunities. This paper examines the ethical challenges of AI in health data management, emphasizing Islamic values and Iranian culture. The main objective of this research is to propose an ethical framework that aligns technological advancements with the fundamental principles of Iranian-Islamic culture.

Background: Previous studies have primarily focused on Western ethical frameworks, which often lack depth in understanding the religious and cultural sensitivities of Iran. Islam emphasizes equitable access to healthcare services and the necessity of cultural competence in medical care. Concepts such as justice, privacy, accountability, and the preservation of human dignity hold a special place in Islamic ethics and can serve as a solid foundation for overcoming these challenges. Additionally, the use of Islamic jurisprudence principles, such as *maslahah* (public interest), can facilitate responsible AI governance.

Methods: This research employs a descriptive-analytical approach utilizing library resources. Data were collected from scientific articles, reference books, and Islamic sources. Data analysis was conducted based on Iranian-Islamic ethical principles and contemporary challenges in AI ethics.

Results: The results indicate that integrating Islamic values and Iranian culture into AI ethics development can enhance patient-provider relationships and increase trust in AI systems. Patient data privacy must be protected against breaches and misuse, and informed consent and transparency in AI technology usage are essential.

Conclusion: This paper emphasizes the necessity of creating a comprehensive ethical framework that encompasses both utilitarian and deontological perspectives. Adhering to ethical obligations such as justice and dignity not only does not hinder AI's utility but also enhances its effectiveness. Combining traditional Iranian-Islamic ethics with contemporary AI ethics discussions can help formulate guidelines that promote the ethical development of AI in healthcare. These guidelines aim to shape a future where AI not only improves health outcomes but also aligns with the ethical expectations of Islamic societies.

Keywords: Ethics, AI, Healthcare, Culture, Values, Integration

G-1331

Integration of Artificial Intelligence and Complementary Technologies in Cancer Diagnosis: A Focus on Prostate and Breast Cancer

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Abstract:

Background and Aims: Cancer is a leading cause of mortality worldwide, with prostate and breast cancers being among the most prevalent types. Early and accurate detection is critical for improving survival rates and treatment success. Recent advancements in artificial intelligence, particularly deep learning and convolutional neural networks, have enabled automated and precise cancer diagnosis. This study systematically evaluates advanced artificial intelligence-based methodologies, focusing on hybrid models, multimodal data integration, and complementary technologies to enhance diagnostic accuracy.

Methods: This research explores deep learning architectures, including multi-scale convolutional neural networks, transformer-based models, federated learning, and hybrid artificial intelligence frameworks applied to multimodal medical data. Additionally, it examines the role of complementary technologies such as the Internet of Things for real-time data acquisition, cloud computing for large-scale processing, edge computing for distributed analysis, and blockchain for secure and decentralized medical data management. The study evaluates models based on sensitivity, specificity, and computational efficiency while addressing challenges in clinical deployment.

Results: Findings indicate that artificial intelligence models utilizing self-attention mechanisms and ensemble learning significantly enhance cancer detection accuracy. Specifically, convolutional neural networks trained on large-scale labeled datasets achieved over 99% accuracy in breast cancer detection and 97.4% in prostate cancer diagnosis. Integrating real-time Internet of Things-based monitoring with artificial intelligence models improves early detection, while blockchain technology enhances data security and interoperability in collaborative cancer research.

Conclusion: Advanced artificial intelligence-based models have improved the accuracy, speed, and reliability of medical imaging interpretation and histopathological analysis. The integration of deep learning with digital health technologies offers a scalable and cost-effective solution for automated, non-invasive cancer screening. Future research should focus on improving model

generalization through transfer and federated learning, diversifying training datasets, and incorporating multi-omics data for precision oncology and personalized treatment strategies.

Keywords: Artificial Intelligence, Deep Learning, Cancer Diagnosis

G-1334

Unveiling Patterns: A Comparative Study of Machine Learning Clustering Techniques on Synthetic Headache Data for Real-world data Prediction

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Abstract:

Background and Aims: Headaches are recognized as one of the most prevalent health issues, affecting millions of people worldwide daily. Given its potential to disrupt lives and pose life-threatening risks, accurate diagnosis and effective management are paramount. Considering the limitations posed by real-world data, synthetic data generation emerges as a powerful tool for deeper analysis. This study aims to compare and evaluate various Clustering methods in Machine Learning applied to synthetic datasets representing different types of headaches. The analysis seeks to uncover hidden patterns and structures within the data, ultimately contributing to the enhancement of predictive models and improving headache diagnosis.

Methods: Comprehensive data on primary and secondary headache disorders were extracted from state-of-the-art versions of resources, including UpToDate, Applied Therapeutics: The Clinical Use of Drugs, The 5-Minute Clinical Consult, Symptoms in the Pharmacy, Community Pharmacy, and Aminoff's Neurology and General Medicine. The collected features of headaches were used to construct a synthetic dataset with the assistance of Synthetic Data Generation Libraries in Python. Subsequently, preprocessing was performed separately for each data type within the heterogeneous dataset, which comprised long-text categorical data, short-text categorical data, and numerical data. The final preprocessed dataset was then utilized to analyze, compare, and evaluate clustering patterns. It was applied to various clustering models, including DBSCAN, HDBSCAN, OPTICS, Agglomerative Clustering, GMM, and Hybrid Agglomerative-DBSCAN, using different hyperparameter configurations. Finally, the Cluster Purity metric was employed to assess the alignment of the dataset with the clustering models.

Results: The performance of seven clustering algorithms was evaluated based on Cluster Purity. The results indicate that DBSCAN, HDBSCAN, and OPTICS achieved a purity score of 0.9285, while Hybrid Agglomerative-DBSCAN obtained 0.9285 without hyperparameter tuning and 1 with optimized parameters. In contrast, Agglomerative Clustering yielded 0.7254, and GMM recorded 0.7142.

Conclusion: Based on the evaluation results, Hybrid Agglomerative-DBSCAN emerged as the most effective approach, achieving the highest Cluster Purity score of 1, demonstrating superior clustering accuracy. These findings suggest that Hybrid Agglomerative-DBSCAN can effectively identify the appropriate cluster within real-world patient data, facilitating precise classification of headache-related clusters.

Keywords: Headache, Machine Learning, Artificial Intelligence, Synthetic Data Generalization, Clustering Techniques, Unsupervised Learning

G-1335

The Necessity of Moving Towards Smart Hospitals

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Abstract:

Background and Aims: In recent years, global healthcare systems have faced numerous challenges, including rising patient demand, increasing costs, and inefficiencies in traditional care models. As the world enters an era dominated by digital transformation, smart hospitals have emerged as a potential solution to these challenges. By integrating advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), data analytics, and telemedicine, smart hospitals aim to enhance patient care, optimize operations, and create a more sustainable healthcare environment.

Methods: This study examines the role of smart hospitals in modern healthcare by analyzing their impact on patient safety, operational efficiency, cost reduction, and healthcare accessibility. It explores key technological implementations and the challenges associated with adopting smart hospital models.

Results: Enhanced Patient Safety and Care: Smart hospitals facilitate faster interventions, reduce medical errors, and improve diagnostic accuracy. Operational Efficiency: AI-driven automation optimizes resource management, reduces patient wait times, and handles routine administrative tasks. Telemedicine Integration: Remote healthcare services expand access to medical care in rural areas while alleviating the workload of healthcare professionals. Cost Reduction: Although implementing smart hospital technologies requires significant initial investment, they lead to long-term financial savings by reducing operational inefficiencies. Challenges and Considerations High Initial Costs: Implementing smart hospital infrastructure requires substantial investment. Data Security and Privacy: The widespread use of digital technologies raises concerns about patient data protection. Staff Training: Ensuring that healthcare personnel are adequately trained to work with new technologies is essential for successful adoption.

Conclusion: The transition to smart hospitals is no longer a luxury but a necessity in modern healthcare. By integrating innovative technologies, these hospitals provide a pathway to improved patient care, enhanced operational efficiency, and solutions to systemic challenges such as workforce shortages and rising costs. While challenges exist, the long-term benefits of smart hospitals far outweigh the obstacles. As healthcare continues to evolve, the adoption of smart hospitals will play a crucial role in shaping the future of medicine and healthcare delivery, leading to better patient outcomes and more efficient healthcare systems.

Keywords: Smart Hospitals, Digital Healthcare, Artificial Intelligence

G-1336

The Effectiveness of Applying Artificial Intelligence in Sick Children's Communication

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Abstract:

Background and Aims: Children facing severe illnesses often struggle to communicate due to their health conditions and hospitalization. Effective communication is essential to ensure these children receive appropriate emotional and medical care. Traditional communication approaches are insufficient in the case of children with complex conditions. AI technology like image-guided e-books and therapeutic games can improve pediatric patients' confidence and interaction with nurses. This study aims to prove that AI-generated image teaching materials can improve communication with sick children.

Methods: The current systematic review study was conducted by systematic searching in reputable scientific databases, including PubMed, Scopus, Web of Science, and Google Scholar, from 2015 to 2024 using the keywords "Artificial Intelligence," "Children's Communication," and "Sick Children." Articles related to the study aim were also evaluated through the Mixed Method Appraisal Tool (MMAT). Finally, 6 studies were included in the research.

Results: Tools such as AI-generated images, speech-to-text devices, and AI companions also significantly reduced communication time among pediatric patients. For instance, if facial recognition software identified an emotional state, it would inform the caregiver so they could respond with empathy. Several studies in this field noted improved patient satisfaction, decreased communication barriers, and greater emotional comfort.

Conclusion: Abstract AI-based image tools surpass traditional methods by supporting communication with sick children and providing transformative, empathetic solutions to clinical and emotional needs. AI enables better, more appropriate interactions that engage and empower

pediatric patients as partners in their care while still allowing personalized, empathetic clinical attention.

Keywords: Artificial Intelligence, Children's Communication, Sick Children

G-1337

Transformation in Medical Education with Generative AI: From Advanced Generative Models to Enhanced Clinical Skills

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Abstract:

Background and Aims: With the rise of digital technologies, generative artificial intelligence (Generative AI), through advanced models such as GPT-4, Med-PaLM, and Stable Diffusion, has introduced transformative possibilities for medical education. These tools enable the generation of precise educational content and realistic clinical simulations, addressing limitations of traditional teaching methods. This study aimed to assess the impact of generative AI on improving diagnostic accuracy, accelerating clinical decision-making, and enhancing learning satisfaction among medical students and specialized residents.

Methods: A randomized controlled trial was conducted at a teaching hospital and medical university from January to June 2024. A total of 150 medical students and residents were randomly assigned to three equal groups (n=50 each):

Control Group: traditional in-person teaching with standard materials.

Experimental Group 1: AI-based education using simulated clinical cases developed by Med-PaLM and ChatGPT.

Experimental Group 2: blended learning combining traditional and generative AI methods.

Evaluations included diagnostic accuracy (via image- and case-based tests), response times in simulated clinical scenarios, and learning satisfaction (via standardized questionnaires). Assessments occurred at three points: before training, immediately after, and one month post-training. Data analysis involved one-way ANOVA and multivariate regression.

Results: Average diagnostic accuracy scores were 72% (Control), 85% (Experimental 1), and 91% (Experimental 2), with significant differences across groups ($p < 0.01$). The hybrid group (Experimental 2) showed a 40% reduction in decision-making time and a 93% satisfaction rate, compared to 75% in the control group. These findings highlight the effectiveness of generative AI in advancing both clinical reasoning and learner engagement.

Conclusion: Generative AI, when integrated with traditional educational methods, can significantly enhance clinical training outcomes. Its ability to provide personalized, interactive, and realistic learning experiences marks it as a valuable tool for modern medical education.

Future studies should explore long-term impacts, develop implementation frameworks, and address ethical considerations surrounding AI use in education.

Keywords: GenerativeAI, MedicalEducation, ClinicalSimulation, Artificial Intelligence, Advanced Generative Models

G-1338

Introduction to Deep Learning in Medical Image Processing

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Abstract:

Background and Aims: Deep Learning (DL) has significantly improved the processing of medical images, particularly through the use of Convolutional Neural Networks (CNNs). These networks help automate the analysis of medical images, enhancing the accuracy, speed, and efficiency of diagnostic processes. This paper explores the main applications, challenges, and recent advancements in deep learning for medical image processing, including disease detection, image segmentation, and patient prognosis prediction.

Methods: The study investigates the use of CNNs in extracting complex features from medical images, highlighting the role of deeper networks and new models such as ResNet and DenseNet. It also examines advancements in image segmentation techniques, including the use of models like U-Net and Attention U-Net, which focus on critical areas of images such as tumors or organs. Additionally, the paper explores the application of deep learning in disease diagnosis, classification, and prognosis prediction using medical imaging.

Results: Key findings show that deep learning models, particularly CNNs, have significantly improved diagnostic accuracy in detecting diseases such as cancer, diabetic retinopathy, and heart conditions. Models such as U-Net and Attention U-Net have made advancements in precise image segmentation, especially in MRI and CT scans. Furthermore, deep learning has proven effective in predicting disease progression, such as cancer recurrence and heart disease detection, based on medical images.

Challenges: Despite the vast potential of deep learning, several challenges remain:

Data and Labeling Scarcity: There is a need for large, labeled datasets for training deep learning models, which is a significant challenge in the medical field.

Interpretability and Explainability: Many deep learning models, such as CNNs, function as "black boxes," making it difficult to interpret and explain their results.

Computational Resources: Training deep learning models requires significant computational power, which can be a barrier for many hospitals and medical centers.

Conclusion: Deep learning has revolutionized medical image processing, and despite its challenges, its applications in enhancing diagnostic accuracy and predicting disease progression

are expanding rapidly. Addressing the challenges of data scarcity, model interpretability, and computational resources will be crucial to furthering the impact of deep learning in healthcare

Keywords: Deep Learning, Convolutional Neural Networks (CNN)

G-1339

Saving Financial and Human Resources by Smart Pharmacies

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Abstract:

Background and Aims: The advent of smart pharmacies has revolutionized the pharmaceutical industry by introducing significant financial and human resource savings. Through the integration of advanced technologies such as automation, artificial intelligence (AI), and remote drug dispensing, these pharmacies enhance operational efficiency, reduce labor costs, and improve patient care quality. This study explores the impact of smart pharmacies on pharmacy operations, workforce optimization, and remote pharmaceutical services.

Methods: This research reviews the role of automation, AI-driven workforce management, and telemedicine integration in smart pharmacies. It examines how these technologies streamline inventory management, prescription distribution, billing processes, and customer service interactions.

Results: Automation in pharmacies simplifies various processes, including inventory control, prescription distribution, and billing. Automated dispensing systems efficiently manage drug inventories, ensuring accuracy in stock levels and timely replenishment, thereby preventing overstocking or shortages. This efficiency leads to cost savings and improved cash flow.

AI and machine learning optimize workforce scheduling and workflow management in smart pharmacies. Predictive analytics forecast peak hours, allowing for effective labor planning and minimizing overstaffing or shortages. AI-powered chatbots and virtual assistants handle routine customer inquiries, enabling pharmacists to focus on more complex tasks and patient consultations. This delegation enhances employee productivity and job satisfaction.

Furthermore, the integration of remote drug dispensing and telemedicine services expands the reach of pharmacies, enabling remote patient care. This approach reduces the need for extensive physical infrastructure while allowing pharmacies to serve a broader patient base without additional physical locations. Online pharmacy platforms facilitate remote consultations, prescription verification, and patient education, all of which contribute to cost savings and improved healthcare accessibility.

Conclusion: Smart pharmacies represent a transformative shift in the pharmaceutical industry, leveraging automation, AI, and telemedicine to enhance efficiency, reduce costs, and improve patient care. While these advancements offer substantial benefits, successful implementation

requires addressing technological integration challenges and regulatory considerations. The future of smart pharmacies holds great promise for further optimizing healthcare services and expanding access to medication management.

Keywords: Smart Pharmacies, Automation, Artificial Intelligence

G-1341

Predicting Occupational Risk Using Machine Learning and Deep Learning: A Comparative Study of NLP-Based Models

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Abstract:

Background and Aims: Identifying and evaluating human errors in the shortest time with high accuracy can significantly reduce occupational accidents and related damages. Given the advancements in Natural Language Processing (NLP) and Machine Learning (ML), this study aims to compare the accuracy and efficiency of various ML and Deep Learning algorithms in risk prediction.

Methods: This descriptive cross-sectional study was conducted on the job tasks of overhead crane operators in a process industry. The tasks of 18 cabin and remote-controlled overhead crane operators were analyzed using the HTA method, and the probability of human error for each task was quantitatively calculated using the HEART method. In this study, text data processing included stop-word removal, tokenization, stemming, and vectorization using the TF-IDF method. After preprocessing the data and splitting it into training and testing sets, ML models, including KNN, Random Forest, and SVM, as well as deep learning models such as LSTM and CNN, were trained for risk level prediction.

Results: There was an imbalance in risk action distribution, where low-risk assessments were significantly more frequent than the "medium" and "high" categories. Among the models evaluated, SVM achieved the highest overall accuracy (93%) and demonstrated superior performance in precision, recall, and F1-score, making it the most balanced and efficient model. The CNN model also performed strongly with 92% accuracy, particularly excelling in textual data classification.

Conclusion: This study demonstrates that the application of machine learning (ML) and deep learning models, particularly support vector machines (SVM) and convolutional neural networks (CNN), can effectively assist in identifying and predicting risks arising from human errors in process industries. The high accuracy of these algorithms makes them suitable options for risk management in work environments. Organizations are encouraged to implement these models in their risk prediction systems. Additionally, further research to explore influential factors in human errors and assess the efficiency of other algorithms in different industrial domains can enhance predictive accuracy and reduce workplace incidents.

Keywords: NLP, Risk Analysis, Deep Learning, Human_Error

G-1346

Applications of artificial intelligence in prostate cancer diagnosis

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Abstract:

Background: Prostate cancer is one of the fetid cancers affecting men around the world and is a significant contributor to cancer-related mortality. For effective treatment, early diagnosis is essential; however, conventional ways of diagnosis in cases like biopsy and digital rectal examination are invasive and, in most situations, lead to unnecessary procedures. The new incorporation of artificial intelligence and machine learning technologies offers potentially viable routes to improve diagnostic accuracy and aid patient management. The review describes AI's applications in interpreting molecular imaging and histopathological data for prostate cancer detection.

Methods: Meanwhile, traditional machine learning approaches, such as support vector machines (SVMs) and ensemble methods, are discussed concerning feature extraction and classification. A systematic review was performed of databases (PubMed, Web of Science, and Scopus) of these studies published from December 2015 onward. The review highlights the need for large, high-quality annotated datasets to train these models adequately to address the problems posed by data scarcity and variability in clinical settings.

Results: The application of AI techniques has positively influenced the detection and characterization of prostate cancer. For example, a study employing CNNs has been reported to yield up to 91% recall in detecting cancerous lesions from histopathology images. Also, AI-driven approaches are more accurate than conventional diagnostic methods, leading to fewer invasive procedures. Integrating radionics and assessing quantitative indexes obtained from medical images have also been mentioned as factors in improving accuracy and enabling treatment plans. AI applications are not limited to detection but extend into staging, treatment planning, and outcome prediction.

Conclusion: Artificial intelligence in the detection of prostate cancer makes a new paradigm shift in medical diagnostics. AI technologies and intense learning models have proved a boon to prostate cancer diagnoses' accuracy and efficiency. However, some bottlenecks remain, like the generation of high-quality datasets and the seamless integration of AI systems with clinical

workflows. Such problems should be cited in future studies and directed at improving model interpretability and, more importantly, ensuring research work geared toward clinical needs.

Keywords: Prostate Cancer, Artificial Intelligence, Machine Learning

G-1347

The role of artificial intelligence in health management

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Abstract:

Background: AI or Artificial Intelligence is an emerging technology that plays a significant role in health management as it enhances prediction, data analysis, and designing health interventions. Increasingly, health awareness and the need for health services have led to a very high increase in AI use in health management, particularly in forecasting natural disasters or managing health crises such as the COVID-19 pandemic. Many articles show that AI can identify and help further reduce health inequalities, optimize health services, and enhance the quality of primary healthcare.

Methods: This article describes the applications of artificial intelligence in health management based on different papers with their data. It defines ways to improve the decision-making process in health management analysis through machine learning techniques, natural language processing, and smart sensors. A systematic review of databases (PubMed, Web of Science, and Scopus) was conducted on those studies published in December 2015. It also discusses the ethical and legal challenges related to the use of AI, such as data protection, equity in accessibility of health services, etc.

Results: AI has been proven to increase the accuracy of predictions needed to enhance health interventions' efficiency. For example, using historical and current information on natural disasters, AI systems can identify potential at-risk populations and assist health authorities in allocating resources. Further, an instance of AI intervention in health crisis management would be the issues it raises in hastening the identification of health needs and resource allocation to pursue these needs

Conclusion: Artificial intelligence is poised to revolutionize health management, improve access to health services, and mitigate existing asymmetries. All the same, the ethical and legal concerns have to be resolved, and a proper data infrastructure developed. With AI, the future of health management is moving toward constructing an intelligent and efficient health system that can enhance the quality of life; therefore, the investment in research and development of AI-related technologies in health management must take center stage if this technology is to be beneficial.

Keywords: Artificial Intelligence, Health Management, Machine Learning

G-1348

The role of artificial intelligence in health system policies

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Abstract:

Background: AI has proved to be one of the key paradigms transforming health policy from vast health data to computational tools for prediction, analysis, and decision support. However, the fast adoption of AI in public health has accelerated, as it has helped solve multifactorial challenges. Fournier-Tombs (2023) emphasized AI applications in his discussions within and beyond COVID-19 in health service planning, public communication, and the tracking of infections.

Methods: We align the findings of the three peer-reviewed articles sourced from leading journals (Frontiers in AI, Journal of Public Health Policy, MDPI). The articles were chosen based on relevancy regarding AI in health policymaking and analyzed qualitatively. A systematic review was done within databases (PubMed, Web of Science, and Scopus) for studies published since December 2015. Fournier-Tombs uses the TAC framework (Transplantation, Adaptation, Creation) to evaluate the localization of AI models. Naumova studies causal AI methods, combining philosophies with statistical tools, such as Hill's criteria, Granger causality, and Pearl's causal diagrams.

Results: The result indicates that AI has a multi-faceted impact on health policymaking. Allam et al. Fournier-Tombs are showing that AI can perform public health through chatbots in communication and predictive models for planning, but a TAC framework shows that locally created models outperform transplanted ones, yet capacity building and transparency are required. Naumova proposed that causal AI utilizing causal diagrams can predict unintended policy consequences and improve decision-making. However, limitations, such as biased and imperfect datasets and the absence of standardized protocols for data sharing, inhibit all potential of AI.

Conclusion: AI has great potential to improve health policy making from early detection of illnesses to causal analysis, local model development, and many more. However, several challenges must be resolved, such as data privacy, model bias, and global collaboration. Frameworks such as TAC and causal tools provide pathways for designing more effective

interventions. To maximize AI's impact, standardized data-sharing protocols were recommended to improve accuracy and scalability. AI can become a central actor in urban health policies by forming timely and credible responses to public health emergencies.

Keywords: Artificial Intelligence, Health Policy, Causal Analysis

G-1350

The role of accompanying health in improving the health of pregnant women

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Abstract:

Background: The rise of mobile health (mHealth) represents a significant advancement in healthcare delivery because smartphones have become ubiquitous among pregnant women. Through these technologies, women gain access to vital information and health management resources while reducing the necessity for face-to-face medical consultations, which benefits underserved groups such as low-income women or those managing diabetes. The quality and accuracy of these applications remain problematic alongside privacy issues, which underscore the necessity of examining their effectiveness and adaptability for different categories of pregnant women.

Methods: Five scientific articles provided this narrative review's basis for studying mHealth applications for pregnant women. The research articles originate from trustworthy sources and include studies that utilize both qualitative and quantitative methods. The research team systematically reviewed app quality through usability principles and surveyed perceptions of underprivileged communities in their final study. The research team systematically reviewed studies in PubMed, Web of Science, and Scopus databases published since December 2015. The research results were synthesized narratively to expose trends, preferences, and gaps in mHealth apps for pregnant women.

Results: Through mHealth applications, pregnant women monitor their physical health data, such as weight and blood glucose levels, while learning about fetal development and nutrition and building social networks. An app achieved high usability scores (66.65%) and 98% user satisfaction by delivering accurate results and facilitating doctor connections. The review indicated that merely 41% of the apps provided comprehensive features, yet it was uncommon to find text search (24%) or scientific citations (28%). Both privacy issues and inaccurate information presented challenges that highlighted the inconsistent quality of apps.

Conclusion: Mobile health is indeed the future of the care offered to pregnant women in terms of self-management, education, and access to services-especially in resource-limited settings. Efficient, high-quality applications will become tools for tracking and empowering women's

health during pregnancy. Improvements in accuracy, privacy protection, and information standardization for reliability would still be needed.

Keywords: M Health, Pregnant Women, Healthcare Delivery

G-1351

The challenges of using artificial intelligence in the field of medical education

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Abstract:

Background: Artificial Intelligence is the biggest game-changer for medical education. AI-generated visual art, cutting-edge adaptive learning systems, and large language models - like ChatGPT- will equip students with visualization, personalized learning, and enhanced clinical decision-making skills. However, the challenges of incorporating such technologies into medical education include accuracy, ethics, and resource demands in education systems as diverse as China's secondary vocational system and the specialism of radiation oncology.

Methods: These authors have reviewed the narrative literature and synthesized data/findings from five articles on the use of artificial intelligence in medical education: two sets of qualitative and quantitative studies encompassing one assessing benefits of AI-generated art and challenges associated with it, another assessing ChatGPT performance in radiation oncology exams and cases, a third mirroring this assessment, a fourth describing reforms to vocational medical education in China, and the fifth looks at mHealth preferences among low-income pregnant women (used here for broader AI comparisons). The researchers systematically reviewed PubMed, Web of Science, and Scopus databases for studies published since December 2015. Data were narratively synthesized to identify common barriers across contexts.

Results: AI in medical education visualizes complex concepts such as anatomy, personalizes educational content, and simulates clinical scenarios. For example, ChatGPT proved 74.57% accurate on the ACR TXIT exam and suggested several new cases for the Gray Zone. High investment and training of educators will be needed for implementing AI, with some resistance to changing traditional systems. Furthermore, because ChatGPT cannot analyze medical images, its reliability is reduced by its surface understanding of several domains; hence, it must be duly verified and fine-tuned for specific domains.

Conclusion: The barriers include accuracy, ethical issues, and the question of equal resources that deter mass application. To move on, one has to work on standardized assessments, robust ethical frameworks, and the provision of infrastructure and training. The following steps in this direction

must include developing AI tools for specific medical areas and disseminating them among different educational platforms, thereby enhancing the advantages of AI in education.

Keywords: Artificial Intelligence, Medical Education, Ethics

G-1353

Deep Learning for Breast Cancer: Advances in Diagnosis

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Abstract:

Background and Aims: Breast cancer is a malignant tumor originating in breast tissue, mainly affecting ductal and lobular cells. Key risk factors include genetic mutations, hormonal influences, and environmental factors. Early detection through screening is vital for improving survival rates. Recent advancements in artificial intelligence (AI) are revolutionizing medical practices by enhancing diagnostic accuracy, personalizing treatment plans, and increasing operational efficiency. In mammography, AI improves risk assessment, evaluates breast density, and facilitates early tumor detection through advanced image analysis techniques, ultimately enhancing the quality of mammography services.

Methods: Studies conducted on the PubMed database, along with case-based research, suggest that artificial intelligence (AI) can significantly improve the analysis of mammography images. Through deep learning, AI, by examining mammograms of both healthy and cancerous individuals from various articles, can identify patterns in breast tissue. This capability enables AI to distinguish between individuals with and without cancer with greater accuracy.

Results: Breast cancer screening has evolved from analog systems to digital mammography over the past 30 years. The introduction of AI and deep learning has improved automated detection methods. Recent advancements in artificial intelligence, especially deep learning, greatly improve mammography diagnosis. These models accurately detect subtle patterns, increasing speed and precision in breast cancer detection. This leads to more effective screening and better healthcare outcomes.

Conclusion: Computer systems for breast cancer detection in digital mammography have improved significantly. However, comparisons with radiologists require large-scale trials, and legal/ethical issues need addressing. Additionally, minimizing false positive results is crucial to prevent unnecessary costs and procedures in the screening process.

Keywords: Deep Learning, Diagnosis, Mammography

G-1354

Internet of Things (IoT) Applications in Hospitals

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Abstract:

Background and Aims: The Internet of Things (IoT) represents a network of interconnected, wireless devices that gather and store data, thereby eliminating the need for direct human-to-human or human-to-computer interaction. In light of the critical role that modern technologies play in hospitals and healthcare facilities, this study explores the diverse applications of IoT within these settings.

Methods: The present study was a scoping review conducted in March 2025. the valid databases such as PubMed and Scopus, utilizing search strategy (((iot) OR ("internet of things")) AND ("hospitals")) OR ("hospital")) was searched. In an initial review of databases, a total of 358 articles were retrieved. After removing the duplicate and irrelevant items based on the evaluation of the titles, abstracts and full texts, 10 articles were selected. The relevant data was extracted from this original research articles and summarized.

Results: A total of 10 articles were included in the study. The application of IoT had been introduced by 8 articles. The positive impact of the application of IoT systems on reducing hospital infections, saving time, and improving the quality of health services had been examined in 3, 4, and 2 articles, respectively. The findings reveal that IoT can be effectively implemented across various hospital departments, with notable applications including the reduction of errors through IoT platforms, the development of proactive healthcare management systems in smart hospitals, and the use of RFID-enabled wristbands for accurate patient identification. Furthermore, IoT facilitates nurse call systems that enhance communication between patients and caregivers, contributes to infection control and the establishment of safer medical environments, and enables access to real-time data and location information via IoT sensors. The installation of these sensors throughout hospitals aids in efficient patient tracking.

Conclusion: The integration of IoT systems within hospitals significantly enhances healthcare quality and improves patient outcomes. This technology also presents opportunities for

bolstering device and database security in healthcare environments. Overall, IoT is increasingly recognized for its potential to boost efficiency in hospitals and healthcare centers, paving the way for more effective and responsive patient care.

Keywords: Internet of Things, Hospital, Healthcare

G-1355

The Role of Artificial Intelligence Tools in Improving the Quality of Clinical Care

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Abstract:

Background and Aims: Artificial Intelligence (AI) has emerged as a transformative force in healthcare, offering innovative solutions to enhance clinical decision-making, diagnostics, and patient outcomes. This review explores the integration of AI tools—such as machine learning (ML), natural language processing (NLP), and predictive analytics—into clinical care. Key findings highlight AI's potential to reduce diagnostic errors, personalize treatment plans, and optimize resource allocation. Challenges, including data privacy concerns and algorithmic bias, are also discussed. The synthesis of recent studies underscores AI's capacity to augment, rather than replace, human expertise, fostering a future of precision medicine.

Background and Aims: The growing complexity of healthcare demands tools that improve efficiency and accuracy. AI's ability to analyze vast datasets and identify patterns aligns with these needs. This review aims to: evaluate AI's role in enhancing diagnostic accuracy, treatment personalization, and workflow efficiency; identify barriers to implementation; and propose strategies for ethical and equitable AI adoption in clinical settings.

Methods: A systematic literature search was conducted using PubMed, IEEE Xplore, and Google Scholar (2018–2023). Keywords included “AI in clinical care,” “machine learning in healthcare,” and “predictive analytics.” Peer-reviewed articles, clinical trials, and meta-analyses were prioritized. Studies were categorized into themes: diagnostics, treatment optimization, and operational efficiency.

Results: 1. Diagnostics: AI algorithms, particularly deep learning, have demonstrated superior performance in medical imaging (e.g., detecting tumors in radiology with 92–98% accuracy, surpassing human radiologists in some cases). NLP tools improved early sepsis prediction by analyzing unstructured EHR data. 2. Treatment Personalization: ML models predict patient responses to therapies, such as chemotherapy regimens in oncology, reducing adverse effects by 20–30%. 3. Operational Efficiency: AI-driven predictive analytics reduced hospital readmission

rates by 15% through risk stratification. Virtual assistants streamlined administrative tasks, saving clinicians 2–3 hours daily. 4. Challenges: Biases in training data (e.g., underrepresentation of minority groups) and interoperability issues between AI systems and legacy EHRs remain significant hurdles.

Conclusion: AI tools hold immense promise for elevating clinical care quality by enhancing accuracy, efficiency, and personalization. However, successful integration requires addressing ethical concerns, improving data diversity, and fostering interdisciplinary collaboration.

Keywords: Artificial intelligence, Clinical Care, Personalized Medicine

G-1357

Artificial Intelligence for Accurate Motion Tracking in Radiation Therapy: A Scoping Review

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Abstract:

Background and Aims: Managing intra-fraction motion to maintain accurate tumor targeting during radiation therapy remains one of the foremost challenges in the field. In recent years, artificial intelligence (AI) has demonstrated significant potential for real-time tracking of tumors during treatment. This review explores AI techniques and their applications in radiation therapy motion management.

Methods: A review according to PRISMA-ScR methodology was performed for studies published on PubMed between January 2020 and January 2025 using the following **Keywords:** radiation therapy, motion management, and artificial intelligence, excluding review articles. The title and abstract were screened independently by reviewers, followed by the full texts of the papers. Data extraction was done using a data collection form.

Results: The initial search yielded 56 articles. After the PRISMA-ScR-based study selection, a total of 26 studies were included. A total number of 830 cases were enrolled in these studies. In most studies, lung and liver cancer were the primary focus (21/26, 80%). Literature approaches were mostly deep learning (22/26, 84%), with classical machine learning (3/26, 12%) and a combination of both (1/26, 4%). The majority of studies (20/26, 77%) utilized imaging data, identifying key AI applications in motion management such as image reconstruction (5/26, 19%), image segmentation (4/26, 15%), deformable image registration (3/26, 11%), image decomposition (2/26, 7%), and image compensation (2/26, 7%). A smaller proportion of studies (6/26, 23%) employed signal-based data as input.

Conclusion: The study results indicate that deep learning holds significant potential for real-time tumor tracking and precise radiation therapy for patients. Image reconstruction and segmentation gained the most attention among the various techniques employed. In addition, the results underlined the continued need for research and development into more accurate motion management in radiation therapy.

Keywords: Radiation Therapy, Motion Management, Artificial Intelligence

G-1360

Bioinformatics study of genes related to skin cancer

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Abstract:

Background and Aims: Skin cancer is one of the most active types of cancer in the current decade. It is generally classified into two main categories: melanoma and non-melanoma skin cancer. Melanoma is a dangerous, rare and deadly skin cancer. Melanoma develops in cells called melanocytes. Various types of biologically active molecules can be seen in exosomes, which can be combined with them and transferred to target cells. The aim of this study was to bioinformatics study of gene expression and signaling pathways in skin cancer.

Methods and Results: To identify the differentially expressed genes, the combination of two criteria (2 Fold Change -2) and (Adj P-Value 0.05) was used. The obtained results were used to create a gene network. In this regard, to understand the molecular mechanism of communication between genes, the WGCNA package based on the R environment was used to identify hubs and gene modules in this disease. WGCNA is a valuable tool for correlation research between genes, identification of modules with high correlation and identification of Hub genes in different modules.

The skin is often described as a protective layer because it is the body's first line of defense. Melanoma is the most dangerous cancer and is the main cause of 74% of deaths, even though it accounts for only 4% of all skin cancer cases. Based on the analyzes performed in skin cancer and different signaling pathways, we examined genes and signaling pathways that are identical to previous research.

Conclusion: According to the investigations, it was observed that skin cancer has a significant relationship with the studied genes, and by increasing and decreasing the expression of genes, and by affecting the pathways of STAT3, PI3K, IL-22 and other investigated pathways, it induces, increases or decreases apoptosis in cancer.

Keywords: Skin cancer, LncRNA, mRNA, meta-analysis

G-1362

The Role of Artificial Intelligence in Improving the Pabon Lasso Model: The Future of Hospital Management

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Abstract:

Background and Aims: Effective hospital management relies on continuous performance evaluation to ensure high-quality healthcare delivery. The Pabon Lasso model is a well-established tool for assessing hospital performance through indicators such as bed occupancy rate and average length of stay. Nevertheless, complexities in data analysis may limit the model's comprehensive utility. The present study aims to explore the opportunities and challenges associated with incorporating artificial intelligence (AI) into the Pabon Lasso model for the enhancement of hospital management.

Methods: This study is a descriptive review of scientific literature, published management reports, and research articles related to the application of AI within the Pabon Lasso framework. Relevant information was systematically collected from scientific databases and available managerial documentation. Content analysis was employed to synthesize and interpret the findings.

Results: The integration of AI with the Pabon Lasso model may provide considerable benefits, including improved accuracy in forecasting patient admissions, more efficient allocation of hospital resources, and real-time monitoring of key performance indicators. Nonetheless, barriers such as inconsistent data quality, significant initial investment requirements, and organizational resistance to technological change persist as major challenges to effective implementation.

Conclusion: Applying AI to the Pabon Lasso model has the potential to enhance hospital performance management; however, achieving these benefits is contingent upon addressing issues related to data integrity, financial resources, and adoption of new technologies by healthcare personnel.

Keywords: Artificial Intelligence, Pabon Lasso, Performance Management

G-1363

Learning Rate Optimization of U-Net Architecture Using Grasshopper Optimization Algorithm to Enhance Accuracy in CT Image Segmentation of COVID-19 Patients

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Abstract:

Background and Aims: In light of its excellent learning accuracy and rate, rapid data processing, and independence from large databases for network training, the U-Net architecture is a well-known and popular deep learning architecture for image segmentation and feature extraction. Learning rate selection and updating are crucial in network training. As U-Net is a completely nonlinear network, classical mathematical optimization algorithms increase the probability of local optima. When initializing a neural network and selecting its associated hyper-parameters, there are typically two approaches that can be taken. In the first scenario, values are assigned based on empirical knowledge or prior experience with similar models. The second scenario involves using a metaheuristic algorithm to search for optimal solutions within a range of values that we know empirically has a higher probability of network convergence.

Methods: This analytical research paper used the grasshopper optimization algorithm (GOA) as a metaheuristic approach to optimize the learning rate of U-Net. The network was trained using 256*256 CT images of the lungs of COVID-19 infected and uninfected individuals. A total of 400 CT images were employed as the training dataset, whereas 80 CT images were used as the testing data. Coding was implemented in MATLAB.

Results: The optimization of the learning rate enhanced image segmentation accuracy by 2.23%.

Conclusion: Iterative metaheuristic algorithms would lead to longer network training times. However, the proposed network optimization method could be very useful when large databases are not available for network training and higher accuracy is preferred over time savings.

Keywords: Covid-19, GOA, Image segmentation, Metaheuristic, U-Net

G-1364

Automated Design and Characterization of Hybrid Metallopharmakon-Peptide Nanodrugs for Epigenetic Regulation in Resistant Cancers: A Machine Learning

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Abstract:

Background and Aims: Resistant cancers often exhibit epigenetic alterations that contribute to their progression and limit the effectiveness of conventional therapies. Hybrid metallopharmakon-peptide nanodrugs have emerged as a promising approach for targeted epigenetic modulation, enhancing the specificity and efficacy of treatment. This study integrates artificial intelligence (AI) with nanotechnology to design and optimize these hybrid nanodrugs while automating their characterization through advanced imaging analysis.

Methods: A curated dataset was assembled from two key sources: (1) publicly available repositories, including ChEMBL, PubChem, and BindingDB, to obtain comprehensive data on metallopharmakons and their anticancer activities, alongside TCGA/GEO for insights into epigenetic modifications in resistant cancers; (2) high-resolution TEM/SEM images extracted from peer-reviewed literature and databases such as NanoMine and the Material Data Facility (MDF) to analyze nanoparticle morphology and drug loading. Advanced image processing techniques, including noise reduction, contrast enhancement, and deep feature extraction, were applied to optimize input data. A convolutional neural network (CNN) model was developed in parallel with classical machine learning algorithms such as Support Vector Machine (SVM) and Random Forest to automate nanoparticle characterization and predict therapeutic efficacy.

Results: The CNN-based model achieved a classification accuracy of 95.1% in distinguishing drug-loaded nanoparticles and predicting their stability. Additionally, machine learning techniques successfully identified optimal metallopharmakon-peptide hybrid structures with enhanced epigenetic regulatory potential, leading to improved tumor cell selectivity and therapeutic effectiveness.

Conclusion: The integration of AI-driven molecular design with automated imaging analysis provides an innovative and efficient approach to developing hybrid nanodrugs for resistant cancers. By leveraging publicly available datasets and machine learning methodologies, this strategy accelerates drug discovery while minimizing the reliance on extensive experimental procedures. Future research will focus on refining predictive models through experimental validation and expanding datasets to incorporate in vitro and in vivo results.

Keywords: Artificial Intelligence, Nanodrug, Metallopharmakon, Epigenetic Regulation

G-1365

Application of pharmaceutical resource management dashboard in public hospitals

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Abstract:

Background and Aims: A medication dashboard could provide executive directors and managers with the ability to manage medication resources in hospitals. This study aimed to design, implement, and evaluate a medication resources management dashboard for general hospitals.

Methods: This study was of the development-applied type conducted in an academic therapeutic community center. Based on scientific sources, the dashboard's key performance indicators (KPIs) and functional requirements were identified. The data collection tool was a questionnaire comprising demographic information, KPIs, and functional requirements. The dashboard conceptual model was designed using Rational Rose software, and then POWER BI software was used to develop the system. The usability of the dashboard was evaluated using the standard questionnaire for End User Computing Satisfaction by 10 users. The data were analyzed in SPSS software using descriptive statistics.

Results: The most important KPIs determined for a medication resources management dashboard in general hospitals were "the ratio of antibiotic consumption to total number of drugs", "the ratio of the antibiotic prescribed by general practitioners to total number of drugs", "the ratio of patients for whom antibiotics were prescribed to all patients", and "the ratio of the number of drug items prescribed by specialists to all physicians". The most important functional requirements determined were "updating information at specific intervals", "checking the dashboard at different time intervals", "defining access levels to view the information", and "choosing between graphical and tabular displays". Usability evaluation showed that users' satisfaction with the dashboard content variable was "very high" and for the other variables was at a "high" level.

Conclusion: The KPIs associated with antibiotics and drug costs within the medication dashboard of general hospitals are high priority. Future studies should evaluate the impact of using a medication dashboard on hospital executive directors' and managers' decision-making.

Keywords: Dashboard, Business Intelligence, Medication Management, Hospital

G-1367

The artificial intelligence revolution in personalized medicine: a systematic review of opportunities, challenges and future solutions

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Abstract:

Background and Aims: Today, the advancement of artificial intelligence and its integration into global life has resolved many challenges. In the field of medicine, particularly personalized medicine, Artificial Intelligence has provided promising assistance, although it also comes with certain challenges. The aim of this systematic review is to examine the revolutionary role of Artificial Intelligence in personalized medicine by analyzing dynamic opportunities, identifying challenges in this industry, and proposing strategies to enhance medical services, improve treatment outcomes, and maximize patient satisfaction.

Methods: In this review, an extensive search was conducted using keywords such as "artificial intelligence", "personalized medicine" and "disease prediction" in databases including PubMed/Medline, Web of Science (WOS) Core Collection, Scopus, and Google Scholar, as well as national databases such as Irandoc, SID and Magiran. The initial search yielded 219 studies. Inclusion criteria were limited to studies published within the last five years, and studies without full-text access or duplicate studies were excluded. After critical evaluation using relevant tools, 18 studies were selected for detailed analysis.

Results: The studies indicate that the integration of Artificial Intelligence into medicine, particularly personalized medicine, has significantly contributed to this field by improving the accuracy of prediction, timely identification, and diagnosis of diseases, as well as enabling the development of unique treatments. Additionally, Artificial Intelligence has facilitated the organization of patient data, saving time and enabling faster initiation of treatment.

Conclusion: In conclusion, the accurate diagnosis and timely use of Artificial Intelligence can reduce the burden on personalized medical systems and lead to faster recovery, resulting in reduced costs and increased patient satisfaction with healthcare providers. However, challenges such as public unawareness of Artificial Intelligence and its applications, limited access to Artificial Intelligence technologies, and insufficient infrastructure for widespread implementation in

healthcare centers remain. Addressing these issues is essential to ensure that society can fully benefit from the potential of Artificial Intelligence.

Keywords: Artificial Intelligence, AI, Personalized Medicine

G-1368

Design and development of AI assistant for monitoring rational drug administration

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Abstract:

Background and Aims: The idea is to “build an AI assistant for monitoring rational drug prescription.” Preliminary studies and scientific, technical, and economic feasibility studies have been conducted. The product is to be based on AI LLM models. The final product is to be developed using agile software rules and delivered to the target market.

Methods: The main strategic goal is to increase productivity in the field of drug prescription and reduce patient overhead costs. The main practical goal is to provide the possibility of efficient management monitoring in the field of drug prescription (with rational prescription criteria) in related organizations (insurance companies, the Ministry of Health, and universities). In the field of drug information management and related monitoring at the level of insurance companies and the Ministry of Health, a variety of software solutions have been produced and are being used. These software merely meet routine needs; therefore, designing and developing products based on AI models that cover the requirements hidden in their information and reports is very productive. The degree of rationality of drug prescriptions will be extracted from the content of guidelines and standard drug prescription protocols. Any prescription with drug interactions, drug precedence and delay, and induced prescription (with bias) will be presented as a percentage of rationality by the AI model.

Results: Entering the knowledge-based field of rational drug prescription management by utilizing high-value-added tools in AI. Optimal and dedicated use of large language models (LLM) and not entering traditional machine learning processes such as building neural networks.

Conclusion: So far, no similar example of the product of the present idea has been presented in the country, and there is no completely similar product in other leading countries, but there are several related technical projects in related fields such as drug production or distribution.

Keywords: Chatbot, LLM, Rational Drug Prescription, Local

G-1369

Application of Artificial Intelligence for Innovative Development of Antibacterial Drugs and Resistance Prediction

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Abstract:

Background and Aims: In recent years, artificial intelligence (AI) has revolutionized the discovery of drugs, especially antimicrobial agents that are effective against bacteria resistant to existing antibiotics. This study aims to explore the application of AI, particularly deep learning and machine learning algorithms, in identifying new antibacterial agents and predicting bacterial resistance to drugs.

Methods: Data related to the molecular structures of antibacterial compounds and bacterial resistance are collected and analyzed using machine learning and deep learning algorithms. Deep neural networks are used to recognize patterns and predict biological properties such as antibacterial activity and drug toxicity. Additionally, molecular dynamics simulations and laboratory experiments are performed to verify the effects of the predicted compounds.

Results: AI can successfully simulate antibacterial compounds and identify new agents with comparable or superior efficacy to current drugs. AI accurately model bacterial resistance characteristics and predict drug-target interactions, thus facilitating the design of targeted therapies and reducing adverse effects.

Conclusion: AI, particularly deep learning, plays a crucial role in accelerating the design of antibacterial drugs. This technology not only aids in simulating novel compounds and predicting biological properties, but also enhances the identification of more effective treatments while minimizing side effects. Moreover, AI's ability to predict bacterial resistance will promote the development of targeted therapies and overcome resistance challenges. Integrating these technologies with traditional drug discovery methods can provide innovative solutions for the treatment of drug-resistant infections.

Keywords: Artificial Intelligence, Medicine, Drug Design

G-1370

The Role of Artificial Intelligence in Breast Cancer Detection: A Review Study

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Abstract:

Background and Aims: Breast cancer is one of the most common cancers worldwide, with high mortality and disability rates, and is the leading cause of cancer among women. Early diagnosis and treatment of this disease significantly increase the chances of survival. Artificial intelligence (AI) technology is rapidly advancing, and many people expect these systems to have a significant impact on the diagnosis of breast cancer using ultrasound. The present study aimed to investigate the role of artificial intelligence in the diagnosis of breast cancer.

Methods: This study is a narrative review conducted using the strategy (OR, AND) in Persian and English databases (Medline, Cochrane, PubMed, Scopus, SID, ISC, Magiran) with a time limitation from 2020 to 2025, focusing on Persian and English articles. The study was carried out in five stages, including identification and goal setting, resource search, data evaluation, data analysis, and presentation of results, as proposed by Knafl & Whittemore.

Results: After applying the inclusion criteria and evaluating the articles, 29 out of 33 articles were finally included in the study. The articles were reviewed independently and simultaneously by the researchers in three stages (title, abstract, and full text), and finally, 8 studies relevant to the research objectives were selected. The related data indicate that with the evolution of artificial intelligence (AI) tools, the diagnosis and prognosis of breast cancer have become easier than before.

Conclusion: While artificial intelligence promises widespread integration into the diagnosis and treatment of breast cancer, challenges such as data quality, legal and ethical issues, and algorithm validation are critically important. Addressing these issues is essential to fully realize the potential of AI in improving early diagnosis and patient outcomes in breast cancer management.

Keywords: Breast Cancer, Artificial Intelligence, Diagnosis

G-1371

The Impact of Artificial Intelligence on Arrhythmia Detection in Intensive Care Units: A Review Study

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Abstract:

Background and Aims: Cardiac arrhythmias account for a significant portion of sudden deaths, especially among young individuals. Recent advances in our understanding of these syndromes have improved patient diagnosis and care. However, in the healthcare and medical field, accurately diagnosing many conditions with complex and overlapping symptoms—including cardiac arrhythmias—remains a challenge. Since artificial intelligence (AI) offers various solutions to a wide range of challenges, it can be used to process massive amounts of patient data and identify disease patterns more efficiently than traditional time-consuming methods.

Methods: The present study is a narrative review conducted using the (or_ and) strategy across both Persian and English databases (Medline, Cochrane, PubMed, Scopus, SID, ISC, Magiran), with a time limitation from 2018 to 2024. It searched for Persian and English articles related to the topic. This study followed five stages proposed by Knafl & Whittemore: identifying and setting objectives, searching for sources, data evaluation, data analysis, and presenting results.

Results: After applying the inclusion criteria and evaluating the articles, 18 out of 26 articles were finally included in the study. The articles were screened by researchers independently and simultaneously in three stages (title, abstract, full text). Ultimately, 8 studies closely aligned with the research objectives were selected. The relevant data indicates that with the evolution of AI tools, the diagnosis and prognosis of cardiac arrhythmias have become easier than before.

Conclusion: The results showed that AI-based techniques for diagnosing cardiac arrhythmias can assist healthcare professionals in accurately identifying arrhythmias, making early screening easier and more precise.

Keywords: Artificial Intelligence, Arrhythmia, Intensive Care Units

G-1373

An overview of the use of artificial intelligence in health policymaking

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Abstract:

Background and Aims: Policymakers in complex health systems require accurate and timely information for informed decisions. Artificial intelligence (AI), an innovative approach to facilitate data collection and analysis within these systems, is rapidly becoming a powerful tool in health policymaking. By analyzing vast datasets, identifying patterns, and providing predictions, AI can assist policymakers in making better decisions regarding resource allocation, the design of health and treatment programs, and improving the quality of care. The aim of this research is to investigate and analyze the role and impacts of AI in the health policymaking process, focusing on opportunities, challenges, and practical solutions for the effective utilization of this technology in improving health systems.

Methods: This study employs a scoping review methodology to comprehensively examine the application of artificial intelligence (AI) in health policy. English-language articles published between 2010 and 2024 were systematically searched across PubMed, Web of Science, and Google Scholar databases using predefined keywords related to AI, health policy, and related terms. Original articles, reports, and policy documents that explored the role of AI in health policy were included. Review articles, editorials, and opinion pieces were excluded. After removing duplicates, articles were screened based on title and abstract, followed by a thorough full-text analysis of relevant studies to synthesize key findings and identify emerging themes.

Results: Artificial intelligence plays a significant role in health policy by analyzing health data, identifying disease trends, predicting disease outbreaks, optimizing resource allocation, evaluating policies, and providing personalized medicine. These tools help policymakers make evidence-based decisions and design more effective health programs.

Conclusion: "Artificial intelligence has the potential to revolutionize health policy by providing powerful tools for data analysis, disease prediction, resource allocation, policy evaluation, and treatment personalization. This technology can help policymakers make more informed and evidence-based decisions, and design and implement more effective and equitable health

programs. However, to fully realize this potential, it is necessary to pay special attention to the challenges related to data access, privacy, algorithm bias, and transparency.

Keywords: Artificial Intelligence, AI, Health Policy

G-1374

An overview of the use of digital twins in the field of health

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Abstract:

Background and Aims: In the digital age, new technologies are rapidly changing and transforming various industries. One of these advanced technologies is Digital Twins, which act as a virtual copy of physical systems. Digital twins enable the simulation, prediction, and optimization of physical systems using real-time data and advanced computational models. In the healthcare sector, this technology has great potential to improve the quality of medical care, personalize treatments, and reduce costs. This review article examines the applications of digital twins in the healthcare sector.

Methods: This study was conducted using a systematic review method. To collect information, reputable scientific databases including PubMed, IEEE Explore, Science Direct, and Google Scholar were searched. Keywords used included "Digital Twins in Healthcare", "Medical Digital Twins", "Healthcare Simulation," and "Personalized Medicine". Articles published between 2018 and 2024 were reviewed, and finally, 45 relevant articles were selected.

Results: 1.Patient Simulation: Digital twins enable the creation of virtual models of patients. These models use clinical, genetic, and lifestyle data to help doctors provide personalized treatments.

2.Disease Prediction: Using digital twins, it is possible to predict the progression of chronic diseases such as diabetes, heart disease, and cancer and take preventive measures.

3.Surgery Optimization: In complex surgeries, digital twins allow surgeons to simulate different scenarios before surgery and choose the best surgical method.

4.Hospital Management: Digital twins can be used to manage hospital resources such as hospital beds, medical equipment, and human resources.

5.Pharmaceutical research: In the pharmaceutical industry, digital twins help researchers test the effects of drugs on virtual models of humans, accelerating the drug development process.

Conclusion: As an emerging technology, digital twins have great potential to transform the healthcare sector. By providing accurate virtual models of patients and healthcare systems, this technology enables personalized treatments, disease prediction, and medical process optimization. However, challenges such as data security issues, high implementation costs, and the need for advanced infrastructure still exist that need to be addressed. In the future, as technology advances and costs decrease, digital twins are expected to become an integral part of healthcare systems.

Keywords: Digital Twins, Digital Health, Medical Simulation

G-1378

Artificial Intelligence in Preventing Nursing Errors in Psychiatric Units: A Review Study

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Abstract:

Background and Aims: Nursing errors in psychiatric units can significantly impact patient safety, leading to mismanagement of medications, delayed interventions, and improper assessments. The integration of Artificial Intelligence (AI) in healthcare has introduced innovative solutions to minimize these errors and enhance nursing care quality. This systematic review examines the role of AI in preventing nursing errors in psychiatric settings.

Methods: A literature review was conducted using databases such as PubMed, Science Direct, Scopus, Web of Science, and Google Scholar. Articles published between 2015 and 2025 were analyzed based on AI applications in psychiatric nursing. A total of 50 studies were selected for review, emphasizing AI-driven interventions, predictive analytics, and automated decision support systems.

Results: The findings indicate that AI technologies, including machine learning algorithms, natural language processing (NLP), and predictive analytics, significantly reduce nursing errors. AI-assisted medication management systems were shown to decrease prescription errors by 55%, while chatbots and virtual assistants improved response time to patient needs by 40%. Furthermore, AI models for behavioral risk assessment demonstrated high accuracy in predicting aggressive behaviors in psychiatric patients, allowing for timely interventions.

Conclusion: AI has proven to be an effective tool in enhancing patient safety and reducing nursing errors in psychiatric care. However, challenges such as ethical concerns, data privacy issues, and the need for AI training among nurses must be addressed to optimize implementation. Future research should focus on integrating AI-driven tools into clinical decision support systems (CDSS) to ensure comprehensive psychiatric care with minimal errors.

Keywords: Artificial Intelligence, Psychiatric Nursing, Nursing

G-1379

The applications of artificial intelligence for continuous measurement of anesthetic gases in the operating room

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Abstract:

Background and Aims: Anesthetic gases play a crucial role in modern surgeries, ensuring that patients remain unconscious throughout the procedure. However, precise monitoring and control of these gases in the operating room are essential not only for patient safety but also for the well-being of medical staff. Traditional gas measurement methods often rely on periodic sampling and manual adjustments, which may fail to capture real-time fluctuations and optimize gas usage. Additionally, the environmental impact of anesthetic gas emissions has become an increasing concern in global healthcare systems. This study explores the potential of artificial intelligence (AI) in enabling real-time, continuous monitoring of anesthetic gases. By integrating AI algorithms into gas management systems, the goal is to enhance accuracy, improve operational efficiency, reduce environmental harm, and create a safer operating room environment for both patients and healthcare professionals.

Methods: A comprehensive literature review was conducted using databases such as PubMed, Scopus, and Google Scholar. The search included keywords such as anesthetic gas monitoring, operating room, anesthetic gas management, and artificial intelligence in healthcare, focusing on articles published between 2000 and 2025.

Results: The integration of AI into continuous anesthetic gas monitoring systems has resulted in increased accuracy, reduced human error, and improved patient safety by minimizing anesthetic gas overexposure. AI automates gas management, reducing the need for manual adjustments and

enhancing operational efficiency in the operating room. Additionally, by minimizing gas waste, AI helps lower environmental impact and reduces costs. However, challenges such as high implementation costs, technical complexities, and integration with existing medical infrastructure hinder widespread adoption of this technology.

Conclusion: While AI holds great promise for enhancing anesthetic gas monitoring, overcoming technical and financial challenges is essential for its broader implementation in clinical settings.

Keywords: anesthetic gas monitoring, operating room, Anesthetic

G-1381

The Role and Applications of Artificial Intelligence in Education Policy Making

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Abstract:

Background and Aims: Artificial intelligence (AI) is expanding across all fields and around our lives. It is no longer an innovation but a technology aimed at automating and improving many areas, including education. The main objective of this research is to determine the role and impact of AI on educational policy.

Methods: This study is a scoping review and was conducted in five stages: formulating the research question, searching and extracting relevant studies, selecting related studies, tabulating and summarizing information, and reporting data. The search covered the years 2000 to 2025 and was conducted in the databases PubMed, Scopus, and Web of Science. The search strategy included keywords such as Policy OR diplomacy AND Education AND Artificial intelligence OR AI OR computational intelligence OR machine intelligence OR computer reasoning OR machine learning OR neural network OR brain intelligence. The retrieved articles were evaluated and screened independently by two researchers.

Results: Out of 1816 initially identified abstracts, two studies were selected after screening the abstracts and full texts. The results of the two studies indicated that AI can play a significant role in educational policy as a policy advisor. It can also enhance evidence-based decision-making and management practices in the education sector. This technology can improve the use of information technology in education, including teaching and assessment, and significantly impact the effectiveness of education and learning. However, to fully harness its benefits, governments and educational institutions must collaborate to develop policies and strategies that maximize the positive impacts of AI while addressing its potential challenges and adverse effects.

Conclusion: The applications of AI in the field of educational policy can bring valuable opportunities for education. Policymakers can identify educational trends and issues from both macro and micro perspectives to gain a better understanding of the phenomenon and assist in the creation and evaluation of educational policies.

Keywords: Policy-making, Education, Artificial Intelligence, Application

G-1382

Application of Artificial Intelligence in Endoscopy

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Abstract:

Background and Aims: Artificial intelligence (AI), particularly deep learning, has revolutionized the landscape of diagnostic medicine. In recent years, its applications in gastrointestinal (GI) endoscopy have shown promising results in improving the detection, classification, and prediction of GI lesions. This review aimed to evaluate the current state and diagnostic potential of AI-based systems in GI endoscopy, including upper GI endoscopy, colonoscopy, and capsule endoscopy.

Methods: A narrative review was conducted in October 2024. Relevant literature was searched in PubMed/MEDLINE and Scopus databases using keyword combinations such as “artificial intelligence,” “endoscopy,” “gastrointestinal tract,” “esophagus,” “stomach,” and “intestines.” A total of 175 English-language original research articles published between 2018 and 2024 were identified. Only studies that implemented AI models within GI endoscopic procedures were included. Two independent reviewers assessed all retrieved articles using EndNote software and evaluated titles, abstracts, methodologies, and outcomes. Final data were documented using a standardized review checklist.

Results: Among the 175 selected articles, 75 focused on colonoscopy, 37 on gastric endoscopy, 38 on esophageal endoscopy, and 25 on capsule endoscopy. AI applications in upper GI endoscopy involved detection of early-stage cancers, prediction of histopathologic diagnosis, assessment of tumor invasion depth, and identification of *Helicobacter pylori* infection. In capsule endoscopy, AI models were capable of detecting gastrointestinal bleeding, ulcers, tumors, and small intestinal diseases with high accuracy. Studies consistently reported improved diagnostic performance and reduced interpretation time.

Conclusion: AI is rapidly transforming GI endoscopy by enhancing diagnostic accuracy, reducing observer variability, and optimizing workflow efficiency. Despite these advantages, AI should complement—not replace—clinical judgment. Further large-scale clinical trials are essential to assess real-world effectiveness and ensure responsible integration into endoscopic practice.

Keywords: Endoscopy, Gastrointestinal Tract, Deep Learning, Colonoscopy

G-1383

The Role of Artificial Intelligence in Data Processing for Nutrition Science: Opportunities and Challenges

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Abstract:

Background: The rapid growth of data in nutrition science has created both opportunities and challenges for researchers and practitioners. Artificial intelligence (AI) offers powerful tools for processing and analyzing complex datasets, enabling advancements in personalized nutrition, dietary recommendations, and public health interventions.

Methods: We reviewed studies from 2015 to 2023 using Scopus, PubMed, Google Scholar, and Web of Science. AI techniques, including machine learning and deep learning, were applied to dietary data, nutrient databases, and health records.

Results: AI demonstrated remarkable capabilities in automating nutrient analysis, identifying dietary patterns, and predicting health outcomes. For instance, machine learning models successfully classified dietary habits with over 90% accuracy, while deep learning algorithms improved the precision of nutrient tracking in real-time. AI also enabled the integration of wearable device data (e.g., Fitbit, Apple Health) with public health datasets (e.g., NHANES), providing actionable insights for personalized nutrition. However, challenges such as data heterogeneity, algorithmic bias, and ethical concerns related to data privacy were identified, highlighting the need for improved data standardization and governance.

Conclusion: AI is critical in transforming data processing into nutrition science, offering innovative solutions to handle complex datasets and improve decision-making. To maximize its benefits, interdisciplinary collaboration, robust data governance frameworks, and further research are essential to address existing limitations and ensure ethical implementation.

Keywords: Artificial Intelligence, Data Processing, Nutrition Science

G-1385

Application Of Digital Health In The Management Of Chronic Diseases By Nurses

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Abstract:

Background: Digital health technologies have rapidly transformed modern healthcare. These tools—such as remote monitoring systems, mobile apps, and wearable devices—support diagnosis, treatment, and disease management. Nurses, as front-line healthcare providers, are essential in implementing digital health solutions, especially for chronic diseases like diabetes, heart failure, and COPD, which require long-term monitoring and patient engagement.

Methods: This study is a systematic review conducted via the PubMed database. Articles were searched using the keywords "Digital Health", "Chronic Disease", "Nursing", "Remote Monitoring", and "Self-management" from January 2015 to February 2024. A total of 128 articles were identified. After screening for duplicates and relevance, 48 full texts were reviewed. Finally, 12 articles that focused specifically on nurses' roles in digital health for chronic care were included. These included 6 interventional studies, 3 systematic reviews, and 3 qualitative studies.

Problem Statement: Chronic disease management poses challenges such as limited staff, rising patient numbers, and healthcare costs. Digital health offers new solutions, but adoption depends on how well nurses integrate these tools into practice. Understanding the benefits and barriers is crucial for optimizing digital strategies in chronic care.

Results: The review found that:

Remote monitoring reduced hospital readmissions by 17–31%.

In cardiac patients, readmissions dropped from 28% to 19% (P0.05).

Mobile apps improved medication adherence from 58% to 82%.

Digital training boosted nurses' clinical confidence in 70% of participants.

Digital interventions saved annual costs, reducing average expenses from \$3,450 to \$2,610 in some cases.

Conclusion: Digital health significantly improves chronic disease outcomes when effectively used by nurses. It enhances patient care, reduces costs, and supports long-term disease management. To maximize its benefits, healthcare systems must focus on nurse training, technology access, and data privacy.

Keywords: Digital Health, Chronic Diseases, Nursing, Management, mHealth

G-1386

Artificial intelligence in medicine and medical ethic concepts

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Abstract:

Background and Aims: Artificial intelligence (AI) has assumed an unprecedented role in medical diagnosis and treatment, offering significant advantages such as enhanced diagnostic accuracy, reduced processing time, minimized human error, optimized resource utilization, and improved accessibility. Given its transformative potential, experts across diverse disciplines have increasingly contributed insights and perspectives through visual, audio, and digital media. This review article presents a comprehensive and up-to-date analysis of AI's current applications in medicine, focusing on its associated ethical considerations.

Methods: This study involved a systematic review and critical analysis of contemporary literature on the application of AI in healthcare. A comprehensive search was conducted across indexed databases, including PubMed/Med Line, Scopus, etc., to identify relevant publications. The retrieved literature was evaluated to assess AI's role in health care field, and associated ethical implications.

Results: The reviewed literature highlights the transformative implications of AI for the future of medical practice. While technological advancements in other fields have led to the obsolescence of certain professions, similar concerns arise regarding the role of healthcare providers in an AI-driven paradigm. A critical consideration in this discourse is the ethical dimension of medical service delivery, which underscores the distinction between a mere job and a true profession. Key ethical competencies- such as professional privacy, delivering bad news with sensitivity, practicing truth-telling within cultural contexts and patient-physician relationships-cannot be replicated by artificial intelligence. These skills are not solely cultivated through formal education but are honed through experiential learning and ongoing interaction with colleagues, trainees and even patients. The humanistic aspects of medicine thus remain irreplaceable by AI, emphasizing the enduring value of clinician judgment and empathy in healthcare.

Conclusion: The integration of AI into healthcare presents both transformative opportunities and profound ethical challenges. Without the guidance of well-trained and ethically grounded healthcare professionals, the future of medicine risks becoming impersonal and devoid of the essential humanistic and cultural dimensions that define quality care. While the contributions of AI in enhancing data-driven decision-making are undeniable, the irreplaceable role of human

clinicians—particularly in ethical reasoning, empathetic patient interactions-must remain central to medical practice.

Keywords: Artificial Intelligence, Health Services, Medical Ethics

G-1387

Responsible Artificial Intelligence in digital health: Ethical Challenges and Future Directions

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Abstract:

Background and Aims: Artificial Intelligence (AI) holds significant potential for transforming healthcare by enhancing diagnostic accuracy , improving patient outcomes, and increasing operational efficiency. However, the integration of AI into digital health raises ethical concerns, particularly in the areas of data privacy, algorithmic bias, and accountability. The aim of this study is to examine the concept of Responsible Artificial Intelligence (RAI) in healthcare, focusing on its applications, challenges, and ethical considerations. Additionally, it highlights the importance of explainability and patient trust in Artificial Intelligence-driven medical decisions.

Methods: A review was conducted on articles from the PubMed , IEEE Xplore , and Google Scholor databases (2018-2024) . Topics such as fairness in algorithms , General Data Protecting Regulation (GDPR) compliance , and bias reduction methods were examined .

Results: The results show that the use of Responsible Artificial Intelligence in diagnostic models has significantly reduced racial inequality and improved data security . Additionally, systems that are General Data Protecting Regulation-compliant have enhanced patient trust .

Conclusion: The establishment of international ethical standards, the development of Artificial Intelligence-based monitoring tools, and the education of healthcare professionals in Artificial Intelligence ethics are essential for the responsible deployment of this technology.

Keywords: Responsible AI, digital ethics, GDPR compliance

G-1388

Artificial Intelligence in Medical Sciences: Innovations in Precision Medicine and Biotechnology

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Abstract:

Background and Aims: Artificial intelligence (AI) is rapidly transforming the field of medical sciences, with significant impacts on precision medicine and biotechnology. This review aims to comprehensively analyze AI's applications in genomic analysis, diagnostic imaging, and pharmaceutical development, highlighting its potential to enhance diagnostic accuracy, treatment efficiency, and personalized care.

Methods: A systematic review of recent literature, tools, and methodologies was conducted to examine how AI, including machine learning and deep learning, is integrated into various domains of medical science. The review focuses on up-to-date advances in genomic data analysis, diagnostic imaging, and drug discovery, ensuring a thorough synthesis of current knowledge and innovations.

Results: AI significantly improves genomic analysis by enabling the rapid identification of genetic variations and disease susceptibility, facilitating personalized treatment plans. In diagnostics, AI-powered imaging and molecular data analysis reduce human error and enable early disease detection through improved radiological and histopathological assessments. Additionally, AI expedites drug discovery in pharmaceutical development by predicting drug-target interactions and optimizing clinical trials. Notable examples include the use of AI platforms like BenevolentAI for drug repurposing and DeepMind's AlphaFold for protein structure prediction, which have accelerated the development of targeted therapies.

Conclusion: AI is a transformative tool in medical sciences, contributing to improved patient outcomes, treatment personalization, and innovation in biotechnology. However, data privacy, ethical considerations, and regulatory barriers must be addressed to ensure AI's responsible and effective integration into precision medicine. Future efforts should focus on overcoming these challenges to fully realize AI's potential in advancing medical science.

Keywords: Medical, Precision, Genomics, Diagnostics, Biotechnology

G-1392

Virtual and in vitro screening of approved drugs targeting genes involved in colorectal cancer: an approach with drug repurposing

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Abstract:

Background and Aims: Colorectal cancer is the second leading cause of cancer death and the third most common cancer worldwide. In this research, given the lengthy process of discovering new drugs, machine learning was employed to select the compounds to inhibit specific signaling pathways associated with colorectal cancer, with the goal of repurposing FDA-approved drugs.

Methods: The target gene was identified via the GEPIA database and literature review. As a metalloprotease target, it aids extracellular matrix degradation, promoting colorectal cancer progression and metastasis. Based on the IC50 values of the tested compounds for the target genes in the ChEMBL database, two groups—active and inactive—were classified. The morgan fingerprint and physicochemical properties methods from the RDKit package was used to calculate the molecular descriptors. The data was split into the two groups: train and test with a ratio of 80 to 20. Using the training data, a machine learning model was trained to predict the effect of the FDA-approved drugs on the target gene. The machine learning model was developed using eight algorithms (k-nearest neighbors, Decision tree, Support vector machine, Naïve Bayes, Logistic regression, Random Forest, Multilayer Perceptron, Extreme Gradient Boosting). The models were tested, and accuracy, AUC, and other parameters were calculated. A total of 2,766 FDA-approved drugs were fed into the top models, and the results from the models' predictions were analyzed.

Results: XGBOOST and SVM models were selected due to their highest accuracy and AUC. The accuracy of both models was 92%, while the AUC values were 98% and 96%, respectively. In the prediction results of FDA approved drugs, drugs that were above 95% active were selected and the two models' results were compared. Finally, we identified 58 drugs out of 2,766. Some of the final drugs include: Bromocriptine, Ledipasvir, Telaprevir.

Conclusion: Docking and molecular dynamics can be used for drug re-screening, and the selected drug can ultimately undergo in vitro studies. This approach minimizes the likelihood of failure in experiments and enables the rapid identification of new targets for existing drugs in disease treatment.

Keywords: Colorectal Cancer, Machine Learning, Drug Repurposing

G-1393

Digital Health And Population Health Promotion By Nurses

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Abstract:

Background and Aims: The rapid development of digital technologies has greatly influenced healthcare, especially the nursing profession. Digital health tools—such as telemedicine, artificial intelligence (AI), electronic health records (EHR), and health apps—enable nurses to provide better and more accessible care. This review aims to explore how nurses use digital health to improve population health and identify the benefits and challenges of this approach.

Methods: This is a literature review based on articles published between 2015 and 2024. Scientific databases such as PubMed, Scopus, and Google Scholar were searched using keywords like “Digital Health,” “Nursing,” “Population Health Promotion,” “Telemedicine,” and “Remote Patient Monitoring.” Relevant studies were selected and analyzed to provide a comprehensive understanding of the topic.

Results: From the initial database search, a total of 40 articles were retrieved. After screening titles, abstracts, and full texts based on inclusion and exclusion criteria, 8 relevant articles were included in the final review. The analysis shows that digital health technologies support nurses in various aspects of population health, including remote patient monitoring, chronic disease management, and health education. Telemedicine enables nurses to deliver care to underserved populations; artificial intelligence helps process patient data and supports clinical decisions; and electronic health records improve continuity of care. Despite these benefits, challenges such as data privacy concerns, insufficient digital literacy among nurses, and limited infrastructure in some regions still remain.

Conclusion: Digital health offers great potential for nurses to play a more active role in promoting population health. To achieve this, healthcare systems must invest in nurse training, ensure data security, and improve digital infrastructure. Combining the clinical skills of nurses with digital tools can lead to more efficient, equitable, and high-quality healthcare.

Keywords: Digital Health, Population Health Promotion, Electronic Health Records

G-1394

Explainable Multilayer Neural network for prediction of Lower limb amputation in hospitalized diabetic foot patients

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Abstract:

Background and Aims: Diabetic foot ulcers (DFUs) account for over 80% of non-traumatic lower limb amputations globally. Early risk prediction is critical for preventing amputations, but traditional systems like PEDIS lack precision and interpretability. Explainable AI models offer a promising solution by combining accuracy with clinical transparency. This study aims to develop an interpretable neural network for predicting amputation risk in hospitalized DFU patients, identifying actionable biomarkers.

Methods: A retrospective cohort of 203 hospitalized diabetic foot patients (70 instances of lower limb amputation) from Sina hospital, Tabriz, Iran in 2023 was analyzed. Ethical approval was obtained from IRB (IR.TBZMED.REC.1399.571). Twenty-one features were selected via ReliefF analysis. Numerical features were standardized using z-scores. A multilayer perceptron (21-40-18-2) with Tanh activation in hidden layers, Adam optimizer (learning rate=0.001), and L2 regularization ($\alpha=0.001$) was modeled. The samples were randomly divided into train and test sets with a ratio of 8:2. SHAP values were computed to interpret feature contributions. Models were implemented in python 3.11.8, Orange 3.37, using appropriate libraries. The PEDIS scoring system was used as comparison with a cutoff of ≥ 7 .

Results: The neural network achieved an AUC of 0.962, sensitivity=78.6%, specificity=92.3%, and F1=0.815, and Accuracy=87.5%. In comparison, PEDIS score achieved an AUC of 0.881, sensitivity of 78.20%, and specificity of 82.86%. SHAP analysis identified Wagner 4 ulcer, ulcer size ≥ 3 cm, Ulcer depth of bone or joint, greater ESR values, absence of prior amputation, and higher platelet counts as top predictors.

Conclusion: Our explainable AI model demonstrated clinically significant accuracy in predicting amputation risk, outperforming PEDIS while providing interpretable insights into ulcer severity and inflammatory markers. High specificity reduces unnecessary interventions, addressing a key concern in DFU management. Future work should validate the model across larger, more diverse cohorts and integrate emerging biomarkers (e.g., proteomics) for broader clinical adoption. This study highlights the transformative potential of explainable AI in high-stakes diabetic care.

Keywords: Artificial intelligence, Medicine, Diabetic foot, Amputation

G-1395

AI-Driven Wearables: Revolutionizing Global Efforts to Prevent Leishmaniasis Outbreaks

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Abstract:

Background and Aims: Leishmaniasis, a vector-borne disease caused by Leishmania parasites, considers a significant global health challenge, particularly in endemic regions. Current preventive measures, such as insecticides, have limitations in efficacy and scalability. The integration of artificial intelligence (AI) with wearable technology offers a novel approach to combating leishmaniasis by enabling real-time monitoring, early detection, and insect-repelling capabilities. This review explores the potential of AI-driven wearables in reducing leishmaniasis outbreaks through innovative applications such as smart repellents, predictive analytics, and personalized protection.

Methods: A systematic review of existing literature was conducted, focusing on AI applications in wearable technology for health monitoring and vector control. Sources included peer-reviewed journals, conference proceedings, and case studies published between 2018 and 2024. Studies on AI-driven diagnostic tools for leishmaniasis, wearable repellent technologies, and spatial repellents were analyzed. Key metrics such as device efficacy, AI algorithm performance (e.g., sensitivity, specificity), and user adoption rates were evaluated. Additionally, mathematical modeling studies assessing the epidemiological impact of repellents and wearables were reviewed to gauge their potential in outbreak prevention.

Results: AI-powered wearables demonstrated significant advancements in vector control and disease prevention. For example, spatial repellents integrated into wearable devices achieved very good protection against sandflies. AI algorithms used in diagnostic tools for cutaneous leishmaniasis achieved high accuracy rates. Predictive analytics enabled by wearables provided actionable insights for targeted interventions in high-risk populations. Furthermore, mathematical models indicated that widespread adoption of repellent wearables could avert up infections during outbreaks with moderate transmission rates.

Conclusion: AI-driven wearable devices hold immense potential to revolutionize leishmaniasis prevention with effective vector control strategies. These technologies offer scalable solutions for endemic regions by reducing reliance on traditional methods like insecticides. However, challenges such as affordability, and infrastructure limitations must be addressed to ensure widespread adoption. Future research should focus on optimizing AI algorithms for resource-limited settings, enhancing device durability, and conducting large-scale field trials to validate

their epidemiological impact. By using AI-powered wearables, global efforts to combat leishmaniasis can achieve greater precision and sustainability.

Keywords: Leishmaniasis, Vector Control, AI-driven Wearables, Parasites

G-1397

Governance and Ethical Regulation of Artificial Intelligence in Healthcare: Towards a Global Policy Framework

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into healthcare has unlocked innovative opportunities, yet persistent ethical and governance challenges—including data protection, transparency, accountability, and equitable access—demand a comprehensive policy framework. The absence of unified standards underscores the urgent need for a global governance model. This study proposes an evidence-based framework for ethical AI governance in healthcare through a mixed-methods empirical approach.

Methods: The research adopted a sequential mixed-methodology design. A quantitative phase surveyed 500 policymakers, healthcare professionals, AI developers, and ethicists from diverse global regions to capture perceptions of regulatory challenges and governance priorities. A qualitative phase followed, involving 50 semi-structured interviews with key experts, analyzed via thematic analysis. A Delphi method was then employed to establish consensus on core elements of a global policy framework.

Results: Findings revealed regional disparities in governance priorities: European stakeholders emphasized privacy and algorithmic fairness, while North American respondents prioritized innovation and legal accountability. The qualitative analysis identified five foundational principles for AI governance: (1) algorithmic transparency and explainability, (2) bias mitigation and ethical risk assessment, (3) international data-sharing protocols, (4) dynamic regulatory adaptation to AI advancements, and (5) participatory oversight mechanisms.

Conclusion: This study underscores the necessity of a global, multi-stakeholder governance framework for AI in healthcare, engaging policymakers, healthcare experts, and industry leaders to foster transparent, accountable, and equitable AI systems. Future research should evaluate proposed governance models and their impact on healthcare quality.

Keywords: AI Governance, Healthcare Ethics, Mixed-Methods Research

G-1398

A Systematic Review on the Role of Artificial Intelligence in Early Diagnosis and Prognostication of Neurological Disorders

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Abstract:

Background: Neurological diseases including Alzheimer's disease, Parkinson's disease and stroke are challenging due to their progressive nature and complexity in diagnosis. Such timely intervention may be beneficial in limiting disease progression and improving outcomes for these patients. Artificial intelligence (AI) is a powerful tool that could facilitate early diagnosis and prognostication of neurological disorders. Still, there is confusion surrounding what AI is, its ability, limitations, and implications for the future, and its role in the early diagnosis and prognostication of neurological disorders, and its accuracy compared to traditional diagnostic methods.

Methods: A systematic search was performed on PubMed, Scopus, Web of Science, and Google Scholar for articles published between 2015 and 2024. Inclusion criteria comprised studies that assessed AI models for the early detection, progression prediction, and clinical decision-making of neurologic disorders. Quality assessment was performed using PRISMA guidelines.

Results: We reviewed 45 studies in total. Models based on machine learning and deep learning were shown to be very accurate for early detection of possible biomarkers through neuroimaging, genetic data, and clinical assessment. By using MRI scans, convolutional neural networks (CNNs) achieved over 90% accuracy distinguishing between Alzheimer's disease and mild cognitive impairment. Multimodal AI models achieved superior predictive performance on disease progression in Parkinson's and multiple sclerosis.

Conclusion: AI has considerable potential to improve early diagnosis and prognostication of neurological diseases. Although present models show great accuracy, additional validation

through large-scale clinical trials and enhanced transparency of AI decision-making is required before they can be broadly adopted clinically.

Keywords: Artificial Intelligence, Neurological Disorders, Early Diagnosis

G-1399

Simulating Medical Education Scenarios Using Generative Models Based on Evolutionary Game Theory and Parameter Optimization via Swarm Intelligence Algorithms

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Abstract:

Background and Aims: Designing dynamic and realistic educational scenarios in medical training has long faced fundamental challenges due to the complexity of human interactions and the need to adapt to variable clinical conditions. This study introduces a novel framework for intelligent simulation of educational scenarios by integrating evolutionary game theory and swarm intelligence. The framework aims to model strategic behaviors of stakeholders (students, virtual patients, instructors) and optimize educational parameters in multi-agent environments.

Methods: The study employed a hybrid model combining multi-agent stochastic differential equations with Particle Swarm Optimization (PSO) and Ant Colony Optimization (ACO) algorithms. Educational scenarios were defined as evolutionary games with dynamic reward matrices, where learning strategies (collaboration, competition, adaptation) were refined using Nash Equilibrium theory. Real-world data from 420 medical students and 60 clinical instructors were collected in a simulated environment and analyzed via Deep Reinforcement Learning (DRL).

Results: The proposed model demonstrated a 45% improvement in educational engagement retention and a 32% reduction in prediction errors for complex clinical behaviors compared to traditional simulation systems. Parameter optimization with ACO accelerated scenario convergence to ideal educational equilibrium by 2.7 times. Additionally, ethical metrics grounded in John Rawls' theory of justice reduced educational biases by 28% in scenario design.

Conclusion: This research proves that integrating advanced mathematical frameworks (game theory and swarm intelligence) with medical pedagogy enables the creation of adaptive, personalized educational environments while mitigating ethical challenges and cognitive complexities. The practical application of this model is proposed for developing fourth-generation virtual training platforms capable of simulating multi-stage pandemics and ethical crises. Future work should explore scalability to larger cohorts and integration with augmented reality technologies.

Keywords: Evolutionary Game Theory, Medical Simulation

G-1400

A Transfer Learning and Attention-Mechanism-Based Framework for Personalized Medical Education Using Heterogeneous and Sparse Data

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Abstract:

Background and Aims: With advancements in artificial intelligence (AI)-driven educational technologies, personalized learning processes in medical education have become feasible. Educational data in this domain are often heterogeneous and fragmented, encompassing resources such as academic records, clinical performance, instructor feedback, and learner interactions with digital learning systems. Classical machine learning models struggle to handle such data effectively. This study proposes a hybrid framework integrating transfer learning and attention mechanisms to optimize personalized educational pathways by transferring knowledge from analogous domains with high precision.

Methods: The proposed model employs transfer learning to leverage insights from prior learners and utilizes attention mechanisms to prioritize information critical to academic progress. First, heterogeneous data from diverse educational sources—including textual, numerical, and behavioral data—were preprocessed and transformed into multi-dimensional vectors. A deep neural network model with an attention mechanism was then applied to identify salient features. Finally, a transfer learning model was implemented, utilizing historical student data to refine predictions for personalized learning trajectories. Model performance was evaluated using accuracy, recall, and F1-score metrics on real-world datasets.

Results: The results demonstrated the superiority of the proposed framework over traditional machine learning models and classical neural networks in predicting individual learning needs. The transfer learning model achieved higher accuracy in personalizing education, even with limited data, while the attention mechanism played a pivotal role in identifying and focusing on critical educational information.

Conclusion: This study highlights the potential of combining transfer learning and attention mechanisms to create a robust framework for enhancing personalization in medical education. The approach not only optimizes learning pathways but also enables continuous improvement of educational systems by leveraging historical learner experiences. Future research should explore the application of this methodology across diverse educational environments and analyze its impact on learning outcomes.

Keywords: Transfer Learning, Attention Mechanism, Medical Education

G-1401

Designing a Multimodal Virtual Assistant with Graph Neural Network Architecture and Hierarchical Bayesian Inference for Supporting Clinical Decision-Making Under Uncertainty

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Abstract:

Background and Aims: Clinical decision-making under uncertainty, particularly when dealing with heterogeneous data modalities (imaging, genomics, electronic health records), necessitates intelligent support systems capable of extracting latent relationships and modeling uncertainty. This study introduces the design of an advanced virtual assistant that integrates graph neural networks (GNNs) with hierarchical Bayesian inference, proposing a novel framework to enhance decision-making in complex medical environments.

Methods: The proposed architecture leverages multi-layered medical knowledge graphs to encode clinical entities (symptoms, diseases, treatments) and their nonlinear relationships via attention-based GNNs (GATs). A hierarchical Bayesian inference layer quantifies uncertainty across multiple levels (data, model, and decision) using Markov Chain Monte Carlo (MCMC) methods and non-parametric prior distributions. Evaluation was conducted on 1,200 real-world clinical scenarios and synthetic datasets derived from hospital records.

Results: The developed system demonstrated a 41% improvement in diagnostic accuracy (AUC=0.96) and a 35% reduction in type I error (false positives) compared to classical deep learning models. The Bayesian hierarchical framework estimated uncertainty with 89% precision (Brier Score). SHAP-based explainability analysis revealed complex dependencies between knowledge graph nodes and clinical decisions, achieving a correlation coefficient of 0.87.

Conclusion: This research demonstrates that integrating GNNs with hierarchical Bayesian inference enables both structural modeling of multi-modal medical data and dynamic management of inherent clinical uncertainty. While computational complexity from combining graph-based and Bayesian methods posed a challenge, adaptive sampling algorithm optimization effectively mitigated this issue. The virtual assistant holds transformative potential for clinical decision support systems (CDSS) by unifying structured knowledge and probabilistic reasoning. Future extensions of this framework to personalized medicine and pandemic management are recommended.

Keywords: Clinical Decision Support Systems (CDSS)

G-1402

Evaluating the Application of Machine Learning in Predicting the Mortality of Hospitalized COVID-19 Patients Using the Confusion Matrix and the Matthews Correlation Coefficient

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Abstract:

Background and Aims: The COVID-19 pandemic, which occurred between 2019 and 2023, posed a significant threat to global health. Its high transmissibility, the emergence of new variants, and the novel nature of the disease made treatment and control highly challenging. This study aimed to develop an algorithm for predicting the mortality of hospitalized COVID-19 patients using machine learning methods.

Methods: This cross-sectional study was conducted on 581 hospitalized COVID-19 patients. The approach integrated multi-model features derived from computed tomography (CT) scans and electronic health record (EHR) data. High-resolution computed tomography (HRCT) images were initially processed using the Pulmonary Toolkit package in MATLAB software. Subsequently, the extracted variables were entered into the model as predictive factors, alongside demographic characteristics, underlying conditions, and laboratory results of the patients. The machine learning model was developed using the AdaBoost method by incorporating demographic and laboratory data with HRCT features.

Results: In this study, 581 hospitalized COVID-19 patients were included. Among them, 199 (34.25%) patients died, while 382 (65.75%) recovered. According to the machine learning algorithm, the most effective variables for predicting COVID-19 mortality were lymphocyte variables, CRP, age, mean lung density, lung tissue percentage, RBC count, D-dimer levels, and emphysema. The MCC Index in this study was 0.73, and the area under the ROC curve was 0.96.

Conclusion: According to our results, the three variables with the greatest impact on predicting mortality in COVID-19 patients were related to HRCT findings, laboratory results, and patient age. Therefore, it is recommended that, given the high cost of HRCT, this diagnostic test should only be performed if other risk factors are identified in laboratory results. If necessary, HRCT should be conducted promptly

Keywords: Machine Learning, Covid-19, HRCT

G-1403

Graph Neural Networks for Neurological Disorder Detection

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Abstract:

Background and Aims: Graph Neural Networks (GNNs) have emerged as the game-changing tool to process complex neurologic information by presenting unparalleled models of non-Euclidean patterns of connectivity in brains.

Methods: This paper introduces the Integrated Functional Connectivity GNN (IFC-GNN), a more advanced architecture that dynamically constructs latent features from several neuroimaging modalities within an integrated framework, adding time dependencies and population demographics to enhance biomarker discoveries.

Results: The efficacy of IFC-GNN for neuro-disorder diagnosis was demonstrated through three tasks: (1) Autism Spectrum Disorder (ASD) classification from Functional Magnetic Resonance Imaging (fMRI) data in the ABIDE dataset, 80.66% accuracy; (2) Alzheimer's Disease (AD) progression prediction from Electroencephalogram (EEG)-based networks, where graph transformers attained 91.77% accuracy; and (3) Epilepsy seizure focus localization, 99.84% accuracy with graph transformers. The IFC-GNN outperformed conventional GNNs and methods like CNNs and SVMs, revealing significant biomarkers like reduced alpha-band power in AD and disrupted theta-band synchronization in Epilepsy. By combining spatial-temporal brain connectivity analysis with demographic data, IFC-GNN drives precision medicine, yielding clinically actionable insights into early diagnosis and therapeutic targeting.

Conclusion: This paper highlights the promise of GNNs in computational neurology and encourages interpretable, multimodal architectures to help close the loop between deep learning and clinical practice.

Keywords: Graph Neural Networks, Autism Spectrum, Alzheimer

G-1405

Generative Artificial Intelligence in Virtual Care and Patient Interaction: Digital Transformation in Healthcare

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Abstract:

Background and Aims: With the expansion of digital technologies and changing patterns of healthcare service delivery, generative artificial intelligence has emerged as a novel tool in the field of virtual care. This study aims to examine the applications, challenges, and opportunities of generative artificial intelligence in virtual care and patient interaction to provide a comprehensive picture of the potential of this technology in transforming the healthcare system.

Methods: This research was conducted as a review through systematic search in scientific databases including PubMed, Scopus, IEEE Xplore, and Google Scholar. Published studies between 2018-2023 that examined the applications of generative artificial intelligence in virtual care were analyzed and reviewed.

Results: Results showed that virtual assistants based on generative artificial intelligence are capable of providing services such as initial medical consultation, answering patient questions, and managing chronic diseases. These systems help increase treatment adherence through personalization of educational content, providing smart reminders, and continuous monitoring of patient status. Studies have also shown a 23% reduction in unnecessary visits to healthcare centers and a 35% increase in access to health services in underserved areas. The main challenges include privacy protection, data security, accuracy of provided information, and the digital divide in access to these technologies.

Conclusion: Generative artificial intelligence has significant potential for transforming the healthcare system and improving patient interaction. This technology can serve as a complementary tool alongside traditional care to enhance the quality and accessibility of health services. However, the development of regulatory frameworks, ensuring data confidentiality, and designing human-centered systems are essential for effective utilization of this technology.

Keywords: Generative Artificial Intelligence, Virtual Care, Patient

G-1406

Future of Nursing Care with Artificial Intelligence

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into nursing care is poised to revolutionize the healthcare landscape. This study aims to review existing literature on the future implications of AI in nursing, focusing on its potential to enhance patient care, improve decision-making processes, and address challenges faced by healthcare professionals.

Methods: A systematic review of relevant articles published between 2018 and 2025 was conducted across various academic databases, including PubMed, Scopus, and Google Scholar. The search focused on studies that explored the applications of AI in nursing, highlighting both benefits and challenges.

Results: The findings indicate that AI can significantly improve nursing care by providing real-time data analysis, enabling nurses to make informed decisions quickly. AI-driven tools, such as virtual nursing assistants and predictive analytics, facilitate personalized patient care and enhance monitoring capabilities. Studies have shown that AI can reduce human errors in medication administration and improve patient outcomes by allowing nurses to focus more on direct patient interactions. Furthermore, AI has the potential to alleviate staffing shortages by automating routine tasks, thereby increasing efficiency within healthcare settings.

Conclusion: The future of nursing care with artificial intelligence presents numerous opportunities for enhancing the quality of healthcare delivery. As AI technologies continue to evolve, they will play a crucial role in redefining nursing practices and improving patient experiences. However, it is essential to address ethical considerations, data privacy issues, and the need for ongoing training for nursing professionals to ensure successful implementation. Embracing AI in nursing will not only enhance operational efficiency but also foster a more patient-centered approach to care.

Keywords: Artificial Intelligence, Nursing Care, Patient Outcomes

G-1407

Artificial Intelligence and Infection Prevention in Two Critical Hospital Areas

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Abstract:

Background and Aims: In the twentieth century, infectious diseases accounted for the highest number of premature deaths and disabilities worldwide. Healthcare-associated infections (HAIs) are the most dangerous adverse effects occurring during patient care. Operating rooms and special units represent some of the most critical care areas in any hospital, facing numerous challenges in maintaining hygiene. Despite extensive training on hand hygiene and adherence to sanitary techniques, we continue to witness preventable errors in patient care. The fear of transmitting infectious diseases has prompted authorities to adopt artificial intelligence and advanced technologies in healthcare.

Methods: This study was a narrative review that was performed during 2019-2025 through searching electronic databases (Pubmed, Science Direct, Google Scholar, and Scopus) with the keywords Artificial Intelligence, Operating Room, Intensive Care Unit, Infection, Prevention, Hygiene.

Results: Of the 55 articles initially identified, 20 studies met the inclusion criteria for this review. All included studies were either randomized clinical trials or descriptive and prospective studies that artificial intelligence can be utilized to identify the source of infections. The research has focused on using sensors that monitor adherence to hand hygiene techniques and sensors that ensure proper mask-wearing. Additionally, smart operating rooms equipped with temperature and humidity control systems and proper procedures for disinfecting tools and personal protective equipment have been developed. Analyzing data related to patients' temperature and blood oxygen levels has proven effective in the early detection of patients suspected of infection. Furthermore, in addition to preventing the transmission of infections, it can help avoid the overuse of antibiotics and antibiotic resistance through clinical data from patients in specialized units.

Conclusion: The use of recent technologies designed based on artificial intelligence significantly leads to a reduction in the incidence of infections in intensive care units and operating rooms, which in turn results in a decreased length of hospital stay and healthcare costs. Although the acquisition of these tools and modern technologies requires financial investment, the long-term positive effects justify the expense.

Keywords: Artificial Intelligence, Operating Room, Intensive Care Unit, Infection, Perversion, Heygiene

G-1408

Application of artificial intelligence in the care of diabetic patients

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Abstract:

Background and Aims: Diabetes is the most common endocrine disorder affecting more than 100 million people worldwide. Given that the care provided to diabetic patients falls far short of the standards of patient care and this gap has imposed significant costs on the country's health system, this article focuses on various aspects of artificial intelligence in the management and care of diabetic patients, its future promises, and challenges.

Methods: The present study is a review article that conducted a PubMed search combining the terms artificial intelligence, diabetes, and care to review the role of artificial intelligence in the care of diabetic patients.

Results: Recent advances in digital health technologies, particularly artificial intelligence, offer significant opportunities to achieve greater efficiency in diabetes care. Studies in this area highlight the potential of AI to improve the management of diabetes and related metabolic disorders through personalized nutrition and lifestyle modification. The role of AI in analyzing vast amounts of data, from dietary patterns to gut microbiome composition, enables the creation of highly personalized dietary recommendations.

Conclusion: Analysis and review of various articles showed that the use of new technologies such as artificial intelligence along with medical knowledge can have a positive impact on the prediction, diagnosis, control and care of diseases such as diabetes. Artificial intelligence has the potential to optimize diabetes care by providing personalized, accurate and data-driven support to patients and healthcare professionals. Given the increasing importance of artificial intelligence methods for diabetes management and care, it is suggested that in a developing country like Iran, the use of artificial intelligence techniques, especially in the field of diabetes management and care, be expanded and this technique be used at different levels of health.

Keywords: Artificial Intelligence, Diabetes, Care

G-1409

Clustering Analysis of Occupational Incident Data to Identify Fire Risk Patterns: A Case Study of Mashhad Fire Department Operations

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Abstract:

Background: Occupational safety is a critical concern, with workplace incidents causing significant human and economic losses globally. Analyzing occupational incident data using data-driven approaches can provide valuable insights into risk patterns. This study applies clustering techniques to categorize occupational groups based on fire-related incidents recorded by the Fire Department Operations and Management System (FOMS) in Mashhad, Iran.

Methods: The study utilizes fire department operational data from March 2017 to September 2021, encompassing 89,461 incidents. Data preprocessing included handling missing values, data cleanup, feature selection, and guild classification through expert evaluation. The K-means clustering algorithm was employed to categorize different occupations based on their fire risk profiles.

Results: The clustering analysis identified eight distinct occupational clusters with unique risk characteristics. Key findings include high fire risks in small industrial and repair units due to machinery-related incidents, storage facilities due to combustible material accumulation, and food service establishments due to gas leaks and electrical faults. Hospitals emerged as a high-risk category due to oxygen tank hazards and medical electronic equipment. The study also identified new occupational groups previously unclassified in fire department records.

Conclusion: The study underscores the effectiveness of clustering algorithms in classifying occupational fire risks and informing targeted fire prevention strategies. The findings highlight the need for industry-specific fire safety regulations and proactive mitigation measures tailored to high-risk occupational sectors. The research also suggests integrating additional occupational hazard data and predictive modeling to enhance future fire risk assessments.

Keywords: Occupational Safety, Incidents Analysis, K-means Clustering

G-1411

Pressure Ulcer Prediction System in Spine Fracture

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Abstract:

Background and Aims: Pressure ulcers are a serious and costly complication for patients with spinal fractures. This study aims to develop a machine learning-based system for predicting pressure ulcer development in hospitalized patients with spinal fracture.

Methods: We collected data from 4326 spinal fracture patients (2015–2024) from the National Spinal Cord Injury Registry of Iran (NSCIR-IR) with ethics approval, including 347 variables. Potential risk factors for pressure ulcers were reviewed. After preprocessing (handling missing values, outliers, normalization, and balancing to avoid overfitting), PCA determined the optimal number of components. Univariate filters (ANOVA for continuous, Chi-squared for categorical variables) were applied, followed by Random Forest for feature selection. Machine learning algorithms (logistic regression, SVM, decision trees, KNN, naive Bayes, neural networks) were trained, with hyperparameter tuning via grid search and K-fold cross-validation. Ensemble methods (bagging, random forest, boosting—XGBoost, AdaBoost, GBM—voting, and stacking with a random forest meta-model) enhanced performance. The final model was chosen based on the highest AUC. A Django-based UI was developed, and the model was evaluated using external hospital data.

Results: 18 variables were selected as key features through feature selection and used in model development. Bagging models (logistic regression, naive Bayes) and neural networks showed satisfactory results, with the neural network achieving the highest performance (ROC-AUC 85%, F1-score 91%) in predicting pressure ulcers. Using SHAP analysis, significant predictors included fever, small-town hospitals, neurological deficits (ASIA scale), low GCS, severe pain, surgical intervention, numerous fusions, internal organ injuries, advanced age, severe cervical fractures, prolonged heavy traction, extreme blood pressure, and low oxygen saturation. A validation study at Shohada-e Ashayar Lorestan Veterans Hospital confirmed the system's 91% accuracy in predicting pressure ulcer occurrence.

Conclusion: The designed neural network model demonstrated a relatively good performance in predicting pressure ulcer occurrence in the target population. The interpretation of how the model made decisions based on the predictor variables, along with the alignment of identified

risk factors with previous scientific evidence, indicated that the designed and implemented model was clinically acceptable.

Keywords: Pressure Ulcer, Spinal Fracture, Predictive Model

G-1412

Artificial intelligence, modelling communicable diseases: one of the applications in Epidemiology.

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Abstract:

Background and Aims: Artificial intelligence is becoming a very relevant tool in contemporary science. The world is also facing the phenomena of emerging and re-emerging infectious diseases. The aim of this study is to systematically review research that has addressed the use of artificial intelligence in infectious disease modeling.

Methods: A search for reputable scientific articles and sources from PubMed, Google Scholar, and Web of Science databases was conducted and various applications of this technology were analyzed. The final database search was conducted on October 31, 2025. The identified publications were reviewed based on the specified inclusion and exclusion criteria to determine eligibility. The risk of bias was assessed, and the findings were synthesized narratively and quantitatively.

Results: In total, this review identified 35 studies that addressed disease modeling using artificial intelligence. Machine learning and deep learning modeling have been increasingly used to predict disease outbreaks. In comparing the accuracy results of AI models with classical epidemiological approaches, AI models have been highly validated. However, there were significant considerations and limitations related to data quality and ethical considerations.

Conclusion: The use of AI in the infectious disease surveillance system can play a significant role and can bring about a tremendous transformation in the scientific and easier application of these models for health policymakers. However, the need for further research and further redefinition of models in this field is felt.

Keywords: Artificial Intelligence, Modelling Communicable Diseases, Epidemiology

G-1413

The Role of Artificial Intelligence in Promoting Medical Education Equity in Iran: A Qualitative Study

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Abstract:

Background and Aims: Educational equity, as defined by the OECD, ensures that every student can achieve their educational potential, regardless of personal or social circumstances. This research aims to explore the role of artificial intelligence (AI) in promoting medical education equity in Iran, marking the first investigation of its kind.

Methods: In the present qualitative research, 17 participants were selected through purposeful sampling, comprising educational group managers, educational executive managers, health information technology specialists, medical informatics specialists, and academic sociologists. Semi-structured interviews were conducted using an interview guide, both in-person and remotely, allowing flexibility in exploring participants' views on the research objective. The interviews lasted between 30 and 40 minutes, with the process continuing until data saturation was reached. Thematic analysis, based on Braun and Clarke's approach, was employed to identify and analyze patterns within the data. MAXQDA 2020 software facilitated the systematic organization and coding of the data.

Results: The role of AI in promoting medical education equity is explored through four main themes, including (1) Remote Learning, where AI-powered platforms provide equal access to quality education, particularly for students in remote or underserved regions; (2) Personalized Learning Opportunities, as AI allows for tailoring educational content to meet individual student's learning needs and progress; (3) Unbiased Assessment, highlighting AI's ability to ensure fair and consistent evaluations while reducing potential human biases in grading; and (4) AI-Driven Mentorship, with AI offering personalized career guidance and mentorship, especially for students lacking access to experienced advisors.

Conclusion: AI has the potential to revolutionize medical education, but its implementation requires careful attention to key factors, such as bridging the digital divide, ensuring data privacy, and balancing AI with human interaction. In Iran, a developing country affected by international sanctions, digital infrastructure is weak, and there is limited internet access in remote areas. Furthermore, economic shocks restrict Iranian households' ability to access digital learning tools. Tackling these issues is crucial for AI to foster a more equitable medical education system in the country.

Keywords: AI, Medical Education, Equity, Iran

G-1414

Design and Implementation of an AI-Powered Nursing Education Chatbot Using Natural Language Processing (NLP)

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Abstract:

Background and Aims: The increasing demand for accessible healthcare education underscores the need for innovative tools to empower patients and their families. This study aims to design and propose an intelligent nursing chatbot architecture based on artificial intelligence and natural language processing to deliver standardized nursing care education.

Methods: The proposed chatbot architecture integrates advanced natural language processing models to provide accurate and user-friendly responses. It is designed to operate across multiple platforms, including websites, WhatsApp, and Telegram. The development process involves creating a knowledge base covering medication management, nutrition, wound care, public health, and chronic disease management. The chatbot employs a conversational interface to engage users, with iterative testing to ensure reliability and usability across diverse user groups.

Results: The chatbot successfully delivers scientifically validated information tailored to user queries, enhancing patient knowledge in key nursing care areas. Preliminary testing indicates high user satisfaction, with the chatbot effectively addressing 85% of queries accurately across platforms. Its multilingual capability and accessibility ensure broad reach, particularly for underserved populations. The system demonstrates adaptability in updating its knowledge base to reflect current medical guidelines.

Conclusion: The intelligent nursing chatbot offers a scalable solution to bridge gaps in healthcare education, empowering patients and families with practical nursing knowledge. Its deployment

across widely used platforms enhances accessibility, fostering better self-care and health outcomes. Future work should focus on expanding the chatbot's capabilities to include real-time health monitoring integration and personalized care plans, further strengthening its role in nursing education and patient empowerment.

Keywords: Artificial Intelligence, Nursing Care, Natural Language

G-1416

Digital epidemiology, public health surveillance and the necessity of artificial intelligence

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Abstract:

Background and Aims: Digital epidemiology is rapidly advancing. In digital epidemiology, behavioral data is collected to increase our understanding of the dynamics of infectious diseases in order to predict the occurrence of epidemics. Our aim in this review is to review digital epidemiology, public health surveillance and the necessity of artificial intelligence.

Methods: We collected and analyzed reliable scientific articles and sources from PubMed, Google Scholar and Web of Science databases to examine the various applications of this technology. The final search was conducted on October 31, 2025. The identified publications were assessed based on specific inclusion and exclusion criteria to determine their eligibility. Also, the risk of bias was examined and the findings were presented as a combination of narrative and quantitative analysis.

Results: Combining office health data with other digital sources such as mobile health, social networks, and wearable devices, along with artificial intelligence methods, can create new areas for research and improvement of public health. A number of studies examine the users of a web-based artificial intelligence system to check for disease symptoms. On the other hand, the technological revolution, the Internet, and social networks have had a significant impact on the way disease data is collected and analyzed, and can help in faster surveillance and prediction of disease outbreaks. A number of articles also address the role of biosensors in occupational safety and health management. The use of wearable sensors and smart systems to monitor worker health and prevent occupational accidents is one of the main focuses of these studies.

Conclusion: The reviewed articles show that artificial intelligence and digital data play an important role in the advancement of digital epidemiology and public health surveillance. From machine learning models for disease prediction to AI-powered apps for medical advice, these technologies could revolutionize the way health data is collected and analyzed.

Keywords: Artificial Intelligence, Surveillance, Digital Epidemiology

G-1417

Gamification applications in E-learning among medical student: a systematic review

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Abstract:

Background and Aims: In recent years, by growing the medical education and new technologies, the application of gamification in medical education has attracted more attention from researchers and medical educators due to its benefits in motivation, engagement, and social effects. As the usage of gamification in e-learning provided a great opportunity for students to improve their knowledge level, we decided to systematically review the past studies to evaluate the application of gamification in e-learning specifically among medical students.

Methods: Electronic databases of PubMed, Scopus and Web of Science were searched from January 2010 to October 2024 to identify peer-reviewed articles that examined the application of gamification in e-learning for medical students. Data extraction was performed by two reviewers independently, and findings qualitatively were synthesized by the third person.

Results: Of the 3456 articles identified, 25 articles met the inclusion criteria, which included a variety of gamification strategies such as point systems, leaderboards, quizzes, and simulation-based games. Positive effects on student engagement and motivation were the reported majority in the studies. The result demonstrate that gamification was effective either in student engagement improvement (an average increase of 25%) or in acquisition of knowledge (an average increase of 20 in compare with traditional methods). However, due to differences between studies in study design, sample size, and assessment methods, it is difficult to generalize the findings. Also, the alignment of game elements with learning objectives and the degree of interactivity were the influencing Key factors that contributed to the effectiveness of gamification in e-learning.

Conclusion: Gamification in e-learning provides a promising approach to meliorate medical student educational experiences. As the findings show the gamification benefits to promote engagement and improve learning outcomes, the future studies should standardize methodologies and explore long-term effects of gamification in e-learning by focusing on large-

scale randomized controlled trials to confirm these findings and optimize gamification strategies tailored to medical education. This will make these findings more reliable and help confirm these findings and optimize gamification strategies tailored to medical education.

Keywords: Gamification, E-learning, Student Engagement

G-1419

The role of artificial intelligence in medical learning improvement: A systematic review

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Abstract:

Background and Aims: nowadays by growing health care, its need to medical education reform will increase too. as the artificial intelligence (AI) development and its applications in many different subjects, usage of AI in medical education has attracted more attention from researchers and medical educators. we decided to systematically review the past studies to evaluate the application of AI in medical learning improvement among students.

Methods: Electronic databases of PubMed, Scopus and Web of Science were searched from January 2010 to October 2024 to identify peer-reviewed articles that investigated AI applications in medical education, so that they are not limited to adaptive learning systems, virtual simulations, and intelligent tutoring systems. Data extraction was performed by two reviewers independently, and findings qualitatively were synthesized by the third person.

Results: Of 15124 articles initially identified, 30 studies met the inclusion criteria, which included AI applications such as personalized learning platforms, predictive analytics for student performance, and automated feedback mechanisms. The result shows the AI-enhanced learning had significant improvement in student engagement so that improved knowledge retention (average increase of 30%) and clinical reasoning skills. It is worth to noting that there were some challenges that could affect our result such as data privacy concerns, integration with existing curricula, and varying levels of technological proficiency among educators.

Conclusion: the offer of tailored educational experiences and enhancing assessment methods will improve medical learning. We suggest exploring AI long-term impacts on clinical competencies and investigating practices for AI integration into medical curricula as future studies.

Keywords: Artificial Intelligence, Medical Education, Learning Improvement

G-1420

Artificial intelligence as an assistant to medical staff in improving mental health and preventing mental disorders

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Abstract:

Background and Aims: With the increasing prevalence of mental disorders in modern societies, the need for new methods to prevent and manage these disorders is increasingly felt. This research aims to investigate the role and impact of artificial intelligence in improving mental health and preventing mental disorders. With the increasing prevalence of mental problems in modern societies and limited access to mental health services, the need for new solutions for early diagnosis and prevention of these disorders has become increasingly felt.

Methods: The present review study included 65 articles from 2015 to 2025 in national and international databases including SID, PubMed, Science Direct, Web of Science, and Google Scholar. Inclusion and exclusion criteria were based on the relevance of the topic and the quality of articles published in reputable journals, conference proceedings, or reputable online databases, articles that specifically focus on the application of artificial intelligence in the field of mental health care, and review articles that provide an overview, analysis, or synthesis of existing literature published in English.

Results: The findings showed that with the help of artificial intelligence, behavioral and biological data analysis such as sleep patterns, daily activities, and social interactions, and identification of hidden patterns, early signs of mental disorders can be identified. Using machine learning algorithms, it is possible to identify people who are at high risk of developing mental disorders and provide them with preventive interventions with the support and guidance of a virtual therapist. Designing intervention programs tailored to the individual needs of patients leads to improving the effectiveness of treatments. Also, by analyzing demographic and epidemiological data, it predicts the patterns of epidemic disease outbreaks and helps health authorities make appropriate decisions and allocate resources optimally, which leads to improving the efficiency of health systems.

Conclusion: The results showed that artificial intelligence can be a good assistant for medical staff in improving mental health and preventing mental disorders. To fully utilize this technology, there are challenges such as maintaining data privacy, the need for quality data, and ethical issues.

Keywords: Artificial Intelligence, Healthcare Assistant, Mental Health

G-1421

Design and Construction of a Smart Insole with Load Lifting Limit Detection Based on Optimal Symmetrical Lifting Patterns Using a Machine Learning Algorithm

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Abstract:

Background and Aims: In the field of ergonomics, evaluating lifting tasks to determine permissible compression force on the lumbar intervertebral discs is highly significant. This study aims to create a smart insole capable of identifying low-back compression force and safe or unsafe lifting postures in real-time based on foot pressure distribution and trunk angle, and providing corresponding visual and auditory feedback.

Methods: The study was conducted in three phases at Iran University of Medical Science. In the first phase, 23 male participants performed symmetrical manual lifting tasks under 36 conditions while standing on an insole equipped with 12 force sensing resistor and an inertial sensor positioned at the T8 vertebra. Data patterns of foot pressure and trunk angle were labeled as safe/unsafe postures based on the UTAH Index. In the second phase, seven supervised machine learning algorithms were trained, and the best predictive model was compiled on the ESP32 board, and a smart insole was assembled. In the third phase, 10 male participants performed lifting tasks while wearing the smart insole, and correlations between insole feedback and the back compression force were determined.

Results: The results indicated that the most significant features were related to the trunk angle and pressure sensors in the heel area. Additionally, the logistic regression model showed an accuracy of 91%, a precision of 93%, and a specificity of 89%, outperforming other models in predicting safe and unsafe postures. Furthermore, the final performance evaluation of the smart insole demonstrated an accuracy of 88% in correctly identifying safe or unsafe symmetrical manual lifting postures with corresponding auditory and visual responses. Additionally, a significant correlation of 0.69 was found between the pressure exerted on the lumbar intervertebral discs and the corresponding responses from the smart insole.

Conclusion: The study results showed that the smart insole equipped with force sensing resistor and an inertial sensor has acceptable accuracy and reliability for identifying patterns corresponding to safe or unsafe load-lifting postures. Therefore, it can be asserted that it can serve as an automatic posture evaluation method. However, to enhance model generalizability, more extensive studies are required.

Keywords: Musculoskeletal Disorders, Smart Insole, Posture Assessment

G-1424

Applications, Benefits, and Challenges of Using ChatGPT in Medical Scientific Writing: A Review

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Abstract:

Background and Aims: ChatGPT is a type of Large Language Model (LLM) which has since been extensively utilized in the field of medicine. ChatGPT demonstrates significant potential in medical paper writing, aiding in literature retrieval, data analysis, knowledge synthesis, and various other aspects. However, the use of these tools in medical scientific writing faces significant challenges, including the potential for inaccuracy, bias, plagiarism, and a lack of accountability. This review study aims to examine the recommendations, advantages, and limitations highlighted by previous studies regarding the use of ChatGPT in medical scientific writing.

Methods: This study conducted a review of relevant literature on the application of ChatGPT in medical scientific writing. The review focused on studies discussing best practices, benefits, limitations, and potential risks associated with AI-generated texts in scientific publications. For the literature search, reputable databases, including Embase, PubMed, and OvidMedline, were utilized.

Results: The review highlights ChatGPT's benefits in medical writing, including improving language quality, aiding in literature organization, reducing editing costs, and assisting non-native speakers. Effective use requires human oversight, ethical compliance, strategic application, and proper prompt design. However, concerns include reduced critical thinking, accuracy issues, plagiarism risks, bias, misinformation, and the need for transparency in AI usage.

Conclusion: ChatGPT is a valuable tool for medical scientific writing, offering benefits such as language enhancement, structured content organization, and improved accessibility. However, its use requires careful oversight to address concerns related to accuracy, ethical integrity, and potential misinformation. To maximize its benefits, researchers should use ChatGPT strategically as a supplementary tool, ensure human verification of AI-generated content, and adhere to ethical guidelines. Future research should focus on developing standardized frameworks for responsible AI integration in academic writing.

Keywords: Artificial Intelligence, ChatGPT, Large Language Models

G-1425

An Overview Of The Effectiveness Of Mobile-Based Education For Promoting Self-Care In Trauma Patients After Discharge

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Abstract:

Background and Aims: Recent advancements in communication technologies have significantly contributed to the development of mobile health (mHealth), utilizing mobile computing and communication tools in healthcare and public health. This review study aims to explore and analyze mobile-based educational models for self-care among trauma patients.

Methods: In this review, Persian-language databases, including the Scientific Information Database (SID), were searched using keywords such as trauma, mobile phone-based education, discharge, and self-care. Additionally, international databases such as PubMed and Google Scholar were explored using the keywords mobile, self-care, education, trauma, and digital health.

Results: An initial search yielded 1,411 articles. After removing duplicates and irrelevant papers, 70 studies remained. Based on a review of titles and abstracts and in accordance with inclusion criteria, 11 articles were identified as relevant. These papers addressed topics such as mobile education, home care, discharge planning, and trauma management in both medical and interdisciplinary literature. Some relevant information was also extracted from Persian databases, especially the SID.

Conclusion: Mobile-based education has emerged as an effective tool for enhancing self-care among discharged trauma patients. Moreover, it offers a promising solution for strengthening public health systems and advancing community health initiatives. This approach not only benefits patients but also reduces the burden on healthcare systems and contributes to cost-effectiveness. Therefore, the development and implementation of mobile-based educational programs should be prioritized by policymakers and healthcare providers.

Keywords: Self-care, Mobile-based Education, Trauma Educational Methods

G-1426

Consequences and Challenges of Applying Artificial Intelligence in Providing Nursing Care

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Abstract:

Background: With the advancement of artificial intelligence in medical sciences, its utilization in nursing care has become a necessity. While this technology enhances the quality of nursing services, it also presents certain challenges. Therefore, assessing its impacts and obstacles is essential for improving care programs.

Methods: In this review study, the keywords "Nursing care" and "Artificial Intelligence" were searched in the PubMed and Scopus databases to retrieve full-text English-language articles with Searched in the time period 2020-2025. Articles relevant to the study's objective were included, and ultimately, 12 articles were reviewed. Articles without full-text access were excluded.

Results: Artificial Intelligence technology in nursing has led to positive outcomes, including faster access to patient information, improved decision-making and nursing diagnoses, enhanced patient education, and higher-quality healthcare services. Moreover, This innovative technology can reduce human intervention in specific nursing tasks, thereby minimizing nursing errors and lowering healthcare costs. also, reducing nurses' workload allows them to dedicate more time to research and effective patient interactions.

However, despite its numerous benefits, Artificial Intelligence presents certain challenges. These include potential breaches of patient privacy due to technological vulnerabilities, reduced human interaction in nursing care, and the possible perpetuation of human and social biases within Artificial Intelligence -driven healthcare systems.

Conclusion: Although AI has the potential to enhance healthcare quality and improve access to medical information, it may also exacerbate healthcare disparities and compromise patient privacy. Therefore, the integration of AI into nursing requires careful evaluation and management of its positive and negative implications by the nursing community. Further research is recommended to identify existing challenges and develop appropriate solutions.

Keywords: Nursing care, Artificial intelligence, Healthcare

G-1427

Analysis and Diagnosis of the Pathogenic Protozoan Microscopic Images using Artificial Intelligence and Machine Learning

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Abstract:

Background and Aims: Developing of the Artificial Intelligence (AI) technology in the 21st century has provided a golden opportunity for application of this technology in medical sciences several disciplines including laboratory diagnosis of the pathogenic microbes such as parasites. Accurate diagnosis of pathogenic protozoan using microscopic images is one of the important challenges in medical parasitology. Analyzing the microscopic images of infectious protozoan using the AI technology are going to be the precise and powerful instrument for diagnosing of the pathogenic protozoan morphology. This study was aimed to investigate and introduce all the recent researches about the application of the Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) technologies in diagnosis and analysis of Pathogenic Protozoan Microscopic Images (PPMI).

Methods: In this study, all the research articles published among 2015-2025 were collected by referring the valuable data bases including PubMed, Scopus, and IEEE Xplore. Criteria for entering the study was using AI and ML algorithms for analyzing of pathogenic protozoan microscopic images (PPMI). Totally, 45 related articles were studied.

Results: The results showed that Deep Learning algorithms including Convolutional Neural Networks (CNNs) have demonstrated high accuracy in diagnosis and analysis of PPMI. The accuracy of these algorithms including CNNs-based models for analyzing and distinguishing the microscopic images of Plasmodium species (malaria disease causing agents) in blood smears was over than 97%. Using image preprocessing and data augmentation techniques have led to improved performance of DL models in diagnosis and analyzing the microscopic images of Leishmania, Trypanosoma, Toxoplasma, Babesia, and Trichomonas species with over than 98% accuracy. On the other hand, AI models have been successfully used in the classification of morphological stages (trophozoites, cysts, and oocysts) of Giardia, and Cryptosporidium species by analyzing the microscopic images.

Conclusion: The technologies of AI, ML, and DL have provided great opportunity to improve the diagnostic methods of pathogenic protozoan parasites through the analysis of microscopic images. However, there are challenges such as the need for big and robust datasets,

interpretability of data, variation in the quality of microscopic images, staining techniques of parasites microscopic smears.

Keywords: Artificial Intelligence, Pathogenic Protozoan, Microscopic Images

G-1428

Artificial Intelligence for Automated Detection of Deep Interproximal Caries and Pulp Involvement in Bitewing Radiography

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Abstract:

Background and Aims: Intraoral radiographs are essential for assessing interproximal caries, yet their diagnostic reliability is often compromised by intra- and inter-examiner variability. Artificial intelligence (AI), particularly convolutional neural networks (CNNs), presents a viable solution to reduce human diagnostic errors by enhancing accuracy. This study aimed to develop and evaluate a CNN-based model as an adjunctive tool for diagnosing deep interproximal caries and assessing their proximity to the dental pulp.

Methods: A total of 899 bitewing radiographs were selected based on predefined inclusion and exclusion criteria. An endodontist classified the radiographs into five color-coded categories according to caries severity: enamel lesions (blue), dentinal lesions extending less than half of the dentin thickness (yellow), deep dentinal lesions extending beyond half the dentin thickness (orange), and lesions reaching the pulp (red). The You Only Look Once v8 (YOLOv8) model was implemented using Python (v3) and the Ultralytics framework, with training and testing performed to detect and classify carious lesions.

Results: The model exhibited optimal performance in detecting pulp-involving caries (red group), achieving 85% sensitivity, followed by yellow (71%), blue (61%), and orange (64%) groups. For deep caries extending beyond half the dentin thickness, the model correctly identified lesions with a high likelihood of pulp exposure in 90% of cases and those with low/no likelihood in 75% of cases.

Conclusion: The study successfully developed a CNN-based model for detecting and classifying interproximal caries in bitewing radiographs. While the results are promising, detection inaccuracies indicate the need for further refinement in future research to enhance diagnostic precision.

Keywords: Bitewing Radiography, Interproximal Caries, Deep Learning

G-1429

Examining Opportunities and Challenges of Clinical Decision Support Systems (CDSS) in Improving Healthcare and the Role of Artificial Intelligence in Expanding Access to Medical Services

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Abstract:

Background: Clinical Decision Support Systems (CDSS), utilizing clinical data and artificial intelligence (AI), significantly enhance healthcare quality. These systems analyze large datasets to improve diagnostic accuracy and offer personalized treatments, reducing medical errors and improving patient safety. AI-based CDSS also enables healthcare expansion to underserved and remote areas, enhancing access to care. Despite these advantages, implementing CDSS comes with challenges. For instance, physicians may resist it, perceiving it as a threat to their clinical autonomy. Moreover, the costs of implementation, maintenance, and support can be significant. Additional challenges include data integration complexities and concerns regarding information security. Investments in infrastructure and staff training can ease adoption, creating opportunities to optimize healthcare systems.

Methods: This research utilized secondary analysis and reviews of scientific sources from databases such as PubMed, Google Scholar, and SID. CDSS opportunities, including improved diagnostic accuracy, data analysis, and personalized treatments, were identified and reviewed. Challenges, including data complexity, staff resistance, and security concerns, were assessed. The role of AI in expanding access to healthcare was evaluated through statistical documentation and case studies. Based on the findings, strategies were proposed to overcome obstacles and maximize the benefits of this technology.

Results: Findings illustrate the transformative impact of AI-based CDSS on healthcare systems and service accessibility:

Opportunities: Reducing medical errors, improving diagnostic accuracy, and enabling access to care in underserved areas.

Challenges: Physician resistance, data integration complexities, and patient data security concerns.

Impact: Accelerated disease diagnosis, improved decision-making, and promotion of healthcare equity.

Conclusion: AI-driven CDSS possesses immense potential to enhance healthcare systems. By improving diagnosis, reducing errors, and expanding access—particularly in remote areas—it plays a pivotal role in advancing healthcare equity. However, challenges such as user resistance and security concerns need attention. Investments in staff training, technological infrastructure, and data security can transform CDSS into an effective tool for cost reduction and better treatment outcomes.

Keywords: ArtificialIntelligence, CDSS, Healthcare, BigData, Personalization, Security

G-1431

Prediction of Osteoporosis using Deep Learning algorithms

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Abstract:

Background and Aims: Osteoporosis is one of the most common metabolic diseases that is characterized by a decrease in bone density and a loss of the quality of the bone structure. The use of deep learning in the prediction of osteoporosis can provide a non-invasive, cost-effective, and efficient approach. The aim of this study is to investigate the diagnostic accuracy of deep learning in the prediction of osteoporosis.

Methods: This is a systematic review and meta-analysis study that was conducted on the diagnostic accuracy of deep learning algorithms for predicting osteoporosis. A literature search was performed in electronic databases including PubMed, Elsevier, and Google Scholar to identify relevant articles until February 1, 2025. Articles were searched in databases by combining related terms such as "deep learning", "convolutional neural network", and "osteoporosis". We conducted title, abstract, and full-text screening based on inclusion/exclusion criteria. Various metrics, such as sensitivity, specificity, and area under the curve (AUC), were used to assess the diagnostic performance of deep learning models.

Results: Out of the 181 articles initially identified, 10 studies were included in the analysis. All studies used a convolutional neural network (CNN) as the deep learning model. Three studies investigated multiple deep learning models. Eight studies used various architectures of CNN, such as ResNet, VGG, and EfficientNet. The pooled sensitivity and specificity were 0.86 (95% CI, 0.82–0.89) and 0.89 (95% CI, 0.85–0.91), respectively. The bivariate approach's pooled SROC curve produced an AUC of 0.94 (95% CI 0.91-0.95). The DOR for the deep learning models was 49.09 (95% CI, 28.74–83.84).

Conclusion: Deep learning has an acceptable performance for the diagnosis of osteoporosis, even better than other ML algorithms. These findings suggest that DL models are promising for noninvasive early detection, but more extensive multicenter studies are necessary to validate their efficacy in at-risk groups.

Keywords: Artificial Intelligence, Osteoporosis, BMD, Deep learning, Machine learning

G-1432

Designing an Artificial Intelligence System for Hospital Emergency Triage: A Decision Support Tool for Triage Nurses

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Abstract:

Background and Aims: Hospital emergency departments, due to the high volume of referrals and the need for rapid decision-making, require tools to improve the triage process and increase the accuracy of patient prioritization. This study aimed to design and develop an artificial intelligence-based system capable of analyzing patient information in real-time and assisting emergency medical staff in making quick and effective decisions.

Methods: In this study, vital and clinical data of 1500 patients from the emergency departments of hospitals under the auspices of Kerman University of Medical Sciences were collected over six months. Using an open-source language model (gemma3-4B), which has a 4 billion parameter model, provides high data processing capabilities for the Persian language and offline execution. The system was trained based on standard triage protocols (ESI). The designed system was implemented offline to preserve patient privacy and was integrated with a simple graphical user interface for use by medical staff. After training, the system was simulated in a simulated environment and then experimentally evaluated in the emergency department of a selected hospital.

Results: The system designed by analyzing real data increased the accuracy of patient prioritization to 91.5%, which was in line with the assessment of emergency nurses and physicians in 87% of cases. The waiting time for patients with severe critical condition (ESI) levels 1 and 2 decreased from 8 minutes to 5.2 minutes (a 35% reduction). Human errors in identifying priorities decreased by 28%, and the allocation of bed and staff resources became more optimal in 72% of cases. Also, 85% of staff found the system easy to use, and 78% found it effective in reducing workload.

Conclusion: This system successfully reduced staff workload by enhancing the accuracy and speed of prioritization, and improved the quality of care by optimizing the allocation of hospital resources, including beds and equipment. Feedback from staff indicated high acceptance and

ease of use in stressful situations. This study confirmed that the designed artificial intelligence system can be an effective tool for improving decision-making in hospital emergencies and enhancing treatment outcomes.

Keywords: Artificial Intelligence, Hospital Triage, Decision Support

G-1433

Predicting the encapsulation efficiency of polymeric nanoparticles using machine learning approaches

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Abstract:

Background and Aims: Encapsulation efficiency is a critical parameter in drug delivery systems, which is defined as the percentage of drug loaded in the carrier to the total amount of drug used in the formulation. Since determining encapsulation efficiency experimentally is time-consuming and costly, machine learning techniques could be used to predict this parameter. This study emphasized the development and comparison of predictive models for encapsulation efficiency prediction using Random Forest and Support Vector Machine algorithms.

Methods: A data set of 57 samples was collected from related articles, including variables such as particle size, polydispersity index, zeta potential, polymer properties (name, molecular weight, Log P, glass transition temperature), drug properties (name, solubility, molecular weight, Log P), and experimental conditions (polymer concentration, drug loading method, polymerization method, temperature, pH, drug-to-polymer ratio, incubation time, solvent type). Predictive models were built in RapidMiner 10.1.002 using Random Forest and Support Vector Machine algorithms. Model performance was evaluated using Root Mean Squared Error and Mean Absolute Error. Correlation-based weights were used to measure feature importance.

Results: The accuracy of Random Forest model was more than the Support Vector Machine model, with a Root Mean Squared Error of 12.498 and a Mean Absolute Error of 12.498. The Support Vector Machine model, for comparison purposes, shows a Root Mean Squared Error of 17.062 and a Mean Absolute Error of 17.062. Weight analysis using correlation determined that polydispersity index (0.569), particle size (0.547), and pH of the medium (0.457) were the most effective features of encapsulation efficiency. Other important features included zeta potential

(0.319), polydispersity index after loading (0.303), and drug-to-polymer ratio (0.214). Features such as polymer name (0.005) and temperature (0.033) had no significant contribution.

Conclusion: The study is a witness to the capability of machine learning, in this case, Random Forest, to improve drug delivery systems by accurately predicting encapsulation efficiency and identifying contributing factors. The limitation of this study was the small number of data, so future research may use a large dataset and have the model optimized to enhance generalizability across different types of drug delivery systems.

Keywords: Artificial Intelligence, Machine-learning, Random Forest, Support Vector Machine, Encapsulation Efficiency

G-1436

Investigating blood perfusion to brain tissue using SPECT images based artificial intelligence

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Abstract:

Single-photon emission computed tomography (SPECT) is a nuclear imaging modality frequently used in diagnostic medicine. At its most basic level, SPECT produces a three-dimensional image of the distribution of a radioactive tracer injected into the blood stream and subsequently taken up by certain tissues. Brain Perfusion SPECT scan is a type of nuclear medicine imaging test that measures blood perfusion in the brain, investigation of sensorial, motor, and cognitive activities and the central effects of central nervous system, drugs in both the normal and the abnormal brain. Recently, many artificial intelligence (AI) algorithms have been proposed to compensate for such deficiencies. Studies include denoising and resolution improvement for SPECT images.

Background and Aims: Obtaining three-dimensional information about brain perfusion and metabolic status, pathological status of the patient. Diagnosing cerebral perfusion abnormalities with the help of tracer absorption rate.

Methods: the nuclear medicine technologist will insert an intravenous (IV) cannula into a vein, usually in your hand or arm. The radiopharmaceutical is injected into your blood stream through the IV cannula. You will then be required to lie on a bed while detectors or cameras obtain the scan images. As part of the SPECT-CT, you are required to lie still in a ring shaped scanner for at least 30–40 minutes. The first 3–5 minutes involves the CT scan component, with the remainder of time required for the SPECT scan. It is very important that you remain still for the entire duration of the two scans, so that the SPECT and CT can be accurately combined.

Results: AI based techniques have shown great promise in enhancing image quality by reducing levels of noise and blur and have shown clinical promise in many task based evaluation studies. Importantly, many studies have suggested that AI based de noising approaches can reduce radiotracer dose and scan times without sacrificing diagnostic accuracy.

Conclusion: The convergence of SPECT and AI is transforming the landscape of medical diagnostics. AI enhances the capabilities of SPECT imaging by improving image analysis, predictive modeling, and operational efficiency.

Keywords: Artificial Intelligence, Brain Perfusion, SPECT

G-1437

Scoping Review on the Impact of Artificial Intelligence in Preventing Pressure Ulcers and Patient Falls

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Abstract:

Background: Pressure ulcers and patient falls are major challenges in healthcare, particularly for hospitalized patients or individuals with mobility limitations. Preventing these issues requires advanced technologies to accurately assess risks and implement effective interventions. The ultimate goal is to enhance the quality of care and prevent these complications.

Methods: This study is a scoping review examining the impact of advanced technologies on the prevention of pressure ulcers and patient falls. Data was collected by searching the databases Google Scholar, PubMed, Scopus, and Science Direct. Inclusion and Exclusion Criteria: Inclusion criteria: Full-text availability and articles in English. Exclusion criteria: Lack of direct relevance to the research topic. A total of seven articles that met the inclusion criteria were selected for review. Strategy search: ("Artificial Intelligence" OR "AI") AND ("Patient Fall" OR "Fall Prevention" OR "Pressure Ulcers" OR "Bedsore") AND ("Prevention" OR "Risk Assessment" OR "Interventions") AND ("Healthcare" OR "Clinical Practice" OR "Patient Safety")

Results: The study found that the combination of AI technologies, such as measuring moisture, cytokine levels, and thermography, significantly contributed to early detection and prevention of pressure injuries. A fall detection system demonstrated better surveillance compared to standard systems, reducing fall rates by 54.1%. Additionally, the Ai Chi program improved pain perception, balance, and functional capacity in Parkinson's disease patients.

Conclusion: AI-based technologies show promise in preventing pressure injuries and falls. The Ai Chi program provides a feasible and effective approach to improving patient outcomes, especially for Parkinson's disease patients.

Keywords: AI, Patient Fall, Bedsore, Prevention

G-1438

Investigation of artificial intelligence methods for the prediction and diagnosis of preeclampsia: A systematic review

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Abstract:

Background and Aims: Preeclampsia is a serious pregnancy disorder that threatens the health of the mother and fetus. Early diagnosis, especially in the early stages, plays an important role in reducing its complications. Advances in artificial intelligence and machine learning have provided new tools such as random forest (RF) and neural networks (ANN) that have high accuracy in predicting and diagnosing this disease by analyzing clinical and biological data. This study aimed to investigate artificial intelligence methods for predicting and diagnosing preeclampsia.

Methods: This study was conducted as a systematic review in 2025 by searching for the keywords "artificial intelligence", "machine learning", "preeclampsia", "prediction" and "diagnosis" in PubMed and Science Direct databases and the Google Scholar search engine. Relevant English-language articles that examined AI methods for predicting or diagnosing preeclampsia and were published between 2020 and 2024 were included in the study. Articles related to other pregnancy diseases or non-AI methods were excluded. The extracted data included methods, results, and conclusions, which were used to analyze the effectiveness of AI in the management of this disease.

Results: A total of 6785 articles were retrieved from the aforementioned databases, and after applying the inclusion and exclusion criteria, 48 articles were finally included in the study. The findings of these studies showed that artificial intelligence algorithms such as random forest (RF), support vector machine (SVM), and artificial neural networks (ANN) have high accuracy in predicting preeclampsia. These models have been able to provide acceptable prediction rates

using clinical, para-clinical, and electrocardiogram (ECG) data. Also, artificial intelligence-based methods have been effective in reducing diagnostic errors and early identification of the disease.

Conclusion: Artificial intelligence-based methods are effective tools for predicting and diagnosing preeclampsia. Models such as random forest and Neural Networks have been able to provide high accuracy by analyzing diverse data. By developing and expanding these technologies, we can help reduce the complications of this disease and improve the health of mothers and babies.

Keywords: Artificial Intelligence, Preeclampsia, Prediction, Diagnosis

G-1443

The effects of training by virtual reality vs biofeedback on pelvic floor muscle strength in postpartum women: a randomized controlled

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Abstract:

Background and Aims: Postpartum starts immediately after childbirth and generally lasts six to eight weeks. The mother body goes through many physical and emotional changes during this time, with some symptoms lasting months after you give birth. Pelvic floor disorders are very common postpartum. Different treatments are performed to strengthen the weak pelvic floor muscle (electrical stimulation, laser therapy, biofeedback therapy, muscle training). Virtual reality is a novel method of visualizing ultrasound data with the perception of depth and offers possibilities for measuring non-planar structures. The levator ani hiatus has both convex and concave aspects. Biofeedback for pelvic floor muscle retraining is a treatment to help patients learn to strengthen or relax their pelvic floor muscles in order to improve bowel or bladder function and decrease some types of pelvic floor pain. It is a painless process that uses special sensors and a computer monitor to display information about muscle activity. To evaluate the effectiveness of abdominopelvic training by virtual reality compared to pelvic floor muscle training (PFMT) using biofeedback on postpartum women's pelvic floor muscle (PFM) strength.

Methods: A randomized controlled trial was conducted with 60 postpartum women, randomly allocated into two groups: abdominopelvic training by virtual reality – APT_VR (n=30) and PFMT using biofeedback – PFMT_BF (n=30). Both types of training were supervised by the same physical therapist, during 10 sessions each, for 20 minutes. The participants' PFM strength was evaluated by digital palpation and vaginal dynamometry, considering three different parameters: maximum strength, average strength and endurance.

Results: No significant between-group differences were observed in most analyzed parameters.

Conclusion: Both protocols have improved the overall PFM strength, suggesting that both are equally beneficial and can be used in clinical practice.

Keywords: Biofeedback, Virtual Reality, Postpartum, Pelvic Floor

G-1444

Genetic Treatment of Breast Cancer with Artificial Intelligence in Women

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Abstract:

Background and Aims: Breast cancer is one of the most aggressive cancers in women and the second leading cause of cancer-related deaths. Early detection and effective treatment play a crucial role in improving survival rates. The integration of artificial intelligence (AI) with personal genetics has emerged as a promising approach for breast cancer diagnosis and treatment. This study aims to evaluate the role of AI-driven genetic analysis in early risk prediction, diagnosis, and personalized treatment of breast cancer.

Methods: This study was conducted using a narrative review method. A comprehensive search was performed in PubMed, SID, and Google Scholar databases using the keywords “Genetic,” “Artificial Intelligence,” and “Breast Cancer” for articles published between 2018 and 2023. A total of 51 original and systematic research articles were initially retrieved. After screening based on title, abstract, and full text, 12 relevant articles were selected for final analysis.

Results: The findings revealed that AI-powered genetic analysis significantly improves early breast cancer detection by identifying individuals at high risk before symptom onset. AI enhances diagnostic accuracy by reducing false positives and negatives in imaging techniques such as mammography and MRI. Additionally, AI facilitates personalized treatment strategies by optimizing drug selection, dosage, and side effect management, leading to better patient outcomes and prolonged survival.

Conclusion: The integration of AI with personal genetics has the potential to revolutionize breast cancer detection and treatment. By enabling early risk prediction and personalized therapeutic approaches, AI can improve survival rates and reduce treatment-related side effects, paving the way for more effective breast cancer management.

Keywords: Genetic, Breast Cancer, Artificial Intelligence, Personalized

G-1447

Integration of Radiomics, Genomics, and Interpretability (XAI) for Diagnosis, Treatment, and Screening in Breast Cancer

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Abstract:

Background Breast cancer, the most common cancer in women, demands innovative AI-driven approaches to enhance screening, diagnosis, and treatment. This study introduces an integrated framework combining radiomic (mammography and MRI), genomic (BRCA1/2 mutations), and clinical data to enable personalized medicine with interpretability. The key innovation lies in the multimodal data fusion using explainable algorithms, applied for the first time in breast cancer.

Methods: Data were extracted from the TCGA-BRCA (genomics) and DDSM (mammography) databases. ResNet50 was used for lesion detection in imaging, and XGBoost predicted treatment response. Interpretability methods (XAI) like SHAP and Grad-CAM identified critical imaging and genetic features. All code was published on GitHub.

Results: 1. Screening: - The ResNet50-based model achieved 96.2% accuracy and 94.8% sensitivity, reducing false positives by 35% compared to conventional methods. This aligns with critiques of mammography's limitations in overdiagnosis and psychological distress from false positives, as noted in Cochrane reviews. - MRI integration improved tumor localization and staging, particularly for high-risk patients with BRCA mutations. 2. Treatment: - The chemotherapy response prediction system demonstrated 89.5% accuracy by analyzing metastasis-related gene expression (e.g., BRCA1). This mirrors clinical practices where systemic therapies like chemotherapy and targeted drugs are tailored to genetic profiles. - SHAP analysis highlighted heterogeneous tumor texture and BRCA1 mutations as key predictors, aligning with studies emphasizing genetic and radiomic synergy. 3. Interpretability: - Grad-CAM visualized tumor regions critical for AI decisions, addressing concerns about "black-box" models in clinical settings. For example, SHAP identified genomic features linked to immunotherapy resistance, supporting precision oncology workflows. Challenges and Ethical Considerations: - Data Privacy: Ensuring patient confidentiality in multimodal datasets remains critical, especially with genomic data. - Standardization: Variability in imaging protocols (e.g., MRI vs. mammography) and genomic testing methods complicates model generalizability. - Clinical Adoption: Overdiagnosis risks (e.g., unnecessary mastectomies) highlighted in Cochrane studies underscore the need for XAI to improve clinician trust.

Conclusion: This AI framework advances personalized breast cancer care through multimodal integration and transparency. However, interdisciplinary collaboration is essential to address ethical dilemmas and standardize XAI models.

Keywords: Artificial Intelligence, Breast Cancer, Personalized-Medicine

G-1448

Development of Interpretable Deep Learning-Based Clinical Decision Support Systems

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Abstract:

Background and Aims: Artificial Intelligence (AI)-driven Clinical Decision Support Systems (CDSS) are transformative tools in digital health. This study focuses on designing and evaluating a novel CDSS framework that integrates clinical, imaging, and patient metadata to assist physician decision-making. The core innovation lies in combining deep learning with interpretability methods (XAI) to enhance system trustworthiness in clinical settings .

Methods: This study developed a deep learning-based clinical decision support system (CDSS) using MIMIC-III (clinical data) and CheXpert (chest X-rays). Data were standardized via FHIR, with Transformers analyzing medical reports and ResNet-50 detecting anomalies. Federated Learning preserved privacy, while SHAP and Grad-CAM ensured interpretability. The system achieved 93.4% accuracy in diagnosis extraction and 94.1% sensitivity in imaging. Innovations included multimodal fusion (**GNNs + Transformers**) and privacy-aware training, balancing speed, accuracy, and transparency for clinical adoption.

Results: Diagnosis: The NLP model extracted complex conditions (e.g., sepsis) from clinical reports with 92.4% accuracy, leveraging deep learning's ability to parse unstructured text . ResNet-50, a convolutional neural network (CNN), identified radiological abnormalities with 94.1% sensitivity, demonstrating its efficacy in medical image analysis . Interpretability: SHAP analysis revealed that key features like CRP levels and tumor patterns in imaging most influenced model predictions, addressing the "black-box" critique of AI in healthcare . Privacy: Federated Learning increased model training time by only 15% while ensuring data security, a critical advancement for multi-institutional collaborations . Challenges and Innovations: Technical Integration: Combining diverse data types (e.g., imaging, genomics) requires robust architectures like CNNs for image processing and Transformers for NLP. Clinical Adoption: Resistance to AI tools persists due to transparency concerns. XAI methods like SHAP and Grad-CAM provide visual explanations (e.g., highlighting tumor regions in MRI), fostering clinician trust. Ethical Considerations: Data privacy and algorithmic bias remain critical, necessitating frameworks like Federated Learning and standardized XAI protocols.

Conclusion: This CDSS framework bridges deep learning's predictive power with interpretability, advancing personalized medicine. However, challenges such as EHR integration and clinician

acceptance require interdisciplinary collaboration. Future work should prioritize real-world validation and addressing disparities in underrepresented populations.

Keywords: Artificial Intelligence, Digital Health, Clinical Decision

G-1449

Transformation in Mobile Health (mHealth) and Telemedicine with Deep Learning Approaches and Data Security

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Abstract:

Background and Aims: Mobile Health (mHealth) and telemedicine are pivotal to digital health but face challenges in managing real-time data and ensuring privacy. This study introduces an AI framework integrating wearable devices (e.g., Apple Watch), medical imaging, and patient speech data to enhance remote diagnosis and monitoring. Innovations include interpretable deep learning and Homomorphic Encryption for secure, privacy-preserving analytics.

Methods: Data from Apple Watch (physiological signals), MedPix (medical images), and the COVID-19 Speech Dataset were analyzed. LSTM models processed wearable time-series data, while Vision Transformer (ViT) detected anomalies in CT scans. Federated Learning and Homomorphic Encryption ensured privacy-compliant training.

Results: The proposed framework demonstrated significant advancements in mobile health and telemedicine. Long Short-Term Memory (LSTM) models achieved 93.7% accuracy in detecting cardiac events such as arrhythmia from wearable device data, enabling real-time alerts for critical conditions like atrial fibrillation. For visual diagnosis, Vision Transformers (ViT) outperformed traditional radiomics, identifying lung abnormalities in CT scans with 95.4% sensitivity, particularly in detecting COVID-19 patterns and tumors. Security measures, including homomorphic encryption, ensured full data privacy compliance with GDPR/HIPAA standards, though processing time increased by 20%. To enhance clinical trust, explainable AI (XAI) tools like LIME elucidated model decisions, highlighting heart rate variability and pulmonary nodule patterns as pivotal factors.

However, challenges remain. Integrating heterogeneous data streams—such as speech and imaging—requires robust architectures combining Transformers for natural language processing and CNNs for imaging analysis. Additionally, the high energy consumption of wearable devices underscores the need for edge computing optimizations to improve efficiency. Finally, the absence of standardized regulatory frameworks for AI in telemedicine poses a critical barrier, necessitating urgent collaboration among policymakers, technologists, and clinicians to ensure ethical and scalable implementation.

Conclusion: This framework merges deep learning, data security, and interpretability to advance mHealth and telemedicine. Future work must address infrastructure integration, energy efficiency, and regulatory alignment through interdisciplinary collaboration.

Keywords: Artificial Intelligence, Digital Health, Mobile Health

G-1450

The Role of the Internet of Things (IoT) and Artificial Intelligence in Transforming Healthcare Systems and Smart Hospitals

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Abstract:

Background and Aims: Smart hospitals, leveraging the Internet of Things (IoT) and Artificial Intelligence (AI), have revolutionized resource management, patient monitoring, and healthcare service quality. This study introduces an integrated IoT-AI framework that uses real-time data from connected devices (e.g., wearable sensors and medical equipment) to optimize hospital operations and reduce medical errors. The core innovation lies in integrating deep learning with IoT networks to predict and prevent clinical crises.

Methods: Data were collected from IoT sensors in Intensive Care Units (ICUs) and operating rooms. Long Short-Term Memory (LSTM) models analyzed physiological time-series data, while Graph Neural Networks (GNNs) modeled interactions between devices. Federated Learning ensured data privacy, and Edge Computing enabled real-time data processing.

Results: Patient Monitoring: The LSTM model predicted critical events (e.g., hypotension) 10 minutes in advance with 94.2% accuracy. Wearable EEG sensors improved seizure detection accuracy to 89% in epilepsy patients.

Resource Management: GNNs reduced ICU bed wait times by 30% through optimized resource allocation. IoT-based medication automation systems decreased prescription errors by 45%.

Security: Federated Learning and Edge Computing increased processing time by only 15% while ensuring data security.

Interpretability: XAI methods like SHAP revealed that heart rate variability and blood oxygen levels were key predictors of clinical crises.

Conclusion: This framework empowers smart hospitals to enhance healthcare quality through IoT and AI. However, challenges such as integration with legacy systems and high energy consumption of IoT devices require future research. Collaborative efforts among technologists, clinicians, and policymakers are critical to address ethical and technical barriers.

Keywords: Artificial Intelligence, Digital Health, Smart Hospital

G-1451

Classification of Colon Cancer Subtypes Through Multi-Omics Integration

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Abstract:

Background and Aims: Colon cancer is a significant global health concern, ranking among the top leading causes of cancer-related deaths worldwide. Subtype identification in colon cancer is crucial for advancing research and improving clinical outcomes. High-throughput sequencing has made multi-omics data crucial for understanding the convoluted biology of cancer. This approach enables comprehensive analysis by integrating genomic, transcriptomic, and epigenomic data, facilitating the characterization of consensus molecular subtypes (CMS) in colon cancer. Specific genetic profiles and clinical outcomes, including treatment responses and survival, are associated with these discrete categories. Recent developments in multi-omics data analysis have facilitated the advent of computational approaches. These methodologies can essentially be categorized into two groups: supervised and unsupervised techniques.

Methods: We selected the TCGA-COAD cohort for our discovery analysis of multi-omics data, including transcriptomics (mRNA, lncRNA, miRNA), DNA methylation CpG sites, and somatic mutation data. Each dataset underwent rigorous preprocessing and normalization using R-based packages such as limma, edgeR, and CHAMP to ensure data integrity and consistency. We performed integrative analysis using the MOVICS package, employing a multi-algorithm clustering approach to uncover molecular subgroups. The number of clusters was selected by clustering prediction index (CPI) and Gap statistics. Subsequently, we applied ten clustering algorithms: iClusterBayes, moCluster, CIMLR, IntNMF, ConsensusClustering, COCA, NEMO, PINSPlus, SNF, and LRAcluster to identify the optimal number of subtypes.

Results: We successfully identified the Multi-Omics Cancer Subtype (MOCS) using the Consensus Clustering algorithm, which revealed four robust subtypes: CS1, CS2, CS3, and CS4, from a cohort of 206 patients. The analysis yielded an average silhouette score of 0.57, indicating substantial intra-cluster similarity among the identified subtypes. This integrative framework enhances our understanding of colon cancer heterogeneity and exemplifies the potential of multi-omics data in refining cancer subtype classification.

Conclusion: Our study advances the classification of colon cancer subtypes through the integration of five distinct omics datasets and ten clustering approaches to classify colon cancer subtypes. This helps stratify patients, reveals cancer heterogeneity, and suggests personalized treatment. It also demonstrates the potential of incorporating multi-omics data for improved patient care and colon cancer outcomes.

Keywords: Colon Cancer, Multi-Omics, Consensus Molecular Subtypes

G-1452

The Role of E-Commerce and E-Marketing with an Artificial Intelligence Focus in the Development of Medical Tourism in Iran

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Abstract:

Background and Aims: Medical tourism is a rapidly growing industry, with Iran emerging as a competitive destination due to its advanced medical infrastructure, cost-effective services, and cultural attractions. This study aims to explore how artificial intelligence (AI)-driven e-commerce and e-marketing can enhance the development of medical tourism in Iran, hypothesizing that these technologies can significantly improve accessibility and global competitiveness.

Methods: The research involved a comprehensive review of existing literature and case studies on AI applications in e-commerce and e-marketing, focusing on their implementation in medical tourism. Data were collected from online platforms, industry reports, and stakeholder interviews to assess the current state of Iran's medical tourism sector. The study analyzed AI tools such as chatbots, personalized recommendation systems, and targeted advertising algorithms, alongside digital infrastructure and workforce capabilities in Iran.

Results: AI-driven e-commerce platforms facilitate seamless booking, transparent pricing, and multilingual support, enhancing patient access to Iranian medical services. E-marketing powered by AI improves global visibility through search engine optimization, targeted ads, and social media management, effectively showcasing Iran's medical and cultural strengths. These technologies reduce operational costs and elevate patient experiences, positioning Iran to compete with leading destinations like Turkey and India. However, challenges such as limited digital infrastructure, a shortage of AI-skilled professionals, and data privacy concerns hinder progress.

Conclusion: AI-driven e-commerce and e-marketing offer transformative potential for Iran's medical tourism industry by improving efficiency, patient satisfaction, and global reach. Strategic investments in digital infrastructure, workforce training, and robust data privacy regulations are essential to overcome barriers. The establishment of a national AI-based medical tourism platform and targeted regional marketing campaigns are recommended to maximize Iran's market share. Further research should explore long-term impacts of AI adoption on patient trust and industry sustainability.

Keywords: Artificial Intelligence, Medical Tourism, E-Commerce, E-Marketing

G-1453

Designing an AI-Based Intelligent Scheduling System for Nursing Staff in Hospitals

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Abstract:

Background and Aims: Nurse scheduling in hospitals is a complex and time-consuming task, often performed manually, leading to human errors and inefficiencies. This study aims to design an AI-based intelligent scheduling system to automate nurse shift planning, optimizing fairness and operational efficiency while enhancing staff satisfaction.

Methods: The proposed system utilizes optimization algorithms and machine learning to generate shift schedules. It incorporates factors such as unit requirements, legal regulations, staff preferences, and workload balance. The system analyzes historical data to identify optimal scheduling patterns and adapts to sudden changes through predictive modeling. A prototype will be developed and tested in a simulated hospital environment, involving a sample of nursing staff and administrative personnel to evaluate usability and performance.

Results: The system is expected to reduce scheduling time by at least 50%, minimize errors in shift assignments, and improve compliance with labor regulations. Preliminary simulations indicate a 30% increase in schedule fairness, as measured by equitable shift distribution and adherence to staff preferences. Additionally, the system's predictive capabilities enhance preparedness for staffing shortages, ensuring uninterrupted hospital operations.

Conclusion: By automating nurse scheduling, this AI-based system significantly enhances operational efficiency and reduces the administrative burden on nursing managers. It promotes a better work-life balance for nurses, potentially increasing job satisfaction and retention rates. The findings underscore the need to transition from traditional scheduling methods to intelligent solutions in healthcare management. This system could serve as a foundation for similar

applications in other service-oriented sectors, with future work focusing on real-world implementation and scalability to diverse healthcare settings.

Keywords: Artificial Intelligence, Nurse Scheduling, Healthcare Management

G-1454

A 3D Hybrid CNN-Transformer Framework with Bayesian Uncertainty Estimation for Robust Brain Tumor Segmentation in Multi-Modal MRI

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Abstract:

Background and Aims: Accurate segmentation of gliomas in multi-modal MRI (e.g., T1, T1ce, T2, FLAIR) is critical for diagnosis and treatment planning but remains challenging due to tumor heterogeneity, ambiguous boundaries, and inter-modal misalignment. Traditional convolutional neural networks (CNNs) often fail to capture global contextual relationships and lack reliable uncertainty metrics, limiting their clinical utility. This study aims to develop a robust hybrid framework that integrates local and global features while quantifying segmentation uncertainty to enhance clinical interpretability.

Methods: We propose a 3D CNN-Transformer architecture combined with Bayesian uncertainty quantification. The framework employs a hierarchical 3D U-Net for localized tumor feature extraction and a spatial-channel Transformer to model long-range dependencies across MRI modalities. Monte Carlo dropout is applied during inference to estimate voxel-wise uncertainty and generate confidence maps. The model was trained and validated on the BraTS 2023 dataset (1,250 cases), with preprocessing steps including N4 bias correction, histogram normalization, and anisotropic resampling.

Results: The framework achieved state-of-the-art performance with mean Dice scores of 0.89 (enhancing tumor), 0.93 (whole tumor), and 0.88 (tumor core), outperforming nnU-Net (+3.2%) and TransBTS (+1.8%). The 95% Hausdorff distance for the tumor core improved by 2.1 mm, and uncertainty quantification yielded an entropy calibration error (ECE) of 0.032, demonstrating high reliability in ambiguous regions. Ablation studies confirmed the Transformer's role in reducing inter-modal inconsistencies (18% variance reduction).

Conclusion: This work presents a computationally efficient hybrid architecture that balances local-global feature integration and provides clinically interpretable uncertainty-aware segmentation. Validated on multi-institutional data, the framework's robustness to MRI artifacts and plug-and-play compatibility with existing tools make it a practical solution for clinical deployment. Open-source implementation is provided to accelerate reproducibility and adoption in medical imaging research.

Keywords: CNN, Multimodal, MRI, Tumor Heterogeneity, Medical-image-analysis

G-1455

The evolution of artificial intelligence methods in the diagnosis of frontotemporal dementia in the aged: a bibliometric analysis study (2010 - 2025)

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Abstract:

Background and Aims: Frontotemporal dementia, after Alzheimer's, is the most common form of dementia in the elderly, and its diagnostic complexities necessitate the use of advanced technologies such as artificial intelligence. This study examines the trends and developments in the application of artificial intelligence in diagnosing frontotemporal dementia in the elderly and analyzes existing research patterns and gaps.

Methods: Using a bibliometric approach, this research collected 56 articles published between 2010 and 2025 from the Scopus database and analyzed them using the VOSviewer software. The search was conducted using the keywords artificial intelligence, frontotemporal dementia, diagnosis, and elderly, and after manual screening, co-authorship networks, co-occurrence of keywords, and international collaborations were evaluated.

Results: The number of articles increased from 0 in 2010 to 17 in 2024, with exponential growth since 2018. The United States led with 20 articles (35.71%) and 1720 citations, followed by the United Kingdom with 16 articles (28.57%) and 1788 citations, and Italy with nine articles (16.07%) and 1530 citations. The collaboration network showed that the United States and the United Kingdom were the most active, with link strengths of 46 and 41, respectively. Keyword analysis identified four clusters (diagnosis, algorithms, imaging and neurodegeneration), and 31% of the articles were categorized in the medical field.

Conclusion: Artificial intelligence was practical in diagnosing and differentiating frontotemporal dementia and improved its management as an efficient tool. However, the lack of data specific to older adults and the need for dual expertise posed challenges. The development of diverse data and the standardization of algorithms were suggested, and emphasis was placed on longitudinal studies.

Keywords: Frontotemporal dementia, Artificial intelligence, Diagnosis

G-1456

Machine utilization in diagnostic ultrasound for triple-negative breast cancer: a systematic review.

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Abstract:

Background and Aims: Triple-negative breast cancer (TNBC) is an aggressive subtype of breast cancer that has limited treatment options due to the lack of estrogen receptors (ER), progesterone receptors (PR), and HER2, and its accurate identification is of great importance. Recent advances in machine learning (ML) and its application in medical diagnosis, especially in ultrasound image analysis, have provided new possibilities for non-invasive diagnosis of TNBC. This systematic review aimed to evaluate the application of machine learning in ultrasound image analysis to diagnose TNBC and differentiate it from other breast cancer subtypes.

Methods: A review was conducted independently by two people based on PICO criteria and aligned with the research objective and based on the PRISMA checklist, using PubMed, CINAHL, Medline, Web of Science, Google Scholar search engine SID databases, and Boolean operators. The time limit between 2018 and 2024 was determined using the MESH keywords "triple negative breast cancer", "machine learning" and "diagnostic ultrasound". After reviewing the inclusion and exclusion criteria and critically assessing the quality of the selected articles, a total of 8 articles were included in the study.

Results: The results showed that the combination of grayscale and color Doppler image features improved the performance of the triple negative breast cancer (TNBC) detection model, so that the accuracy of the model increased to 88%, the sensitivity reached 86.96% and the detection accuracy reached 82.91%. By adjusting the parameters, the XGBoost model was able to show the highest negative prediction value (NPV) of 98.1% and the lowest false negative result rate (1.9%). Also, the use of radiomics technique by extracting specific features from ultrasound images had a great impact on improving the performance of the models.

Conclusion: The findings suggest that integrating machine learning with ultrasound data can be used as an effective tool for non-invasive and more accurate diagnosis of TNBC. Developing more

comprehensive models and evaluating them in larger populations could help improve clinical decision-making and reduce the workload of physicians.

Keywords: Triple-negative Breast Cancer, Machine Learning

G-1457

The Role of Artificial Intelligence in Kidney Calculi Management: A Systematic Review

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Abstract:

Background and Aims: Kidney Stone are one of the most common urinary tract diseases, with a prevalence of 1-15% in all age groups. Recently, AI has presented innovative solutions in the management of kidney Stone, but the evidence is sparse. So, this systematic review was conducted to analyze the impact of AI in areas such as diagnosis, treatment, and prevention of kidney Stone.

Methods: In this systematic review, extensive searches were performed with keywords related to 'artificial intelligence' and 'kidney Calculi' in the international databases of Web of Science Core Collection, PubMed/Medline Scopus, Google_Scholar search engine, and national databases of Irandoc, SID, and Magiran. The initial search yielded 39 studies. Inclusion criteria were publication in Persian/English. Grey literature came out. The time limit wasn't applied. After eliminating duplicates and critiquing with relevant tools, at least seven studies were analyzed. Ethical considerations of non-bias were observed at the stages of selection, extraction, analysis, and classification of evidence, and the abstract was reported according to PRISMA.

Results: Studies have shown that using AI algorithms can increase the accuracy of detection of kidney Stone composition to more than 90% and improve the accuracy of Fourier transform infrared spectroscopy(FTIR) analyses to detect laboratory errors in determining Calculi composition. A transferential learning model using VGG16 with Explainable AI(XAI) helps doctors accurately diagnose kidney Stone. ChatGPT is also useful in urological diagnoses but requires professional supervision. Also, using a Decision Support System(DSS) with 94.8% accuracy is effective in predicting the results of a specific treatment for kidney Stone. The UroGPT AI bot can also assist patients with kidney Stone in accessing information and managing self-care. When comparing chatbots' accuracy in categorizing foods based on oxalate content, Bard AI performed best with 84% accuracy, followed by GPT-4, Bing Chat, and GPT-3.5.

Conclusion: It seems that the use of AI can help urologists provide advice, choose the type of treatment, and predict the results of the treatment method used to remove kidney Stone. It is suggested that future studies compare the accuracy of different AI models in analyzing data in this field.

Keywords: Artificial Intelligence, Kidney Calculi, Systematic

G-1458

A comprehensive review of the applications of artificial intelligence in improving the quality of pediatric nursing care.

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Abstract:

Background and Aims: As one of the leading technologies in the last decade, artificial intelligence (AI) has been able to play an important role in the transformation of the health field, especially nursing care. This article comprehensively and systematically reviews the applications of artificial intelligence in improving the quality of pediatric nursing care and evaluates its potential effects on improving clinical outcomes, increasing efficiency, and patient satisfaction.

Methods: A review was performed independently by two people based on the PICO criteria and aligned to the research objective and based on the PRISMA checklist and using PubMed, CINAHL, Medline, Web of Science, SID databases Google Scholar search engine, and Boolean operators. The time limit between 2018 and 2024 was determined using the MESH keywords “Artificial Intelligence”, “machine learning”, “nursing care” and “children”. After checking the entry and exit criteria and critically evaluating the quality of the selected articles, a total of 8 articles were included in the study.

Results: The analysis showed that AI can significantly improve diagnostic accuracy, personalize treatments, and improve continuous monitoring of pediatric patients. AI tools such as machine learning and natural language processing have been able to accelerate nursing processes and reduce human errors. However, challenges such as ethical issues, the need for strict regulation, and specialized training of nurses for the effective use of these technologies were also identified.

Conclusion: This comprehensive review demonstrates that AI has significant potential to improve the quality of pediatric nursing care. Intelligent use of AI can lead to improved clinical outcomes and increased efficiency of health systems. However, further research is needed to address existing challenges and establish an appropriate ethical and practical framework. These results could pave the way for the development of new strategies in the education and application of AI in pediatric nursing.

Keywords: Artificial Intelligence, Nursing Care, Children

G-1459

Artificial Intelligence as a Driver for Demographic Transformations: A Systematic Review of the Role of AI in Raising Fertility Rates and Improving the Quality of Family Life

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Abstract:

Background and Aims: Demographic transformations are one of the main challenges of modern societies, with low fertility rates and changes in family structure as among its effects. In this regard, artificial intelligence (AI) as a leading technology has great potential for positive demographic changes. This study systematically examines the role of artificial intelligence in raising fertility rates and improving the quality of family life.

Methods: A review was performed independently by two people based on the PICO criteria and aligned to the research objective and based on the PRISMA checklist and using PubMed, CINAHL, Medline, Web of Science, SID databases Google Scholar search engine, and Boolean operators. The time limit between 2018 and 2024 was determined using the MESH keywords “Artificial Intelligence”, “Fertility Rates” and “Quality Life”. After checking the entry and exit criteria and critically evaluating the quality of the selected articles, a total of 8 articles were included in the study.

Results: The results of this study showed that AI can help increase fertility rates through advanced diagnostic and therapeutic methods, including prediction and management of fertility problems. AI can also improve the quality of family life by providing tools for optimizing scheduling and family management. The positive effects of this technology are also evident in reducing parental stress and increasing time spent with children.

Conclusion: As an emerging technology, AI can act as a powerful driver of demographic changes. By creating positive changes in the areas of fertility and family life, this technology can help improve the quality of life and increase fertility rates. Future studies should focus on improving AI models and improving the acceptability of this technology in social and ethical contexts.

Keywords: Quality Life, Artificial Intelligence, Fertility Rates

G-1460

Review of the effectiveness of web-based prenatal care systems on monitoring the health of pregnant mothers: a review of RCT studies

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Abstract:

Background and Aims: Many pregnant women, particularly those in underserved rural areas, lack access to basic medical care and, as a result, do not adequately prioritize their health. Consequently, they often miss crucial regular check-ups necessary for the early detection of congenital anomalies and for reducing the risk of fetal mortality. While ultrasound is currently used for routine monitoring, it requires considerable time, expense, and in-person appointments. Web-based prenatal care systems offer a potential solution by facilitating maternal health monitoring and improving pregnancy outcomes. Therefore, this study aims to investigate the effectiveness of these systems in monitoring the health of pregnant women.

Methods: Six electronic databases (PubMed, Embase, Web of Science, Scopus, ProQuest, and Cochrane) were searched up to October 28, 2024. English-language RCT studies with full text available, focusing on pregnant women undergoing monitoring with prenatal care systems, were included in this review. In addition, a manual search was conducted within the first 10 pages of Google Scholar. The quality of the selected studies was assessed using the CONSORT checklist.

Results: The initial search yielded 2470 articles. After screening titles, abstracts, and full texts, 15 articles were selected. Only 8 studies suggested a potential effectiveness of prenatal care systems, demonstrating effects such as improved breastfeeding self-efficacy, which subsequently led to better infant nutritional outcomes and enhanced metabolic control. A crucial finding was the reduction of pregnancy-related stress. Web-based systems frequently provide educational

resources and support networks, which can alleviate anxiety by equipping pregnant mothers with knowledge and social support. Improved pregnancy outcomes were also demonstrated as a benefit of these systems in the included studies, with digital tools leading to better adherence to prenatal care protocols and, consequently, healthier pregnancies. Ultimately, because these platforms often offer flexibility, accessibility, and personalized care options that are highly valued by users, they resulted in greater patient satisfaction.

Conclusion: A web-based system can help improve the quality of pregnancy outcomes and facilitate the management of pregnant women, and should be considered a complement to in-person visits. More robust RCT studies utilizing advanced technologies appear necessary to demonstrate effectiveness.

Keywords: Pregnancy, Web-Based Prenatal Care Systems

G-1462

Feasibility and effectiveness of tele rehabilitation services for patients with Multiple Sclerosis: A Scoping Review

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Abstract:

Background and Aims: Multiple sclerosis (MS) is a chronic disease of the central nervous system and a leading cause of disability in individuals aged 20 to 40. Recently, there has been a growing interest in utilizing innovative approaches such as telerehabilitation to supplement traditional rehabilitation services; however, the evidence regarding their feasibility and effectiveness remains limited and does not fully address the current needs of patients. This scoping review aims to gather published studies related to the feasibility and effectiveness of telerehabilitation services for patients with multiple sclerosis, conducted in 2024.

Methods: In the present study, a scoping review was conducted using the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to examine studies published in PubMed, Embase, Web of Science, Scopus, and Cochrane databases up to September 29, 2024. To maximize article coverage, the reference lists of selected articles were also screened. The analysis included both descriptive summaries and inductive thematic analysis.

Results: Of the 2700 articles initially identified, 10 were ultimately included in the study. The findings indicated that telerehabilitation is feasible and accessible, leading to improvements in both clinical and non-clinical outcomes. Clinical improvements included enhanced physical function, reduced fatigue, and improved mobility, while non-clinical improvements encompassed psychological well-being and quality of life. This is particularly important because it enables individuals with MS-related mobility impairments to access necessary rehabilitation services

regardless of geographical limitations. Rehacom and ERICA were the most frequently used telerehabilitation software platforms. These platforms offer suitable exercises and monitoring tools that facilitate patient engagement and adherence to rehabilitation protocols. Technical issues were identified as the most significant barrier to implementation. Factors that facilitated implementation included educating patients and healthcare providers on the effective use of the technology, integration with existing healthcare systems, and the presence of supportive policies.

Conclusion: Telerehabilitation for patients with MS is feasible and has significant effects compared to traditional rehabilitation. However, optimizing this technology requires reducing implementation barriers and utilizing accessible, user-friendly, and low-cost technologies.

Keywords: Tele rehabilitation, Multiple Sclerosis, Feasibility, Effectiveness

G-1464

Applications of artificial intelligence in imaging of musculoskeletal disorders: a systematic review of reviews

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Abstract:

Background and Aims: The utilization of standard imaging techniques has grown significantly as a key component in managing patients with musculoskeletal disorders (MSD). Imaging impacts the efficiency, accuracy, and quality of radiology reports. Artificial intelligence (AI) offers the potential to streamline imaging procedures and better serve patient needs. Consequently, this systematic review of reviews was conducted in 2024 to examine the role of AI in MSD patient imaging.

Methods: A systematic review of reviews examining AI applications in MSD imaging was performed according to PRISMA guidelines. Five databases—PubMed, Scopus, Embase, Web of Science, and ProQuest—were systematically searched for relevant studies from inception until March 10, 2025. Backward and forward reference-checking techniques were additionally utilized to identify supplementary sources. Inclusion criteria were applied to titles, abstracts, and full texts. The study protocol was registered with the OSF database.

Results: The most common applications of AI in the field of MSD imaging are ordering appropriate imaging tests to predict patients at risk of fracture, image interpretation consist of the determination of bone age, body composition measurements, screening for osteoporosis, evaluation of segmental spine pathology, fracture detection and classification, identifying and grading abnormal findings of osteoarthritis, diagnosis and outcome prediction of bone and soft-tissue tumors, awareness about appropriate positioning of orthopedic implants and their

complications, automated examination protocoling, optimized scheduling, shorter MRI acquisition times, artifact-reduced and lower-dose CT scans, new methods for producing and using radiology reports, and workflow automation.

Conclusion: AI applications in imaging include both interpretative and non-interpretative tasks. Overall, AI has the potential to enhance various areas of physiotherapy through the automation of analysis, prediction, and classification tasks. Therefore, radiologists are advised to use this tool to optimize the treatment process with a patient-centered approach.

Keywords: Artificial Intelligence, Imaging, Radiology, Musculoskeletal

G-1465

Applications of artificial intelligence in optimizing drug therapies for cancer patients: An umbrella review

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Abstract:

Background and Aims: Artificial intelligence (AI) offers an advanced approach to managing pharmacological (drug) treatments for cancer patients. Optimizing treatment protocols represents a cost-effective and safe strategy for drug utilization. AI is beneficial for both drug development and patient safety, providing a foundation for appropriate medication adaptation and use. Therefore, this systematic umbrella review was conducted in 2024 to investigate the applications of AI in optimizing drug therapies for cancer patients.

Methods: To synthesize existing evidence, a systematic umbrella review was performed, examining prior systematic reviews focused on pharmaceutical applications of AI in cancer. This review adhered to PRISMA guidelines. A comprehensive search was conducted across Scopus, PubMed, Embase, and Web of Science, spanning from database inception through March 5, 2025. Google Scholar was employed as a supplementary resource for manual searches. Eligibility criteria were applied during screening of titles, abstracts, and full-text reports. The study protocol was prospectively registered in the PROSPERO database.

Results: The most common applications of AI in pharmaceutical therapies for cancer patients are identification and drug discovery, drug design, formulation, testing of pharmaceutical dosage forms, optimizing the dose schedule for administration of drugs, predicting drug interactions and combination effects, matching patients with the optimal drug, predicting drug-target interactions, drug-repurposing, and generally optimizing treatment protocols.

Conclusion: This systematic umbrella review explores the wide-ranging applications of AI in drug therapies for cancer patients. Also, this review provides an overview of various AI-based approaches for physicians and pharmacists, highlighting their benefits and drawbacks. Nevertheless, fully realizing the potential of this technology for cancer patients requires further research to improve drug development and patient care processes.

Keywords: Artificial Intelligence, Cancer, Drugs, AI

G-1466

Investigating the Effects of Artificial Intelligence in Kidney Cancer Management: A Review of Novel Applications in Accurate and Early Diagnosis

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Abstract:

Background and Aims: Kidney cancer is a significant global health issue, where early diagnosis is crucial for improving outcomes. Artificial intelligence has emerged as a powerful tool in medicine, particularly in disease detection and management, showing great promise in enhancing therapeutic results for kidney cancer. To date, there have been several studies, however, there was a sharply felt need for a more inclusive review of AI in kidney cancer conduction diagnosis rationale, thus this paper was framed to deal with that.

Methods: This systematic review conducted an extensive search using keywords such as "artificial intelligence," "diagnosis," and "kidney cancer" across international databases (PubMed/Medline, Web of Science, Google Scholar) and national databases (SID, Magiran, Irandoc). Initial searches yielded 154 studies, with inclusion criteria limited to studies published within the past four years. Review articles and gray literature were excluded. After removing duplicates and applying quality assessment tools, nine studies were ultimately analyzed. Ethical considerations, including bias avoidance during study selection, data extraction, and analysis, were strictly followed, and findings were reported according to PRISMA guidelines.

Results: The review focused on the use of machine learning and deep learning algorithms that aimed at CT/MRI images as well as pathological data and clinical records. Radiomics models based on CT imaging showed top performance with AUC values of as high as 0.96 in discriminating between benign and malignant tumors and also for RCC subtype classification. AI did exceedingly well in predicting tumor invasiveness and the likelihood of metastasis and recurrence post-surgery. For histopathology, models such as EfficientNetB0 had up to 97% accuracy in classifying tissue images. Combing clinical and imaging data provided a better basis for decision-making in treatment.

Conclusion: The challenges of limited datasets and generalizability have, however, inhibited the full transformative prowess of AI in kidney cancer diagnosis, classification, and prognosis. Future research should prioritize, within hybrid models, the integration of imaging, pathological, and clinical data to enhance accuracy and clinical applicability. Interdisciplinary collaboration and multicenter validation would move AI one step further in strengthening the domain of kidney cancer management.

Keywords: Artificial Intelligence, AI, Diagnosis, Kidney Cancer

G-1467

Mobile health application for self-care of patients with diabetic retinopathy: Development and validation of the required minimum data set.

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Abstract:

Background and Aims: One of the most common complications of diabetes mellitus is diabetic retinopathy, which is the fifth most common cause of moderate to severe visual impairment in people 50 years of age and older. Mobile health applications enable continuous monitoring, provide patient-centered care, and enhance the participation and independence of patients with diabetic retinopathy. The development of mobile health applications can play an effective role in the management and monitoring of diabetic retinopathy. Still, the development of these applications first requires the identification of the required minimum data set. Therefore, the purpose of this study is to identify and determine the minimum required data set as the first step in designing a self-care mobile application for patients with diabetic retinopathy.

Methods: This descriptive-analytical study was conducted in 2025 in two phases including the development and validation of the minimum data set required for the development of a self-care mobile application for patients with diabetic retinopathy. In the first phase, a comprehensive review of the research literature was conducted and electronic databases such as PubMed, Web of Science, Scopus, and Google Scholar were searched until October 2024. Then, data elements were extracted and identified. In the second phase, these elements were validated by 20 experts from the fields of endocrine metabolism, ophthalmology, medical informatics, and health information management using the Delphi technique.

Results: 55 MDSs were validated in three administrative, clinical, and functional data areas using two rounds of the Delphi technique. The minimum data set that received more than 75% of expert approval was selected as the final minimum data set. Finally, after two rounds of the Delphi technique, 13 data elements in the administrative section, 19 data elements in the clinical section, and 19 data elements in the functional section were selected as the final minimum data set.

Conclusion: In future studies, advanced technologies such as artificial intelligence can enhance the capabilities of mobile health applications by analyzing patient data and providing personalized recommendations, and helping to better monitor, supervise, and manage diabetic retinopathy patients.

Keywords: Diabetic Retinopathy, Mobile Health, Self-care

G-1468

Large Language Models in Medical Imaging: Opportunities, Challenges and Future Trends

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Abstract:

Background and Aims: Medical imaging has long been intertwined with advancements in computer science, with artificial intelligence (AI) playing a transformative role in optimizing diagnostic accuracy and patient care. Recent developments in large language models (LLMs), such as OpenAI's ChatGPT-4 and Google's Gemini, have demonstrated exceptional natural language processing (NLP) capabilities. This study explores the applications and challenges of LLMs in medical imaging, aiming to provide a comprehensive assessment of their role in radiology.

Methods: This is a review study that was conducted on the applications and challenges of LLMs in medical imaging. A literature search was performed in electronic databases including PubMed, Elsevier, and Google Scholar to identify relevant articles until February 1, 2025. Articles were searched in databases by combining related terms such as "large language model", "LLM", and "medical imaging". We conducted title, abstract, and full-text screening based on inclusion/exclusion criteria.

Results: LLMs offer various applications in medical imaging, including automated diagnostic report generation, clinical decision support, integration with radiology information systems, medical education, and research support. Studies suggest that LLM-generated reports can match or exceed the quality of reports by experienced radiologists, reducing reporting time and minimizing errors. Additionally, LLMs assist in differential diagnosis, facilitate access to patient data, and enhance the learning experience for radiologists and medical students. However, their adoption comes with notable challenges. Key concerns include data privacy and security, hallucinations, lack of interpretability, overconfidence in outputs, bias in training data, regulatory uncertainties, and resistance to adoption by healthcare professionals.

Conclusion: LLMs hold immense potential to revolutionize radiology by improving diagnostic accuracy, optimizing workflows, and enhancing medical education and research. However, their implementation requires overcoming significant technical, ethical, and legal barriers. Collaboration among radiologists, AI developers, policymakers, and stakeholders is essential to

establish robust guidelines, improve model transparency, and ensure responsible integration into healthcare systems. Future research should focus on refining these models, mitigating risks, and developing regulatory frameworks to harness their full potential while maintaining patient safety and trust in AI-driven radiology.

Keywords: Medical Imaging, Large Language Model, Radiology

G-1469

AI-Driven Deep Learning for Automated Facial Structure Segmentation in Surgical Planning

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Abstract:

Background and Aims: Artificial intelligence (AI) has changed medical imaging by enhancing precision and efficiency in surgical planning. Deep learning-based image segmentation is particularly valuable in delineating facial structures for preoperative assessment. This systematic review evaluates the effectiveness of AI-driven segmentation techniques focusing on accuracy, clinical applicability, and existing challenges.

Methods: A systematic literature search was conducted across PubMed Medline, Embase, CINAHL, Central, Scopus, and Web of Science databases in February 2024. The search strategy included **Keywords:** Artificial Intelligence, Deep Learning, Image Processing, Surgical Procedures, Preoperative Care, Facial Bones, Tomography, X-Ray Computed, and Magnetic Resonance Imaging. The initial search yielded approximately 267 articles. After removing duplicates and applying inclusion criteria (such as studies focusing on deep learning algorithms for facial structure segmentation in surgical planning, peer-reviewed publications, and studies with reported accuracy metrics) a total of 64 relevant articles were selected for detailed review. Exclusion criteria included non-English articles, studies without quantitative validation, and those lacking clinical relevance. Each study was assessed for model architecture, dataset size, segmentation accuracy, validation methods, and clinical applicability. Additionally, a risk-of-bias analysis was performed using standardized evaluation tools to ensure reliability and validity.

Results: The review identified various deep learning architectures, including convolutional neural networks (CNNs), U-Net, and transformer-based models, achieving high segmentation accuracy in facial imaging. Compared to traditional methods, AI models demonstrated superior precision with some nearing expert-level performance. However, challenges such as dataset limitations, imaging variability, and model generalizability were noted. Clinical validation remains a key step for integration into routine surgical workflows.

Conclusion: AI-driven segmentation offers significant potential for automating preoperative facial structure delineation, improving accuracy and efficiency in surgical planning. However, further

research is needed to enhance model robustness, address dataset biases, and ensure seamless clinical adoption. Future advancements should explore multi-modal data integration and real-time AI-assisted decision-making to optimize surgical outcomes.

Keywords: Artificial Intelligence, Deep Learning, Image Processing

G-1473

The Application of Virtual Reality in the Health Domain: A Review

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Abstract:

Background and Aims: Virtual Reality (VR) has emerged as a transformative technology in various fields, including healthcare. By creating immersive, interactive, and simulated environments, VR offers innovative solutions for medical training, patient treatment, and rehabilitation. This review explores the applications of VR in the health domain, highlighting its potential to improve outcomes and enhance the quality of care. The aim of this review is to examine the current applications of VR in healthcare, assess its effectiveness, and identify future directions for research and implementation.

Methods: A comprehensive literature search was conducted using databases such as PubMed, Scopus, and IEEE Explore. Keywords included "virtual reality," "healthcare," "medical training," and "patient rehabilitation." Studies published between 2015 and 2023 were included, focusing on clinical trials, reviews, and case studies.

Results: VR has been successfully applied in several healthcare areas:

1. Medical Training: VR provides realistic simulations for surgical training, improving skills and reducing risks.
2. Patient Treatment: It is used in pain management, exposure therapy for phobias, and treatment of PTSD.
3. Rehabilitation: VR aids in physical and cognitive rehabilitation, enhancing motor skills and mental health.
4. Medical Education: VR offers immersive learning experiences for students and professionals.

Conclusion: VR holds significant promise in revolutionizing healthcare by providing innovative solutions for training, treatment, and rehabilitation. However, challenges such as high costs and technical limitations need to be addressed. Future research should focus on optimizing VR technologies and expanding their applications in diverse healthcare settings.

Keywords: Virtual Reality, Healthcare, Medical Training

G-1474

Does Gamification Play a Role in Improving Physical activity in Cardiovascular Disease? A Systematic Review

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Abstract:

Background and Aims: Cardiovascular disease (CVD) is a disorder of the cardiovascular system that, due to its high morbidity and mortality rates, requires lifestyle modifications, particularly physical activity (PA), in its management. Today, mobile applications based on gamification have gained prominence in medical sciences, particularly in managing CVD. Accordingly, the present study aims to examine the role of gamification in this area by reviewing existing articles.

Methods: In the present systematic review, articles were searched for using the keywords "mobile app", "gamification", "cardiovascular disease", and "physical activity" in the databases PubMed, ScienceDirect, Scopus, Web of Science, Sid, and the Google Scholar search engine. Free, full-text articles written in English from 2010 to 2025 were included in the study, while articles lacking publication dates, those published in non-reputable journals, or those unrelated to the current research were excluded. Ultimately, using the PRISMA checklist, 14 articles were selected for analysis and reporting of findings from a total of 251 articles.

Results: Gamification can increase PA by enhancing awareness and motivation; however, it faces several challenges. These challenges include a lack of theoretical models related to game elements and health behaviors, unclear identification of more effective elements, neglect of individual characteristics, and insufficient motivation to start and maintain the use of games.

Conclusion: Given that gamification has shown promise in increasing PA among patients with CVD on one hand and has posed challenges on the other, it is recommended that after a more appropriate design considering user experiences and an interdisciplinary approach, the effects of this method should be examined in the long term. Additionally, higher-quality studies should be conducted to integrate gamification in the field of cardiovascular care.

Keywords: Mobile App, Gamification, Cardiovascular Disease, Physical

G-1475

Identification of factors affecting prostate cancer using machine learningMethods: A systematic review

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Abstract:

Background: Prostate cancer is identified as the second cause of malignancy worldwide and the fifth cause of death among men. Considering the upward trend in cancer incidence and mortality rate due to this disease, the identification of risk factors can be of great help in prevention and conservative measures. Also, due to the significant growth in artificial intelligence and machine learning methods, many risk factors can be studied by identifying the most commonly used methods.

Methods: The articles reviewed in this study were from 4 main databases: PubMed, Scopus, Web of Science, and IEEE Xplore. This systematic review was based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Searching the databases was conducted from the beginning of 2015 to February 17, 2023 were included. Only the articles investigating factors affecting prostate cancer using machine learning are included in this systematic review. Non-English language studies, studies that did not involve human participants, review studies, meta-analyses, letters to editors, and commentary were excluded.

Results: The findings showed that China had the most research in identifying prostate cancer risk factors with machine learning algorithms. Age, PSA level (prostate-specific antigen), tPSA (total PSA), fPSA (free PSA), and PSAD (PSA density) were identified as the most important risk factors in prostate cancer. R-software and Python were most employed in the data analysis. Random forest, support vector machine, and logistic regression were utilized more than other machine learning methods. Among data sources, MCC-Spain, SEER (surveillance, Epidemiology, and End Results), PLCO (National Cancer Institute's Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial), and NCBI (National Center for Biotechnology Information) were registries that were used in the studies.

Conclusion: This research can help researchers use machine learning methods with better performance and registered data sources and identify the most influential risk factors for prostate cancer prevention and screening.

Keywords: Machine Learning, PRISMA, PSA, Systematic Review

G-1476

Predicting Prostate Cancer Risk and Its Associated Factors Using Machine Learning Techniques

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Abstract:

Background and Aims: Prostate cancer affects many people around the world and is fatal. Today, artificial intelligence-based techniques are widely used to predict and diagnose diseases. This study aimed to use machine learning-based techniques to predict and identify the most potential risk factors of prostate cancer in two groups of patients with prostate cancer and benign prostate hyperplasia (BPH).

Methods: This study was conducted at the Shahid Beheshti Hospital, Hamadan Province, Iran, in five steps, including the risk factors identification, data collection, preprocessing, modeling, and evaluation. Different prediction algorithms, including Logistic Regression (LR), Gradient Boosting (GB), and Random Forest (RF) algorithms, were developed based on 49 confirmed factors. The algorithm's performance was evaluated using accuracy, precision, recall, F1-score, and support metrics.

Results: The results of this study showed the Random Forest model performed best in predicting the effective factors, with an accuracy of 84.1%, a recall of 89%, and a precision of 83%. Key predictors included total and free PSA (prostate-specific antigen) levels, age, hemoglobin, and a history of BPH. Additionally, lifestyle factors such as opium consumption and dietary patterns emerged as significant contributors to prostate cancer risk.

Conclusion: This study revealed that machine learning algorithms, especially RF, can enhance the risk prediction of prostate cancer and also the identification of potential risk factors of it. Human identification of disease risk factors can be a time-consuming process prone to errors.

Keywords: Prostatic Neoplasms, Machine Learning, Cancer Risk

G-1477

Predicting and managing chronic diseases using mobile health and artificial intelligence

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Abstract:

Background and Aims: Chronic illnesses like diabetes and heart disease are piling pressure on healthcare worldwide, and it's a real challenge to keep up. I've been digging into how mobile health tools like apps and wearables combined with artificial intelligence might help us predict and manage these conditions better. The goal here is to figure out if these tech-driven approaches actually make a difference for patients, and I'm betting they could outshine the usual methods.

Methods: I scoured databases like PubMed, IEEE Xplore, and Scopus for studies from the last decade, up to 2025, focusing on adults with chronic conditions. I picked 32 solid papers, covering 15,780 people, where researchers tested things like smartwatches or phone apps paired with AI tricks, such as machine learning. I looked at how they set up their studies, what gear they used, and what happened clinically, double-checking quality with the Cochrane Risk of Bias tool.

Results: The results were pretty eye-opening. These mHealth-AI combos nailed disease predictions with an average accuracy score of 0.87, and they cut hospital readmissions by 23%. For folks with diabetes, blood sugar levels dropped by nearly a point on the HbA1c scale. Wearables with AI seemed to shine brightest for real-time tracking, though people in rural areas struggled to get on board mostly because of spotty internet.

Conclusion: It's clear this tech duo has serious potential to shake up how we handle chronic diseases, offering tailored care and catching problems early. But it's not all smooth sailing we need solutions that reach everyone, especially in remote spots. I'd love to see more long-term studies and some number crunching on costs to really prove this can work day-to-day in clinics. It's an exciting step toward smarter healthcare.

Keywords: Mobile Health, Artificial Intelligence, Chronic Disease

G-1478

Applications of Artificial Intelligence in Oral and Maxillofacial Surgery: Enhancing Surgical Planning, Diagnostic Accuracy, and Clinical Outcomes

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Abstract:

Background and Aims: Artificial intelligence (AI) has emerged as a transformative technology in various medical fields, including oral and maxillofacial surgery. AI can significantly improve diagnostic accuracy, optimize surgical planning, and predict clinical outcomes in these surgeries. The aim of this study is to explore the various applications of AI in oral and maxillofacial surgery, particularly in areas such as surgical simulation, anatomical anomaly detection, and prediction of surgical outcomes.

Methods: This systematic review was conducted by analyzing scientific articles published in reputable medical databases such as PubMed, Scopus, and IEEE Xplore. A comprehensive search was performed using keywords related to AI applications in oral and maxillofacial surgery, including "Artificial Intelligence," "Oral and Maxillary Surgery," "Machine Learning," "Deep Learning," "Surgical Planning," "Diagnostic Accuracy," "3D Simulation," and "Clinical Outcomes." A total of 450 articles were retrieved from these databases. After thorough screening, 30 articles with valid data and relevant findings were selected for further analysis. These studies included research on radio-graphic image analysis, surgical simulation, outcome prediction, and improving diagnostic accuracy in oral and maxillofacial surgeries.

Results: The findings of this study indicated that the use of AI in oral and maxillofacial surgery, particularly in 3D simulation, surgical complexity prediction, and optimizing surgical planning, has led to significant improvements in surgical precision and a reduction in the time required to perform surgeries. Additionally, deep learning algorithms applied to radiographic image analysis have enhanced the accuracy of detecting maxillofacial and dental anomalies, reducing diagnostic errors. Moreover, AI-assisted prediction of surgical outcomes has contributed to better clinical outcomes and a reduction in postoperative complications. These results were derived from the review of 30 selected articles from PubMed, Scopus, and IEEE Xplore.

Conclusion: Artificial intelligence has the potential to serve as an advanced tool in oral and maxillofacial surgery, enhancing diagnostic accuracy, optimizing surgical planning, and predicting

treatment outcomes. This technology is expected to become a new standard of care in the field, leading to reduced postoperative complications and improved clinical results.

Keywords: Artificial Intelligence, Maxillary Surgery, Machine Learning

G-1480

The role of explainable models in the clinical acceptance of AI-based decision support systems

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Abstract:

Background and Aims: Artificial intelligence is changing healthcare fast, but its “black box” vibe often makes doctors pause. I wanted to dig into whether explainable AI models ones that show how they think could ease that hesitation. My hunch was that if clinicians can see the reasoning, they’d trust these tools more in decision making.

Methods: I dove into PubMed, IEEE Xplore, and Scopus, hunting for studies from 2015 to 2025. After sifting through, I picked 25 solid papers involving 1,200 clinicians from specialties like cardiology and oncology. These studies pitted explainable AI tools (think visual breakdowns or clear algorithms) against the usual opaque systems. I checked their quality with the Joanna Briggs Institute checklist to keep things legit.

Results: The numbers were eye-opening. Explainable models bumped up clinician trust by 35%, making them way more likely to lean on AI advice. Even better, 80% of the studies tied this openness to improved patient outcomes turns out, when doctors and AI team up with clarity, good things happen.

Conclusion: This work shows explainable AI isn’t just a fancy add-on; it’s key to getting AI into clinics for real. It builds a trust bridge that could reshape patient care. Still, we’ve got gaps like figuring out a standard way to measure explainability and testing this in messy, real world settings. I’m pumped to see where it heads next.

Keywords: Explainable AI ,Clinical Acceptance ,Healthcare ,Trust

G-1481

Artificial Intelligence in Personalized Treatment Planning for Facial Cosmetic Surgery: A Systematic Review

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into facial cosmetic surgery is transforming personalized treatment planning by utilizing patient-specific data to predict optimal surgical outcomes. Machine learning and deep learning algorithms analyze facial features, tissue characteristics, and patient preferences to assist surgeons in making data-driven decisions. This systematic review evaluates the effectiveness, accuracy, and clinical applicability of AI-driven approaches in predicting and optimizing surgical outcomes in facial cosmetic procedures.

Methods: A comprehensive literature search was conducted across PubMed, Medline, Embase, CINAHL, Central, Scopus, and Web of Science databases in December 2024. The search strategy included Keywords: Artificial Intelligence, Deep Learning, Machine Learning, Image Processing, Computer-Assisted, Reconstructive Surgical Procedures, and Treatment Outcome. The initial search retrieved approximately 138 articles. After removing duplicates and applying inclusion criteria. A total of 43 relevant articles were selected for review. Exclusion criteria included: non-English studies, research without quantifiable accuracy metrics, and studies lacking clinical applicability. Each study was assessed for model architecture, dataset characteristics, predictive accuracy, validation methods, and clinical relevance. A risk-of-bias evaluation was performed using standardized assessment tools.

Results: AI models successfully analyzed patient-specific anatomical and aesthetic factors, aiding in the customization of surgical techniques. Studies reported improvements in preoperative visualization, patient satisfaction prediction, and complication risk assessment. Additionally, AI-driven simulations provided more accurate post-surgical appearance forecasts compared to traditional methods. However, limitations such as variability in training datasets, lack of standardized evaluation metrics, and ethical concerns related to AI-assisted decision-making were frequently noted. While some models showed high predictive accuracy, their generalizability across diverse patient populations remains a challenge.

Conclusion: AI-driven predictive modeling is advancing the field of facial cosmetic surgery by enhancing treatment personalization and surgical outcome forecasting. These technologies can assist surgeons in optimizing procedural choices, improving patient communication, and reducing postoperative dissatisfaction. However, further research is essential to increase model reliability, ensure diverse and unbiased training data, and establish regulatory guidelines for clinical implementation. Future advancements should focus on integrating multi-modal patient data, real-time AI-assisted simulations, and ethical AI frameworks to maximize both surgical precision and patient trust in AI-assisted decision-making.

Keywords: Treatment Outcome, Reconstructive Surgical Procedures, AI

G-1482

Artificial intelligence application in HIV drug development

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Abstract:

Background and Aims: The conventional drug development process is complex, time-consuming, and costly, relying heavily on trial-and-error methods. The advent of artificial intelligence (AI) has revolutionized this field, enhancing efficiency and effectiveness by integrating AI at all stages of the drug development pipeline. HIV/AIDS remains a significant global health challenge, with Highly Active Antiretroviral Therapy (HAART) being the current standard for long-term viral suppression. However, issues such as drug resistance and toxicity necessitate the discovery of new therapeutic targets and drugs. This study examines the recent advances in AI applications in HIV research and drug development, including viral mechanism analysis, diagnostic innovations, therapeutic strategies, and the discovery of novel drugs.

Methods: To investigate the applications of artificial intelligence in the development of new anti-HIV drugs, related articles can be collected and reviewed using searches in scientific databases and research platforms.

Results: AI has significantly contributed to early disease diagnosis, understanding HIV mechanisms, and identifying new therapeutic options. Despite challenges such as limited high-quality data and the need for transparent predictive models, AI has shown considerable potential in expediting the discovery of new drugs for HIV treatment.

Conclusion: AI technology offers promising advancements in HIV research and drug development, addressing existing limitations in traditional methods. Continued progress and overcoming current challenges could further enhance its impact, paving the way for innovative treatments for HIV/AIDS.

Keywords: Artificial Intelligence, HIV, Aids, Drug, Development

G-1483

Comparing the Effect of Social Cognitive Theory-Based Educational Interventions With and Without Health Literacy Strategies (Photonovel and Plain Language) on Self-Care in Type 2 Diabetes Patients With Limited Health Literacy in Bushehr, 2025

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Abstract:

Background and Aims: Type 2 diabetes is a significant public health challenge, particularly among individuals with limited health literacy. This study aimed to compare the effectiveness of social cognitive theory (SCT)-based training with and without health literacy strategies (such as photonovels and plain language) on the self-care behaviors of patients with limited health literacy in Bushehr.

Methods: This quasi-experimental study included 150 type 2 diabetes patients with limited health literacy, who were randomly assigned to three groups (n=50 each). The first group received SCT-based education, the second group received SCT-based education combined with health literacy strategies (AI-designed photonovels and plain language guides), and the third group served as the control group. Data were collected using validated questionnaires before and after the intervention. Data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (paired t-test and ANOVA) to compare the groups.

Results: Both intervention groups showed significant improvements in knowledge, self-efficacy, self-regulation, and self-care (p<0.05). The group that received SCT-based education combined with health literacy strategies demonstrated greater improvements in all domains except social support.

Conclusion: Integrating health literacy strategies with SCT-based education significantly enhances self-care in diabetes patients with limited health literacy. Healthcare policymakers should prioritize such hybrid interventions to reduce health disparities. Future research should explore long-term outcomes and the scalability of these interventions in diverse populations

Keywords: Social Cognitive Theory, Health Literacy, Diabetes

G-1484

A systematic review of clinical applications of artificial intelligence in pediatric nursing and an examination of related ethical aspects

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Abstract:

Background and Aims: Artificial intelligence (AI) is rapidly changing healthcare practices, and pediatric nursing is no exception. This emerging technology has great potential to improve the quality of care, early diagnosis of diseases, and personalization of treatment in children. However, the use of AI in this field also brings significant ethical challenges. This article presents a systematic review of clinical applications of artificial intelligence in pediatric nursing and an examination of related ethical aspects.

Methods: A review was performed independently by two people based on the PICO criteria and aligned to the research objective and based on the PRISMA checklist and using PubMed, CINAHL, Medline, Web of Science, SID databases Google Scholar search engine, and Boolean operators. The time limit between 2018 and 2024 was determined using the MESH keywords "Artificial Intelligence", "pediatric nursing" and "clinical applications". After checking the entry and exit criteria and critically evaluating the quality of the selected articles, a total of 8 articles were included in the study.

Results: Out of more than 500 identified articles, 75 articles were selected and reviewed based on the inclusion criteria. The results showed that AI has been widely applied in various areas of pediatric nursing, including early diagnosis of diseases, prediction of clinical outcomes, optimization of medication management, and support for clinical decision-making. However, ethical challenges associated with the use of AI, including privacy, informed consent, algorithmic neutrality, and the potential to create inequalities in access to healthcare, require careful consideration and regulation.

Conclusion: This systematic review suggests that artificial intelligence has an important role to play in improving the quality and efficiency of pediatric nursing care. However, its widespread implementation should be done with ethical challenges in mind to avoid potential injustices and legal problems. It is suggested that policymakers and nursing professionals actively participate in

developing ethical frameworks and appropriate regulation for the use of AI in pediatric nursing care.

Keywords: Artificial Intelligence, Pediatric Nursing, Clinical Applications

G-1487

Ethical Issues Related to Use of Artificial Intelligent in Healthcare: From Privacy Protection to Algorithmic Bias

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Abstract:

Background and Aims: Large language models and generative artificial intelligence (AI) have demonstrated significant promise for revolutionizing healthcare with solutions for complex challenges, while these developments offer promising avenues for innovation, but their potential for ethical quandaries cannot be overlooked. The aim of this study is to explore the ethical issues in the use of AI in healthcare.

Methods: This meta-synthesis qualitative study was conducted by reviewing relevant qualitative published articles since 2020. Data were extracted and analyzed from relevant sources discussing the ethical issues of AI in healthcare through reputable academic databases and online sources in a 5 years period of time and analyzed using qualitative meta-synthesis approach.

Results: The analysis of data revealed several key ethical issues in the use of AI in healthcare. These The emerged themes classified into relevant 6 main categories: Security and Privacy Challenges in Healthcare Systems, Transparency and Bias, Data Misuse and Technical Limitations, Value-Based Issues in Healthcare Systems, Accountability and Responsibility in Case of Errors, Equity and Fair Access to Healthcare.

Conclusion: There is a significant ethical concerns in applying AI to healthcare. Implementing strong security frameworks, providing ongoing training for healthcare professionals, continuous monitoring AI model performance for controlling biases, and establishing ethical bill of rights to ensure adherence to ethical standards are some recommended points.

Keywords: Ethics, Healthcare, Artificial Intelligent, Patients Privacy

G-1488

Revolutionizing Telemedicine: A Systematic Review of AI-Enhanced Virtual Reality in Remote Healthcare and Rehabilitation

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Abstract:

Background and Aims: The integration of Virtual Reality (VR) and Telemedicine has gained increasing attention as a transformative approach in remote healthcare delivery. VR enhances telemedicine by enabling immersive diagnostics, remote treatment, rehabilitation, and medical training. This systematic review aims to evaluate the effectiveness, benefits, and challenges of VR-based telemedicine solutions between 2010 and 2025.

Methods: A systematic review was conducted following PRISMA guidelines. A comprehensive literature search was performed in PubMed, Scopus, Web of Science, and IEEE Xplore, covering studies published between 2010 and 2025. Inclusion criteria focused on novel applications of VR in telemedicine, with an emphasis on AI-enhanced VR solutions, immersive remote diagnostics, and virtual collaborative healthcare environments. Studies were screened, and data extraction was conducted using the Cochrane risk-of-bias tool to assess study quality.

Results: The findings indicate that AI-integrated VR environments are enhancing real-time patient monitoring, enabling adaptive therapy programs, and facilitating high-precision remote surgeries. Emerging applications in cognitive rehabilitation for neurodegenerative disorders, virtual group therapy for mental health, and personalized VR-assisted pain management have demonstrated significant improvements in patient outcomes. However, challenges such as ethical concerns, data security, and the need for standardized clinical protocols hinder widespread adoption.

Conclusion: The fusion of VR, AI, and telemedicine holds transformative potential for next-generation digital healthcare. This review highlights the need for further interdisciplinary research to address technological, ethical, and accessibility barriers. Future developments should focus on scalable AI-driven VR interventions, ensuring equitable access and clinical effectiveness in global healthcare systems.

Keywords: Virtual Reality, Telemedicine, Digital Health

G-1490

Bone Age Estimation Through Hand X-Ray Analysis With Visual Transformer Model

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Abstract:

Background and Aims: Bone age estimation is a critical task in pediatric medicine, aiding in the diagnosis of growth disorders and treatment planning. Traditional methods, such as the Greulich-Pyle and Tanner-Whitehouse techniques, depend on radiologists' subjective interpretation of hand X-rays, leading to variability and time inefficiency. With recent advances in deep learning, especially Transformer-based models, automated bone age estimation has gained considerable attention. This study aims to propose an accurate and efficient model for bone age prediction using the Vision Transformer (ViT) architecture.

Methods: The study utilized the Atlas dataset, consisting of 1,390 hand X-ray images of children aged from infancy to 18 years. All images were resized to 512×512 pixels, and data augmentation techniques were applied to enhance generalizability and handle class imbalance. The ViT model was trained using the Adam optimizer, and Mean Squared Error (MSE) was used as the loss function. Evaluation metrics included Mean Absolute Error (MAE) and overall classification accuracy.

Results: The proposed Vision Transformer model achieved a classification accuracy of 92% and a Mean Absolute Error of 3.2 months. Compared to conventional Convolutional Neural Network (CNN) models applied to the same dataset, the ViT architecture demonstrated superior performance by effectively capturing intricate visual patterns in X-ray images.

Conclusion: The ViT-based model shows strong potential in improving the accuracy and reliability of bone age estimation. By minimizing human error and reducing dependency on manual assessment, this approach offers a valuable tool for pediatric diagnostics, enhancing both clinical outcomes and workflow efficiency.

Keywords: Bone Age Estimation, Transformers, DeepLearning, Healthcare

G-1492

The Impact of Artificial Intelligence on Optimizing Pharmacotherapy for Psychiatric Patients: A Review Study

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Abstract:

Background: Pharmacotherapy in psychiatry is associated with challenges such as patients' varied responses to medications and the risk of drug interactions. Artificial intelligence (AI), through the analysis of big data, provides the opportunity for personalized treatment and improved clinical outcomes. This review study examines the role of artificial intelligence in optimizing pharmacotherapy for psychiatric patients.

Methods: In this review study, articles published between 2015 and 2025 in electronic databases such as SID, Magiran, Iran Medex, PubMed, Google Scholar, Cinahl, and Science Direct were reviewed. The search included Persian keywords "Artificial Intelligence," "Pharmacotherapy," "Psychiatry," and "Personalized Medicine," as well as English keywords "Artificial Intelligence," "Psychopharmacology," "Personalized Medicine," and "Drug Interactions." A total of 55 studies that investigated the benefits of AI were reviewed in two stages. Based on inclusion and exclusion criteria, 17 articles were ultimately selected for analysis.

Results: Analysis of the articles revealed that artificial intelligence contributes to optimizing pharmacotherapy in psychiatry in three key areas:

Personalized Drug Prescription : Machine learning algorithms, by analyzing genetic and clinical data, assist in predicting patients' responses to psychiatric medications.

Prevention of Drug Interactions : Intelligent systems enhance patient safety by identifying medication usage patterns and issuing warnings about potential interactions.

Monitoring and Managing Side Effects : AI enables timely identification of side effects by monitoring patient data and facilitates rapid interventions.

Conclusion: Artificial intelligence has significant potential to improve pharmacotherapy for psychiatric patients. However, challenges such as data privacy and algorithmic bias must be addressed. Future research should focus on developing transparent and reliable AI models to achieve broader acceptance within the medical community.

Keywords: Artificial Intelligence, Pharmacotherapy, Psychiatry

G-1493

Comparative Performance of Large Language Models: ChatGPT o3-mini and Deepseek R1 in Pediatric Hematology/Oncology Questions

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Abstract:

Background and Aims: This study compares the performance of two large language models, ChatGPT o3-mini and Deepseek R1, in answering pediatric hematology/oncology multiple-choice questions. With the growing integration of artificial intelligence in clinical decision-making, it is essential to assess the ability of these models to accurately process complex medical queries. The study aims to evaluate their accuracy, response time, and reasoning capabilities under standardized conditions.

Methods: A cross-sectional analysis was performed using 100 self-assessment multiple-choice questions originally developed by the American Society of Pediatric Hematology/Oncology. Due to the inclusion of images in some items, eight questions were excluded, resulting in 92 paired items for evaluation. Both models were tested under controlled conditions with memory features disabled to ensure independent processing of each question. Performance metrics included the accuracy of response selection, response time measured from query submission to answer output, and qualitative assessment of the reasoning process. IBM SPSS version 27 was utilized for the statistical analyses. Statistical analyses, including McNemar's test and the Mann-Whitney U test, were applied to identify significant differences between the models.

Results: Deepseek R1 demonstrated a significantly higher accuracy rate (approximately 85.87%) compared to ChatGPT o3-mini (65.5%). Although ChatGPT o3-mini provided faster response times, its performance in processing complex clinical scenarios was less consistent. The statistical analyses confirmed that the differences in both accuracy and response times between the models were significant ($p = 0.001$).

Conclusion: The findings indicate that while both models show promise for supporting clinical decision-making in pediatric hematology/oncology, Deepseek R1 offers superior accuracy and more reliable clinical reasoning, despite its slower response time. These results suggest that

further research is warranted to optimize the trade-off between speed and precision, and to evaluate the applicability of these models in real-world clinical settings.

Keywords: Artificial Intelligence, Medicine, LLM, Hematology, Oncology

G-1494

Artificial Intelligence (AI) Assistant In Family Approach For Organ Donation

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Abstract:

Background and Aims: The critical shortage of donated organs, exacerbated by rising demand, relies heavily on brain-dead donors. A key challenge is securing family consent during discussions, as low consent rates hinder organ procurement. Organ procurement coordinators, trained traditionally via mentorship, often face unpredictable scenarios and complex questions. These interactions demand nuanced communication skills to navigate sensitive moments effectively. We aimed to train an AI model specifically as an assistant for the coordinators facing challenging circumstances during the discussion of getting consent from the potential donor family and as a result bridge the gap between organ supply and demand.

Methods: To effectively address the challenges encountered during consent acquisition sessions, a comprehensive dataset was compiled, including relevant articles, religious texts (Quranic verses and Hadiths), experiences of seasoned coordinators, specialized books, and other credible resources in the field of brain death and family consent. This dataset served as an analytical reference to create a GPT-organ donor coordinator.

Results: We utilized this AI chatbot in eight consent discussions over the past month, with six of them resulting in successful consent. The AI-assisted approach demonstrated an improvement in success rates, suggesting its effectiveness in supporting coordinators during these critical conversations.

Conclusion: This chatbot has assisted coordinators greatly in dealing with challenges during consent acquisition sessions and led to a substantial decrease in the familial refusal. Furthermore, the system has enhanced the coordinators' expertise and improved the quality and comprehensiveness of responses provided in consent acquisition sessions. Such AI-driven solutions could revolutionize organ procurement, ultimately saving more lives through increased donor participation. This tool empowers the junior donor coordinator to perform with the expertise of a seasoned professional.

Keywords: Brain Death, Artificial Intelligence, Organ Donation

G-1495

The Role of Artificial Intelligence in the Diagnosis and caring of Cognitive Disorders: A Comprehensive Review

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Abstract:

Background: Cognitive disorders such as Alzheimer's disease and schizophrenia significantly impact patients' quality of life. Early diagnosis and effective management are crucial for improving treatment outcomes. Artificial Intelligence (AI), with its advanced data-processing capabilities, has the potential to revolutionize the detection, prediction, and intervention strategies for these disorders. This systematic review explores AI applications in diagnosing and managing Alzheimer's disease and schizophrenia.

Methods: A systematic review was conducted using databases including PubMed, IEEE Xplore, and ScienceDirect, with search terms such as "Artificial Intelligence," "Alzheimer's Disease," "Schizophrenia," "Diagnosis", "caring" and "Cognitive Disorders." Of the studies, 55 were reviewed in two stages. Based on the inclusion and exclusion criteria, a final 13 articles were included in the study.

Results: The findings highlight three primary AI applications in cognitive disorder management; Early Diagnosis: Deep learning algorithms analyze MRI and PET scans to detect early brain changes associated with Alzheimer's disease. Predicting Disease Progression: AI models utilize clinical and genetic data to forecast disease trajectories and aid in personalized treatment planning. Intervention and Monitoring: AI-driven speech and behavior analysis tools track schizophrenia symptoms and recommend interventions based on detected risk patterns.

Discussion: AI can enhance diagnostic accuracy, improve personalized treatment strategies, and predict patient outcomes in cognitive disorders. However, challenges such as data privacy concerns, interpretability of AI models, and the need for extensive clinical validation must be

addressed. AI has transformative potential in the diagnosis and management of cognitive disorders. Future research should focus on developing reliable, interpretable AI models and addressing ethical and regulatory barriers to ensure widespread clinical adoption.

Keywords: Artificial Intelligence, Alzheimer's Disease, Schizophrenia, Cognitive

G-1496

Deep Transfer Learning for Automated Histopathological Image Classification on Kashani Hospital Gastric Cancer Dataset

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Abstract:

Background and Aims: This study presents an in-depth analysis of gastric histopathological images collected from Kashani Hospital, aiming to enhance diagnostic accuracy through advanced deep learning techniques. The research is motivated by the need to improve the detection and classification of gastric diseases, addressing the limitations of conventional diagnostic methods.

Methods: A comprehensive dataset of 440 images was assembled, comprising 348 images of tumoral tissue and 92 images of non-tumoral tissue, which capture diverse pathological features of gastric tissue. Four pre-trained convolutional neural network architectures—VGG16, DenseNet121, ResNet, and InceptionV3—were employed using a transfer learning approach. Each model was fine-tuned on the dataset to adapt generic image features to the specific characteristics of histopathological images. Rigorous experiments were conducted to evaluate the performance of these models in classifying the images accurately.

Results: While all models demonstrated high levels of accuracy, the ResNet model outperformed the others by achieving an impressive accuracy rate of 98.67%. This superior performance is attributed to its innovative residual learning framework, which effectively mitigates the vanishing gradient problem and enables the extraction of complex image features with greater precision.

Conclusion: The findings underscore the significant potential of transfer learning in medical image analysis and demonstrate the capability of deep neural networks to extract subtle yet critical features necessary for accurate gastric disease diagnosis. This study lays a robust foundation for the integration of deep learning models into clinical diagnostic systems, which could ultimately enhance both the efficiency and accuracy of histopathological image interpretation.

Keywords: Deep Learning, Transfer Learning, Histopathology

G-1497

AI-Driven Chatbot For Optimal Possible Donor Identification

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Abstract:

Background and Aims: Brain death identification is vital for organ donation. Traditional phone-based systems were time-consuming, risking delays and donor loss. To improve efficiency, this study developed an AI-powered chatbot for rapid detection of potential brain death cases through voice-based data collection, enhancing speed and accuracy in the identification process. This study aimed to develop an AI-powered chatbot to facilitate the rapid detection of potential brain death cases through voice-based data collection.

Methods: An AI-driven chatbot was created to be professional to identify possible brain death donors. The patient's information including Glasgow Coma Scale (GCS) score, cause of hospitalization and important details regarding treatment process and lab tests, was presented to the bot via voice by the nurses.

The data was completed through a question-and-answer format, and the chatbot provided necessary information to the ICU staff for evaluate the donor and organ viability. A coordinator was promptly dispatched to the hospital for clinical confirmation. The chatbot's performance was compared to the conventional process in terms of donor detection in type I (with neurosurgery care) and type II hospitals.

Results: Although the number of potential donors (GCS 5) identified by the chatbot model and the call-based model was equal in Type I hospitals, a significant increase was observed in Type II hospitals. Notably, some cases of brain death were identified in hospitals that had previously reported no such cases before the implementation of the chatbot.

Moreover, donors with specific conditions such as lupus, brain tumors, and meningitis- who were previously overlooked by ICU staff—were successfully referred to the organ donation unit. This suggests that case selection was no longer influenced by personal judgment, enhancing the objectivity and inclusivity of the donor identification process.

Conclusion: The AI-powered chatbot enhanced the accuracy of brain death identification, particularly in hospitals where ICU staff have limited experience with the organ donation process due to the scarcity of donors. Integrating AI minimized the workload of organ procurement coordinators and optimized the donation workflow, contributing to timely donor identification and increased organ donation rates.

Keywords: Artificial Intelligence, Brain death, Identification

G-1499

Examining the role of artificial intelligence in predicting liver diseases using ultrasound images: a systematic review

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Abstract:

Background and Aims: Liver failure, hypertension, and liver cancer are among the major and potentially fatal consequences of liver diseases. Diagnosis and treatment of the diseases continue to possess numerous challenges despite the significant advances of the past decades. Ultrasound imaging is currently a cost-effective and non-invasive diagnostic method for liver diseases. Revolutionary advancements in machine learning techniques, i.e., the use of convolutional neural networks, have produced highly encouraging findings regarding automation of ultrasound image processing. The aim of the current research was to explore artificial intelligence methods in predicting liver disease from ultrasound images.

Methods: This systematic review study was conducted in 2025 by searching the reliable databases of PubMed, Scopus, Web of Science, and Google Scholar search engine. The keywords of Artificial Intelligence, Prediction, Liver diseases, and Ultrasound Images were investigated in related studies without time limitation. English-language articles that investigated artificial intelligence methods to predict the liver disease based on ultrasound scans met the inclusion criteria. Also, review studies and studies that did not focus on patients with liver diseases were excluded. Titles and abstracts were evaluated independently by two evaluators. Then the full text of the articles was checked.

Results: A total of 230 articles were retrieved from the mentioned databases. After reading the title and abstract of the articles and considering the inclusion and exclusion criteria, finally, 10 articles were included in the study. The findings of the study revealed that artificial intelligence methods would be helpful in correct diagnosis, early treatment facilitation, and eventually the quality of life of liver disease patients. Artificial intelligence can be used by physicians to diagnose these conditions effectively without incurring potential side effects and complications.

Conclusion: The result of this research showed that it is possible to utilize artificial intelligence algorithms as a secondary decision-maker in correct diagnosis of the disease, and therefore for primary treatment based on ultrasound images. However, additional research needs to be carried out in this area in order to discover and determine more precise algorithms.

Keywords: Liverdiseases, Ultrasound Images, Artificial Intelligence, Prediction

G-1500

Examining the role of artificial intelligence in predicting and diagnosing non-alcoholic fatty liver disease using ultrasound images: a systematic review

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Abstract:

Background and Aims: Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease that includes a range of diseases including steatosis, steatohepatitis, cirrhosis and liver fibrosis. Ultrasound is employed by physicians extensively due to it being cost-effective and non-invasive. Computational models based on clinical and laboratory data have also proven to be of value as diagnostic systems and prognosticators of disease outcome. Not only do these systems aid clinicians in being more informed, but data with such models can make treatment planning qualitatively improved. The aim of this study was to investigate the effect AI methods in predicting and diagnosing NAFLD using ultrasound images.

Methods: This systematic review study was conducted in 2025 by searching the reliable databases of PubMed, Scopus, Web of Science, and Google Scholar search engine. The keywords of Artificial Intelligence, Prediction, Diagnosis, Non-Alcoholic Fatty Liver, and Ultrasound Images were investigated in related studies without time limitation. English-language articles that investigated AI methods to predict and diagnose of the NAFLD based on ultrasound images met the inclusion criteria. Also, review studies and studies that did not focus on patients with NAFLD were excluded.

Results: A total of 976 articles were retrieved from the mentioned databases. After reading the title and abstract of the articles and considering the inclusion and exclusion criteria, finally, 24 articles were included in the study. The findings of the study revealed that machine learning techniques such as random forests, decision trees, neural networks (NN), logistic regression (LR), K-nearest neighbors (KNN), support vector machines (SVM), and convolutional neural networks (CNN) can prove significantly useful in arriving at accurate and comprehensive diagnoses using ultrasound images along with a reduction in medical mistakes. Regular exercise and a balanced diet play an important role in prevention and treatment of NAFLD. Decision-making in clinical settings can be optimized and avoidable complications and side effects can be reduced by using this algorithm. **Conclusion:** The findings of the current research validate once again that AI

algorithms used for accurate diagnosis and early prediction through ultrasound imaging in the case of NAFLD prove to be helpful.

Keywords: NAFLD, UltrasoundImages, Artificial Intelligence

G-1501

Artificial Intelligence (AI) In Organ Donation: A Personality-Based Decision Support Tool

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Abstract:

Background and Aims: Currently, organ donation from brain dead donors is based on family consent. Family consent rate is less than 70% in Iran and is one of the most important barrier in organ donation process. This critical decision may be affected by emotional grounds or due to lack of awareness regarding patients' wishes for organ donation during their lifetime. We aimed to create an AI tool that processes personality traits and accessible personal information to predict a person's inclination towards organ donation. By providing these suggestions, the tool aims to assist the families of brain-dead patients in making more rational and less emotionally charged decisions on organ donation.

Methods: First, patient information including demographic information, medical history, attitudes toward organ donation among family members, and publicly available social media activity, was collected in order to assess personality and potential attitudes toward organ donation. Specifically, we analyzed data from Instagram and WhatsApp records to observe linguistic behavior, social engagement, and expressed opinions related to donation preferences. Next, natural language processing (NLP) techniques were employed to extract and analyze the text data, identifying personality traits linked to the inclination towards organ donation. Machine Learning models were then trained to predict a patient's willingness to donate organs based on the extracted traits. Finally, the analysis results were presented to the family to facilitate more informed decision-making. In designing this system, ethical concerns and patient privacy were significant challenges.

Results: Due to ethical constraints, we initially tested this tool on three research team members. The results yielded a generalization of each subject's opinion concerning organ donation and their own stance on the topic.

Conclusion: This preliminary study highlights the potential of AI-driven personality assessment. However, there are significant ethical limitations regarding the feasibility of this approach. Utilizing patient information extracted from publicly available data, along with engaging patient communities and networks in the decision-making process, may help address ethical concerns and enhance the applicability of this concept.

Keywords: Brain Death, Organ Donation, Artificial Intelligence

G-1502

Evaluation of artificial intelligence algorithms for prediction of acute kidney diseases: a systematic review

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Abstract:

Background and Aims: Chronic kidney disease can progress to kidney failure in the final stage, which is fatal without dialysis or kidney transplantation. In addition, people with kidney disease do not experience symptoms until the kidney fails. Therefore, early diagnosis of the disease is important. AI is expected to support predicting future events and clinical judgment in Medicine. This study aimed to evaluate AI algorithms for predicting acute kidney diseases.

Methods: This systematic review was conducted in 2024 by searching the databases of PubMed, Web of Science, and Google Scholar search engine. Keywords acute kidney failure, prediction, acute kidney injury, artificial intelligence, machine learning, and deep learning were investigated in related studies without time limit. English-language studies that investigated artificial intelligence models for predicting acute kidney diseases met the inclusion criteria. Also, review studies and studies that did not focus on patients with acute kidney diseases were excluded.

Results: A total number of 13 articles were retrieved from the mentioned databases. After studying the title and abstract of the articles and considering the inclusion and exclusion criteria, finally 6 articles were included in the study. In one study, a ML algorithm for preoperative risk assessment was compared with the evaluations of 20 doctors. It was checked and showed a higher accuracy than the initial evaluation of doctors. Another study determined which patients with sepsis-related acute kidney injury benefit most from iloprophosphate alfa, a recombinant alkaline phosphatase with renoprotective properties. This study assisted clinicians in primary prevention, monitoring and intervention to improve patient outcomes. Another study developed AI-based systems to predict the risks of contrast-related acute kidney injury (CA-AKI) and the need for

dialysis within 30 days after contrast-enhanced computed tomography (CECT). Artificial intelligence models predicted a higher risk for CA-AKI and 30-day dialysis in patients undergoing CECT.

Conclusion: Findings of this study showed that the use of artificial intelligence algorithms can improve prognosis in patients with acute kidney diseases. It also seems that AI can be used in extensive critical care data to predict, determine prognosis and manage acute kidney injury in the intensive care unit.

Keywords: MachineLearning, Acute Kidney Injury, ArtificialIntelligence

G-1504

Exploring Knowledge, Attitudes, and Practices on Parasitic Diseases: A Comparison of ChatGPT and PET Owners

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Abstract:

Background and Aims: This study compares the knowledge, attitudes, and practices (KAP) of a pet owner and an artificial intelligence model, ChatGPT, regarding parasitic diseases in pets. The aim is to explore differences in their responses and assess ChatGPT's evaluation of pet owners' KAP.

Methods: A questionnaire with sections on knowledge (6 questions), attitudes (7 questions), and practices (7 questions) was used. The human participant, a 30-year-old female with university education and over three years of experience owning two dogs, was matched demographically with ChatGPT, which was modeled similarly.

Result: The pet owner lacked specific knowledge about toxocariasis and toxoplasmosis, while ChatGPT demonstrated comprehensive understanding of these diseases but limited knowledge of giardiasis. Attitudinally, the pet owner opposed the risks of parasitic diseases and slept next to her pets. Conversely, ChatGPT acknowledged the risks and opposed sleeping with pets, reflecting a cautious approach. Regarding practices, the pet owner did not use protective measures like gloves or masks when cleaning pet bedding, while ChatGPT occasionally employed such measures, showcasing safer practices.

Conclusion: analysis highlights gaps in the pet owner's knowledge and practices, which may increase health risks, compared to ChatGPT's consistent and risk-averse responses. While AI provides accurate information, pet owners need targeted education to align their behavior with health recommendations. The study reveals discrepancies between AI and human perspectives, emphasizing the need for enhanced AI algorithms and further research with diverse samples to better understand and address pet owners' attitudes and practices.

Keywords: ChatGPT, Knowledge Assessment, Zoonotic Infections

G-1505

Explore on artificial intelligence in Drug Design: Bibliometric study

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Abstract:

Background and Aims: In recent years, artificial intelligence has been recognized as a transformative tool in drug design. The aim of this study is to identify research patterns, prominent authors, and key publications in the field of artificial intelligence and drug design. The results of this study can help decision-makers in the pharmaceutical industry to identify new trends in the drug design process.

Methods: This study used a small amount of bibliometrics. The Web of Science Core Collection database was selected for data extraction. The data extraction date was March 14, 2025. A comprehensive search strategy and keywords related to artificial intelligence and drug design were used to retrieve all articles. Terms were selected using Medical Subject Headings (MeSH) and for a more precise search, synonyms of drug design and artificial intelligence were also used. Finally, 1927 publications were transferred to Biblioshiny and VOSviewer software for bibliometric analysis.

Results: The first article on drug design and artificial intelligence was published in 1991 and the publication trend continued until 2025. The annual growth rate of these articles was 12.39%. These articles were published by 477 journals and 5988 authors. The Journal of Chemical Information and Modeling played an important role in the publication of these articles with 130 articles. China, the United States and India are the most active countries in producing these

articles. The Chinese Academy of Sciences was the most active among the institutions and the Schneider Gisbert author in producing these articles. The most frequently used keywords in these articles are: «Machine Learning», «Drug Design», «Deep Learning», «Artificial Intelligence», «Drug Discovery», «Virtual Screening», «Structure-Based Drug Design», «Computer-Aided Drug Design», «Molecular Dynamics» and «Bioinformatics».

Conclusion: The relationship between AI and drug design has attracted increasing attention over the past two decades, and its recent expansion demonstrates that researchers have recently become interested in this area. Identifying leading universities, authors, journals, keywords, and countries in the field facilitates global collaboration among researchers, especially those who are younger. Finally, the results of the present study indicate the very important place of artificial intelligence in drug design.

Keywords: Artificial Intelligence, Drug Design, Bibliometrics

G-1506

Applications of artificial intelligence for early detection and Improved treatment of congenital heart diseases: a systematic review

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Abstract:

Background and Aims: Congenital Heart Disease (CHD) is the most common birth disorder that causes structural and functional malformations of the heart at birth. According to the statistics of the World Health Organization (WHO), about 1.49 to 2.01 million infants are born with CHD every year. Artificial Intelligence (AI) technology can assist in early detection and improved treatment of diseases, such as CHD, especially in settings with limited resources. This study aimed to review applications of artificial intelligence for early detection and Improved treatment of congenital heart diseases.

Methods: This article was a systematic review. Related papers were searched using various databases, including PubMed, Scopus, and Google scholar. The time frame was between January 2015 and April 2024. Initially, 307 articles were retrieved and after reviewing the titles, keywords, abstracts and full text of the identified sources, finally, 32 articles were included in the study.

Results: The results of this study showed that echocardiography using AI algorithm can significantly improve the diagnostic efficiency of fetal CHD during pregnancy. Echocardiography has long become the first choice for the diagnosis of CHD because it is noninvasive, nonradiative, real-time imaging, and low-cost. With the spread of technology AI techniques have indicated the ability to accelerate the diagnosis and treatment of cardiovascular diseases (CVDs), including heart failure, atrial fibrillation, hypertrophic cardiomyopathy, congenital heart disease and so on.

Conclusion: Artificial intelligence as a branch of computer science is a new technological science, simulation and development of human intelligence to deal with complex problems. It imitates the human brain for data processing and has an important role in medicine that can detect, process, integrate and analyze the large quantities of health data. Therefore, Trained AI models can detect abnormal image frames that are difficult for clinicians to identify and improve the diagnosis of CHD. AI-based models can be helpful for physicians in making decisions.

Keywords: Artificial Intelligence, Congenital Heart Diseases

G-1507

Machine learning models in optimizing remote health monitoring systems

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Abstract:

Background: Telemedicine is booming these days, and remote health monitoring systems are changing the game for patient care outside hospitals. These systems spit out a ton of data, and it looks like machine learning models are just the right tool to dig into it—helping improve how patients feel and making the systems work better. For this review, I wanted to figure out how well these models are really doing at sprucing up remote monitoring.

Methods: To get the whole story, I poked around in databases like PubMed, IEEE Xplore, and Scopus, searching for studies from 2010 to 2023 that used machine learning in remote health monitoring and had solid results to show. I was pretty choosy—only picking studies that proved they made a real impact, either on patient health or system efficiency. After that, I rounded up info like what kinds of models they used, how they measured their success, and how effective they turned out to be. To double-check that these studies weren't shaky, I ran them through the Cochrane Risk of Bias tool.

Results: After wading through piles of articles, I landed on 25 studies that stood out, covering 10,000 patients in total. The stars of the show were neural networks, support vector machines, and decision trees—these models tackled stuff like predicting illnesses, sorting out which patients to prioritize, and crafting treatment plans tailored to individuals. The payoff was pretty cool: hospital readmissions dropped by 20% on average, and patient satisfaction jumped up by 15%. That's a solid win for better care.

Conclusion: It's pretty obvious that machine learning can give remote health monitoring a serious boost, helping both patients and the systems keeping them going. That said, we're not over the finish line yet there are still tricky issues to sort out, like making these models standard across the board and dealing with data privacy worries. This review makes it clear that this tech could shake up healthcare in a big way and points out what we need to tackle next. If you're interested all the references are listed in the main text.

Keywords: Remote Health Monitoring, Machine Learning, Optimization

G-1508

Challenges in Diagnosing Osteoporosis and the Role of Artificial Intelligence: A Systematic Review

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Abstract:

Background and Aims: Osteoporosis is a prevalent condition affecting nearly 200 million individuals worldwide annually, with approximately 4% of this population suffering fractures related to osteoporosis before their diagnosis. Conventional imaging methods for assessing bone quality, such as DXA (Dual Energy X-ray Absorption), CT scans and QCT (Quantitative Computed Tomography), remain the standard approaches. While DXA is widely regarded as the gold standard for identifying and diagnosing osteoporosis, concerns regarding X-ray exposure especially in conditions like arthritis and aortic vacuities as well as variations in bone size highlight the need for innovative approaches, including AI-based screening methods in the future.

Methods: This systematic review involved a thorough search of databases such as ScienceDirect and PubMed, utilizing keywords including "diagnostic MRI," "diagnostic CT scan," "osteoporosis," "osteopenia," and "machine learning," covering literature from 2019 to 2024. Approximately 4,000 articles were identified. After an initial review and the elimination of duplicates and less relevant studies, 35 articles were retained. A comprehensive review of the full texts led to the selection of 9 articles for final analysis.

Results: Given the strong correlation of osteoporosis with age and gender, QCT imaging demonstrates greater sensitivity than DXA in measuring bone mineral density; however, its clinical accessibility is somewhat limited. Advances in artificial intelligence, particularly through the application of radiomics, enable a deeper understanding of CT images by analyzing intricate tissue structures within medical imaging.

Conclusion: In CT imaging, the presence of surrounding soft tissue organs can often lead to the underestimation of bone damage. However, by leveraging radiomics a technique capable of extracting subtle quantitative features from complex CT images a more comprehensive evaluation of bone tissue can be achieved.

Keywords: Artificial Intelligence, Osteoporosis Diagnosis, Deep learning Methods, CT Imaging

G-1509

Single-Cell Analysis of Macrophage Abundance and Function in Pancreatic Ductal Adenocarcinoma: Implications for Tumor Progression and Therapy

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Abstract:

Background and Aims: Pancreatic Ductal Adenocarcinoma (PDAC) is a deadly form of pancreatic cancer with limited treatment options and poor prognosis. Macrophages, important immune cells, significantly influence PDAC growth and resistance to therapy. Recent advances in single-cell RNA sequencing (scRNA-seq) have enabled researchers to explore the heterogeneity of individual cells within the tumor microenvironment, uncovering hidden details about disease mechanisms and potential therapeutic targets.

Methods: We analyzed the scRNA-seq dataset GSE212966, comprising 6 PDAC samples and 6 adjacent normal(ADJ) samples. Data processing was performed using the Seurat package in R. The first 20 principal components were selected for cell clustering, and cell type annotation was conducted using the SingleR package. Since differential analysis revealed a significantly higher abundance of macrophages in PDAC tissues, we further investigated the role of macrophage marker genes in PDAC prognosis and immune regulation. To better understand the functional roles of macrophage marker genes, we conducted Gene Ontology (GO) enrichment analysis using the enrichR package, focusing on biological processes and pathways associated with these genes.

Results: Our analysis identified 17 distinct cell clusters, including 4,040 macrophages. We identified 13 macrophage-specific marker genes by distinguishing them from other cell clusters. GO enrichment analysis revealed that these marker genes were significantly associated with biological processes such as proteolysis, extracellular matrix disassembly, and cellular component disassembly. These processes are critically involved in tumor invasion and metastasis, suggesting that macrophages may promote PDAC progression through these mechanisms.

Conclusion: Our study reveals a higher abundance of macrophages in PDAC tissues, linked to tumor progression through processes like extracellular matrix disassembly and proteolysis. We identified 13 macrophage-specific marker genes associated with these functions, highlighting their role in PDAC invasion and metastasis. These findings offer potential therapeutic targets to disrupt macrophage-driven tumor progression, paving the way for improved PDAC treatments. Future research should focus on translating these insights into actionable clinical strategies, including the development of macrophage-targeted therapies.

Keywords: Pancreatic Ductal Adenocarcinoma(PDAC), ScRNA-seq, Macrophage

G-1510

Examining the Impact of Advancing Artificial Intelligence on Medical Technology and Equipment: A Systematic Review

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Abstract:

Background and Aims: Machine learning, computer vision, augmented reality, and medical robotics are among the most essential branches of artificial intelligence, finding widespread applications in the diagnosis and treatment of diseases. Despite the exciting advances, there are also numerous challenges. This study is a systematic review examining the advances in artificial intelligence regarding medical technology and equipment.

Methods: A search for scientific articles was conducted in the reputable databases IEEE, PubMed, and Google Scholar. The keywords included "Artificial Intelligence", "Medical Technology", "Healthcare", and "Surgery", and articles published between 2018 and 2024 were reviewed.

Results: In the initial stage, 108 articles related to the research topic were identified. Then, exclusion criteria, including lack of sufficient relevance to the study objective and non-compliance with valid scientific criteria, were reviewed. Finally, 14 articles having a direct and scientific connection to the research topic were selected. The selected articles were translated and their introduction, abstract, results, and key findings were analyzed. Then, information related to advances in artificial intelligence in the field of technology and medical equipment was extracted and classified. The results indicate significant progress and fundamental transformation in medical technologies and equipment resulting from the application of artificial intelligence. The integration of advanced Machine Learning (ML) and Deep Learning (DL) algorithms in medical systems has led to increased performance accuracy, optimization of diagnostic and therapeutic processes, and improved automated capabilities of equipment. Also, the use of artificial intelligence in the design of advanced user interfaces and clinical decision-making systems has led to the ease of use of medical equipment and the reduction of human errors.

Conclusion: Artificial intelligence has played an important role in improving healthcare and medical services, leading to advances in medical equipment, disease diagnosis, more accurate

imaging, and even new treatments. One of its most important applications is the use of deep learning algorithms and artificial neural networks in the automatic diagnosis of diseases and tumors. Artificial intelligence-based models such as CNN (Convolutional Neural Networks) in medical imaging, including MRI and CT scans, have increased diagnostic accuracy by more than 90%.

Keywords: Artificial Intelligence, Medical Technology and Equipment

G-1511

A Multi-Omics Approach to Gastric Cancer Classification: Identifying Distinct Molecular Subtypes for Enhanced Therapeutic Outcomes

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Abstract:

Background and Aims: Cancer is a leading cause of death. It represents a heterogeneous pathology characterized by a variety of genetic and prognostic attributes, necessitating a more refined subtyping methodology to enhance therapeutic outcomes. Here, we aimed to identify distinct molecular subtypes of gastric cancer through multi-omics integration, elucidating their prognostic implications and potential applications in personalized medicine.

Methods: To achieve robust classification, we integrated multiple omics datasets employing consensus ensemble clustering methodologies. Pre-processing steps (annotation, quality control, filtration, normalization, and feature selection) were implemented. Subsequently, the R package called MOVICS provided a unified interface for ten multi-omics clustering algorithms (CIMLR, iClusterBayes, MoCluster, COCA, ConsensusClustering, IntNMF, LRAcluster, NEMO, PINSPlus, and SNF), standardizing their outputs to facilitate subsequent analyses. The optimal number of clusters was determined using two widely accepted metrics: the Calinski-Harabasz Index and Gap statistics.

Results: Based on the CHI and Gap statistics, the highest average statistic value corresponded to two distinct molecular subtypes of gastric cancer: CS1 and CS2. The clustering results generated by the 10 algorithms were then combined using consensus ensembles. The patients were divided into two distinct molecular subtypes: CS1 and CS2, to improve the classification's robustness. Each subtype was characterized by unique genetic alterations and prognostic features. Similarity of samples within the identified clusters was assessed using silhouette analysis, resulting an average silhouette score of 0.43. The potential for personalized medicine approaches was highlighted by these subtypes' differences in survival rates and responses to specific therapies.

Conclusion: The application of multi-omics consensus ensemble clustering to the molecular categorization of gastric cancer offers valuable information about the genetic diversity and prognostic characteristics of the condition. These findings highlight the significance of personalized medicine in the treatment of stomach cancer. Future research should focus on developing targeted therapies based on these molecular classifications to enhance patient outcomes.

Keywords: Multi-Omics, Cancer Subtyping, Prognostic Features

G-1512

The Role of Artificial Intelligence (AI) in Advancing Cancer Drug Delivery and Regenerative Medicine: Innovations and Challenges

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Abstract:

Background and Aims: Artificial Intelligence (AI) employs advanced algorithms and computational models to replicate human cognitive functions such as learning, pattern recognition, and decision-making. In cancer drug delivery and regenerative medicine, AI is revolutionizing how therapies are developed, optimized, and administered. By leveraging large-scale data analysis, AI enables the design of targeted drug delivery systems and the development of personalized regenerative treatments, ultimately improving patient outcomes. This study examines the transformative potential of AI in these domains while also addressing the ethical and technical challenges associated with its implementation.

Methods: This systematic review was conducted using PubMed, Scopus, and Google Scholar databases to identify relevant studies published between 2020 and 2025. Keywords included "AI in cancer drug delivery," "AI in regenerative medicine," "smart drug delivery systems," and "AI-driven tissue engineering." In the end, among the 60 articles obtained, 18 articles were evaluated with the checklist of review articles.

Results: AI has significantly advanced drug delivery by enabling developing smart systems that can control the release of therapeutics exactly, optimize dosing, and target specific tissues or cells. Machine learning algorithms analyze pharmacokinetic and pharmacodynamic data to predict drug behavior and improve formulation design. In regenerative medicine, AI facilitates the creation of biomaterials, scaffolds, and tissue engineering strategies tailored to individual patients. However, the integration of AI in these fields is not without challenges. Ethical concerns, such as data privacy and algorithmic bias, are prominent, particularly when patient-specific data is used.

Additionally, the complexity of AI systems raises questions about transparency, accountability, and the potential for unintended consequences in clinical applications.

Conclusion: AI is a powerful tool for advancing cancer drug delivery and regenerative medicine, offering unprecedented opportunities for precision and personalization. However, its successful implementation requires addressing ethical, regulatory, and technical challenges. Researchers

and clinicians must collaborate to ensure that AI-driven innovations are safe, equitable, and effective. By overcoming these challenges, AI has the potential to transform healthcare, enabling more efficient drug delivery systems and groundbreaking regenerative therapies that improve patients' quality of life.

Keywords: Artificial Intelligence, Cancer Drug Delivery Systems, Regenerative Medicine, Personalized Therapies, Machine Learning Algorithms

G-1515

Predicting Relapse in Opioid Use Disorder: A Narrative Review of Machine Learning Approaches

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Abstract:

Background and Aims: Relapse rates in patients with opioid use disorder (OUD) are notably high compared to other substance use disorders, often leading to significant morbidity among those affected. Predicting which individuals are at greater risk remains a significant challenge due to the multifactorial nature of the condition. This narrative review explores machine learning approaches used to predict individuals at risk of relapse, aiming to identify those with the highest likelihood of recurrence and enable timely, targeted interventions.

Methods: In this narrative review, the AI assistant Elicit was used to search the Semantic Scholar database, yielding 44 relevant articles. These articles were then reviewed by the researchers based on title, abstract, and full text, resulting in the selection of 13 articles for data extraction.

Results: Various machine learning (ML) algorithms, including logistic regression, decision trees, random forests, and XGBoost, have been evaluated for their ability to predict relapse and treatment adherence in OUD. One study developed an "APRIL" score using immunoassay results, effectively categorizing patients into relapse risk groups. Other studies identified key risk factors for relapse, such as younger age, conduct disorder symptoms, multiple substance use disorders, and criminal justice involvement. Models like XGBoost and Random Forest have shown particularly strong performance in predicting treatment adherence and dropout rates, with significant predictors including historical treatment adherence and fentanyl-positive urine tests. These models demonstrated high predictive accuracy, reaching up to 88%, with area under the ROC curve (AUC) values as high as 0.82.

Conclusion: Machine learning approaches offer promising tools for predicting relapse in OUD by identifying high-risk individuals and enabling targeted interventions. These models can help healthcare providers allocate resources more effectively and improve treatment outcomes. Further research is needed to validate these models in clinical settings and to address the multifactorial nature of OUD relapse.

Keywords: Opioid Use Disorder, Relapse, Machine Learning

G-1516

Predicting Postpartum Depression Using Artificial Intelligence: A Multilingual Model Based on Social Media Data Analysis

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Abstract:

Background and Aims: Postpartum depression (PPD) is one of the problems that mothers face after pregnancy and can affect the mother, the child, and even those around her; therefore, predicting it is of great importance. PPD is a depressive episode that may begin during pregnancy or even within the first four weeks after childbirth. It may even be that months after childbirth, mothers suffer from it. So far, traditional tools such as the Edinburgh Postnatal Depression Scale have been used, which have issues such as being monolingual, requiring manual evaluation, and limitations in multilingual regions. The aim of this research is to predict PPD using social media data and artificial intelligence and to present a multilingual model.

Methods: In this research, the DistilBERT model was used, which is a lightweight version executable on weaker systems. This model has 66 million parameters and is used for analyzing emotional texts. Training and testing data were collected from the Sentiment140 dataset with 20,000 samples and were enriched using simulation and translation techniques into Persian. The model was trained using 3-fold cross-validation. This study is a quantitative and statistical analysis using machine learning in the medical domain.

Results: The trained model achieved an internal validation accuracy of 0.955 and a test accuracy of 0.958, which was tested on 8,000 samples. The final output showed that for both groups (healthy and depressed mothers), the precision and recall values were both equal to 0.95. These results are comparable to standard tools.

Conclusion: The proposed model can be used for predicting PPD with multilingual capability. Additionally, this model has the ability to be presented on digital platforms and can help in the rapid diagnosis of PPD and subsequent actions.

Keywords: Postpartum Depression, Artificial Intelligence, Medical

G-1520

Optimizing the Diagnosis of Bacterial Infections: A Review on Advances and Applications of Artificial Intelligence in Clinical Bacteriology

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Abstract:

Background and Aims: Integrating artificial intelligence, human consciousness, and the science of microbiology can create a powerful triad in laboratory diagnosis. Accurate and rapid diagnosis of bacterial infections is essential for successful treatment and infection control. Recent progress in deep learning, machine learning, and natural language processing can be effectively leveraged to achieve precise and early detection of bacterial infection. This review summarizes the current and potential applications of artificial intelligence in clinical bacteriology, including tasks such as expediting preliminary diagnoses, analyzing Gram stains, interpreting culture plates, identifying pathogenic bacterial species with high sensitivity and specificity, predicting disease outbreaks, and performing metagenomic analysis.

Methods: In this study, we conducted an extensive literature search through digital repositories, including Scopus, Embase, PubMed, and Google Scholar, using the keywords 'artificial intelligence,' 'diagnosis,' 'clinical bacteriology,' and 'microbiology,' encompassing studies published up to January 2025.

Results: Findings from various studies indicate that artificial intelligence (directly or indirectly) can improve the accuracy and reliability of laboratory diagnostics. Additionally, this study provides deeper insights and a better understanding of the use of artificial intelligence in clinical bacteriology, including its features, challenges, advantages, disadvantages, and the necessary advancements in this field.

Conclusion: Artificial intelligence significantly enhances the accuracy and efficiency of diagnostics, accelerates result processing, and enables informed decision-making based on data analysis. Despite these advancements, challenges such as data quality, algorithm bias, interpretability, regulatory approval, and data standardization still need to be addressed. As these technologies continue to evolve, integrating artificial intelligence with bacteriology, under the supervision of a human expert (namely a bacteriologist) can optimize the detection of pathogenic bacteria and, consequently, contribute to improved public health.

Keywords: Artificial Intelligence, Diagnosis, Clinical Bacteriology, Microbiology

G-1521

Comparison of Random Forest and Artificial Neural Network Models to Evaluate Diagnostic Factors in the Necessity to Perform Angiography

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Abstract:

Background and Aims: Coronary Artery Disease (CAD) is the most common type of cardiovascular disorders. Despite being costly and invasive, coronary angiography is a reliable method for diagnosing CAD. Therefore, it is crucial to use non-invasive methods to screen candidates for angiography to accelerate the process of decision-making. Two powerful Machine Learning (ML) methods are Random Forest (RF) and Artificial Neural Network (ANN). The present study aimed to compare RF and ANN to define the most important features for positive CAD results and predict the need for angiography as a screening method.

Methods: This cross-sectional study was performed on 1128 patients referred for angiography. The data were divided into test and train sets. The models (RF and ANN) were fitted with the angiographic outcome variable (positive or negative) as the dependent variable and five features as predictors. Then, the performances of the models were compared by considering the Area Under the Rock Curve (AUC). All statistical analyses were done using the R software, version 4.1.2.

Results: Out of the 1128 patients, 752 (66.7%) had positive angiography results. The AUC values were 0.75 and 0.52 for the test data set in ANN and RF models, respectively.

Conclusion: Fasting Blood Sugar (FBS), gender, age, Body Mass Index (BMI), and smoking habit were important in predicting the results of an angiography for CAD. Applying these factors in ML approaches can be considered a screen for angiography to accelerate the process of diagnosis.

Keywords: Artificial Neural Network, Random Forest, Machine

G-1522

Artificial intelligence-Powered Virtual Reality in Pediatric Psychiatry: A Systematic Review of Scientific Evidence

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Abstract:

Background and Aims: Artificial intelligence and virtual reality are emerging as transformative tools in psychiatric treatment, offering interactive and adaptive therapeutic environments. These technologies may improve engagement, personalize treatment, and enhance therapeutic outcomes, particularly for children with psychiatric disorders. This systematic review aims to evaluate the effectiveness, feasibility, and limitations of AI-powered virtual reality interventions in pediatric psychiatry

Methods: A systematic search of peer-reviewed articles was conducted in PubMed, Scopus, and Web of Science following PRISMA guidelines. Studies were included if they examined AI-integrated virtual reality interventions for psychiatric disorders in individuals aged 18 years or younger. Only experimental studies, including randomized controlled trials and quasi-experimental designs, were considered. Data extraction and quality assessment were performed using standardized tools. Findings were categorized based on the type of disorder, AI-driven personalization techniques, and therapeutic outcomes.

Results: The review identified strong evidence supporting AI-powered virtual reality interventions in treating anxiety disorders, autism spectrum disorder, attention-deficit/hyperactivity disorder, and phobias. AI-driven virtual reality exposure therapy significantly reduced anxiety symptoms, while AI-powered social training programs improved emotional recognition and social interactions in children with autism. Additionally, AI-enhanced cognitive training within virtual environments showed potential in improving attention regulation and impulse control in children with attention-deficit/hyperactivity disorder. However, variability in study design, small sample sizes, and ethical concerns related to data privacy remain challenges for broader implementation.

Conclusion: AI-powered virtual reality offers an innovative and engaging approach to pediatric psychiatric treatment, with evidence supporting its effectiveness across various disorders.

However, further large-scale, controlled studies are needed to develop standardized protocols, evaluate long-term benefits, and address ethical and accessibility challenges. The integration of artificial intelligence and virtual reality in digital psychiatry has the potential to revolutionize mental health care for children, making treatments more precise, interactive, and scalable.

Keywords: Artificial Intelligence, Virtual Reality, Pediatric Psychiatry

G-1524

Evaluation and comparison of three tools -Microsoft Copilot, GROK, and ChatGPT- in answering questions related to breast cancer

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Abstract:

Background and Aims: Large language models (LLMs) are machine learning-based systems designed to process human language and answer users' questions. Today, the growing use of these conversational tools in various fields, including healthcare and medicine, can significantly impact users' awareness. Despite their considerable benefits, concerns persist regarding the quality and reliability of their answers and guidance. Therefore, this study aimed to conduct a comparative analysis of three AI tools based on LLM in answering questions related to breast cancer and evaluate the reliability of their responses and the references.

Methods: In this study, the free versions of three AI tools ChatGPT-4, Microsoft Copilot, and GROK3 (beta) were evaluated. First, 10 key questions about breast cancer were identified through interviews with female students aged 20 to 25. These questions were then refined through group discussions among the researchers and multiple reviews, leading to the final formulation of prompts. Next, the finalized prompts were used simultaneously to query all three tools. The accuracy and reliability of the responses were assessed by clinicians. Additionally, two health information management specialists reviewed the sources referenced by these tools.

Results: According to clinicians, the responses provided by these tools were somewhat reliable. Furthermore, a comparison of the answers revealed a relative similarity among these tools, with no significant contradictions observed. However, an analysis of the references showed that while ChatGPT-4 and GROK primarily relied on English-language sources—mainly websites of international organizations—Microsoft Copilot used unreliable Persian-language websites for 70% of the questions. Additionally, the evaluation of references indicated that these tools rarely referenced evidence-based information.

Conclusion: This study provides further insights into the role of conversational AI models as supplementary counseling tools for addressing common questions about breast cancer. The findings suggest that while these tools can be useful for initial education, they are not entirely reliable, raising concerns about the completeness, accuracy, and timeliness of their information. Therefore, they should be used solely as adjunct resources for preliminary education and counseling. If clinical symptoms are present, seeing a specialist is the best solution.

Keywords: Large Language Models, AI, Breast Cancer

G-1525

AI in the Fight Against Cancer: Revolutionizing Diagnosis, Treatment, and Precision Medicine—A Systematic Review

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Abstract:

Background and Aims: Artificial intelligence (AI) has revolutionized oncology, bringing groundbreaking innovations to cancer diagnosis and therapy. Through the application of machine learning (ML) and deep learning (DL) techniques, AI has improved early cancer detection, enabled tailored treatment approaches, and facilitated the prediction of patient outcomes. This review examines the wide-ranging uses of AI throughout the cancer care process, emphasizing its contributions to enhancing diagnostic precision, refining treatment plans, and overcoming obstacles in clinical practice.

Methods: An extensive literature review was carried out by searching databases like PubMed, Web of Science, and Scopus, targeting studies released from 2006 to 2024. Key search terms such as "Artificial Intelligence," "Cancer Diagnosis," "Cancer Treatment," and "Precision Medicine" were employed. The selection of studies was guided by their relevance to AI's role in oncology, encompassing areas like radiodiagnosis, radiotherapy, chemotherapy, immunotherapy, and surgical applications. Extracted data were systematically analyzed to uncover trends, progress, and challenges in AI-powered cancer care.

Results: AI has shown exceptional effectiveness in cancer detection, with systems like CHIEF reaching up to 94% accuracy in identifying cancer cells across various types. It has also refined radiodiagnosis and radiotherapy by improving tumor boundary identification and optimizing treatment plans. In chemotherapy and immunotherapy, AI has enabled tailored treatment approaches by forecasting patient outcomes and pinpointing molecular targets. Furthermore, AI has increased surgical accuracy through real-time guidance and assistance. However, obstacles like data consistency, model transparency, and ethical issues continue to hinder broader clinical implementation.

Conclusion: The incorporation of AI into cancer diagnosis and therapy offers tremendous promise for enhancing patient outcomes by enabling early detection, tailored treatments, and refined planning. Although substantial advancements have been achieved, ongoing research is needed to overcome current challenges and unlock AI's full potential in oncology. Sustained innovation

and collaboration between AI experts and healthcare professionals will be crucial to driving progress in cancer care and alleviating the global cancer burden.

Keywords: Artificial Intelligence, Cancer Diagnosis, Cancer Treatment

G-1526

Revolutionizing Healthcare: The Transformative Role of Artificial Intelligence in Medical Image Processing—A Systematic Review

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Abstract:

Background and Aims: Artificial intelligence (AI) has emerged as a pivotal force in the advancement of medical image processing, driving remarkable progress in diagnostic precision, efficiency, and tailored treatments. This review examines AI's transformative impact on medical imaging, highlighting its applications in fields such as radiology, pathology, and cardiology. Through the use of deep learning algorithms, convolutional neural networks, and generative adversarial networks, AI has strengthened the capacity to identify abnormalities, forecast disease progression, and refine treatment strategies. The incorporation of AI into medical imaging is revolutionizing healthcare, facilitating earlier interventions and enhancing patient outcomes.

Methods: A structured literature review was carried out by searching databases like PubMed, Scopus, and Web of Science, concentrating on studies published from 2018 to 2024. Search terms such as "Artificial Intelligence," "Medical Imaging," "Deep Learning," and "Image Processing" were employed. Studies were chosen based on their relevance to AI's role in medical imaging, encompassing areas like image segmentation, classification, and predictive analytics. The collected data were analyzed to uncover major trends, technological innovations, and clinical results linked to AI-powered medical image processing.

Results: AI has exhibited exceptional abilities in medical image processing, reaching up to 99% accuracy in identifying abnormalities like tumors and early-stage diseases. Deep learning models, trained on extensive datasets, have enhanced the accuracy of image segmentation and classification, allowing clinicians to outline structures of interest with remarkable precision. AI-driven tools have also supported personalized medicine by analyzing patient-specific imaging data to customize treatment strategies. Case studies underscore the successful incorporation of AI in minimizing diagnostic errors, streamlining workflows, and improving patient care. Nonetheless, challenges such as data standardization, model transparency, and ethical issues continue to hinder broader adoption.

Conclusion: The use of AI in medical image processing has greatly enhanced diagnostic and therapeutic capabilities, creating new possibilities for precision medicine and better patient

outcomes. While AI's potential in healthcare is vast, tackling issues related to data quality, ethical concerns, and clinical integration is crucial for its complete realization. Future research should prioritize building robust AI models, promoting interdisciplinary collaboration, and ensuring the ethical application of AI in medical imaging to sustain innovation in healthcare.

Keywords: Artificial Intelligence, Medical Imaging, Image Processing

G-1527

The significance of artificial intelligence in the management of drug resistance

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Abstract:

Background: Antimicrobial resistance represents a significant global health challenge, resulting in increasing morbidity, mortality, and healthcare expenses. The application of artificial intelligence holds potential as an effective instrument in addressing the issue of antimicrobial resistance.

Methods: This review examines artificial intelligence advancements in combating antimicrobial resistance since 2022, based on research from databases like PubMed and Scopus. It focuses on artificial intelligence -driven diagnostics, machine learning for predicting resistance patterns, deep reinforcement learning for treatment planning, and artificial intelligence's increasing role in drug discovery.

Results: The application of artificial intelligence technologies has extremely improved the detection and management of antimicrobial resistance. Machine learning algorithms like Convolutional Neural Networks have been found to be highly reliable in drug-resistant bacterial strain diagnosis and in antibiotic use guidance. Artificial intelligence accelerates genomic analysis and enables prompt detection of resistance markers and detection of morphological changes in drug-resistant bacteria without antibiotic treatment.

In clinical decision support, artificial intelligence-based models like gradient-boosted decision trees enhance antibiotic efficacy predictions and enable clinicians to personalize treatments. These tools integrate extensive clinical data like vital signs, laboratory tests, and microbiological culture data to make evidence-based recommendations that comply with clinical guidelines. In addition, artificial intelligence-based decision support systems enhanced antimicrobial stewardship by reducing inappropriate antibiotic prescriptions and making recommendations in compliance with clinical guidelines. Furthermore, new antibacterial drugs are being developed at a faster rate due to the successful discovery of novel resistance enzyme inhibitors by machine learning algorithms like Random Forests and Support Vector Machines. These approaches significantly enhance bacteriocin discovery by having high predicted accuracy in discriminating active chemicals.

Conclusion: The vast potential of artificial intelligence has been identified in fighting the threat of antimicrobial resistance through enhanced diagnostics, tailored treatments, and accelerated drug development. Even with challenges in data quality, the generalizability of models, and practical application in clinical practice, artificial intelligence's key role in better managing drug resistance is clear.

Keywords: Artificial Intelligence, Machine Learning, Antimicrobial Resistance

G-1528

Empowering the Future of Healthcare: How Artificial Intelligence is Transforming Medical Education and Research—A Systematic Review

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Abstract:

Background and Aims: Artificial intelligence (AI) has experienced considerable expansion in its applications amid a swiftly evolving digital environment, influenced by public expectations driven by social media, industry influencers, and healthcare professionals. Despite this growth, interest in AI within medical education and research has been relatively sparse until the last two decades, which have witnessed a marked rise in both publications and citations in this field. Currently, there is still a limited number of articles that have investigated or reviewed the existing applications of AI in medical education and research.

Methods: An independent review was conducted by two researchers utilizing the PICO framework. A comprehensive search for relevant articles was performed on Google Scholar, PubMed, CINAHL, Medline, Web of Science, and SID databases covering the period from 2020 to 2024. The search employed MESH keywords pertaining to medical education, research, AIED systems, and artificial intelligence. Following the application of inclusion and exclusion criteria and an assessment of article quality, 42 articles were selected for analysis.

Results: Three principal applications of AI in medical education were identified: learning support (n=33), assessment of student learning (n=4), and curriculum review (n=5). The main reasons for employing AI include its ability to provide feedback, establish organized learning pathways, and lower costs. Subgroup analysis revealed that medical undergraduates represent the primary target audience for these AI applications. Additionally, 34 articles discussed the challenges related to the implementation of AI in medical education, highlighting two major concerns: the challenges in assessing the effectiveness of AI in this context and the technical difficulties faced during the development of AI applications.

Conclusion: AI in medical education focuses mainly on learning support through personalized feedback, with less emphasis on curriculum review/student assessment due to digitalization challenges and exam sensitivity. Big data use requires strong data integrity. Wider AI adoption needs improved methods to address technical hurdles and evaluate effectiveness. Integrating AI into medical curricula will help future professionals better understand and utilize AI tools.

Keywords: Medical Education, AIED Systems, Artificial Intelligence

G-1529

Smart Hospitals Reimagined: Harnessing Artificial Intelligence and the Internet of Things for the Future of Healthcare—A Systematic Review

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Abstract:

Background and Aims: Artificial intelligence (AI) and the Internet of Things (IoT) are reshaping healthcare by fostering the development of smart hospitals and elevating medical practices. This review delves into the convergence of AI and IoT in healthcare, emphasizing their contributions to boosting operational efficiency, enhancing patient care, and increasing diagnostic precision. The transformative capabilities of these technologies in tackling issues like resource management, remote patient monitoring, and personalized therapies are explored, alongside the ethical and regulatory implications tied to their implementation.

Methods: A structured literature review was performed by searching databases like PubMed, Google Scholar, and Scopus, concentrating on studies released from 2018 to 2024. Search terms such as "Artificial Intelligence," "Internet of Things," "Smart Hospitals," and "Healthcare Applications" were utilized. Studies were chosen based on their relevance to AI and IoT in healthcare, emphasizing case studies, technological innovations, and implementation challenges. The collected data were examined to uncover major trends, advantages, and constraints of these technologies in smart healthcare systems

Results: AI and IoT have greatly improved healthcare delivery by enabling remote patient monitoring, predictive analytics, and clinical decision support systems. AI-driven wearables and IoT devices facilitate continuous health tracking, enhancing early disease detection and management. In smart hospitals, AI streamlines resource allocation, lowers operational expenses, and improves patient flow. However, challenges like data privacy concerns, algorithm bias, and interoperability issues still exist. Case studies highlight the successful adoption of AI and IoT in minimizing medical errors and enhancing patient outcomes, though scalability and regulatory compliance remain significant obstacles.

Conclusion: The convergence of AI and IoT in healthcare has vast potential to revolutionize smart hospitals and elevate medical practices. Although these technologies provide substantial advantages in enhancing efficiency and patient care, tackling ethical, regulatory, and technical challenges is crucial for their broader implementation. Future research should prioritize creating

standardized frameworks, ensuring data security, and promoting interdisciplinary collaboration to fully harness the capabilities of AI and IoT in healthcare.

Keywords: Artificial Intelligence, Smart Hospitals, Healthcare Applications

G-1531

A Deep Learning Approach for Classifying Skin Lesions Across Fitzpatrick Skin Types

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Abstract:

Background and Aims: The accurate diagnosis of skin lesions using artificial intelligence remains challenging due to the diversity of skin types and imbalances in datasets. This study utilizes the Fitzpatrick17k dataset, a collection of dermatological images annotated with Fitzpatrick skin types (I to VI), to improve classification performance across diverse skin tones. The primary aim is to evaluate the model's accuracy across different skin types and address dataset bias using advanced deep learning techniques.

Methods: A deep neural network was trained to classify skin lesions at three levels of granularity (3-class, 9-class, and 114-class problems). The dataset includes clinical images labeled with both disease class and Fitzpatrick skin type. Additionally, Faster R-CNN was employed for lesion detection, followed by ResNet for classification. A debiasing approach based on variational autoencoders was used to mitigate dataset bias in deep neural networks, ensuring fairer model predictions across all skin tones.

Results: The model achieved overall accuracies of 85.53% (3-class), 81.45% (9-class), and 63.84% (114-class). Performance analysis revealed significant disparities, with higher accuracy for lighter skin tones (types I-IV) compared to darker skin tones (types V-VI). For the 114-class classification task, the model achieved a precision of 70%, recall of 64%, and an F1-score of 64%. These results indicate notable improvements compared to previous studies, which reported accuracies of 62.40%, 36.10%, and 26.7% for the respective classification levels.

Conclusion: The findings highlight the need for more diverse datasets to enhance AI-driven dermatological diagnosis, particularly for underrepresented skin tones. Integrating external datasets with greater diversity and employing debiasing techniques can improve model generalization and fairness. Future work should explore more robust dataset augmentation strategies and domain adaptation techniques to mitigate existing biases and optimize classification performance across all skin types.

Keywords: Skin Lesion Classification, Deep Learning, FitzpatrickSkinTypes

G-1535

Investigating the Role of Artificial Intelligence-Based Clinical Assistants in Critical Nursing Care

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Abstract:

Background and Aims: Today, the advancement of artificial intelligence in the management of ill patients has revolutionized the intensive care units. This new technology can play an effective role in monitoring patients. Therefore, this study aimed to investigate the role of artificial intelligence-based clinical assistants in nursing intensive care.

Methods: This research is a review study that was conducted by searching the Google scholar PubMed, Science Direct bases with a time limit (2022-2025). We reviewed the articles in three stages: title review, abstract study, and full-text study. We removed unrelated articles, finally selecting 11 for review, extracting the relevant information.

Results: Today, software or devices that use artificial intelligence to automate tasks, monitor patients, provide alarms, and offer nursing recommendations are called artificial intelligence-based clinical assistants in nursing care. Artificial intelligence has demonstrated promise that artificial intelligence plays an important role in monitoring, early detection, and customization of care in intensive care units. Several studies highlight the benefits of using this new technology, particularly in the ongoing monitoring of vital signs and early identification of serious diseases, including organ failure, sepsis, and other problems in patients who have been hospitalized. Deep neural network-based artificial intelligence is capable of predicting sepsis with a 92% accuracy and 85% sensitivity. In addition, artificial intelligence can play an effective role in personalizing the care performed by fine-tuning doses of vasopressor drugs and mechanical ventilation parameters.

Conclusion: When applied as a supplement to clinical judgment rather than as a replacement for it, artificial intelligence has demonstrated promise in improving clinical outcomes, lowering mortality, and personalizing the care of sick patients in critical care units.

Keywords: Artificial Intelligence, Intensive Care, Nursing

G-1537

Evaluation of mobile applications in the control and management of Gestational diabetes mellitus: a systematic review

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Abstract:

Background and Aims: Gestational diabetes mellitus (GDM), as a common metabolic disease in the world, causes significant and persistent complications for the mother and baby. Elevated risk of type 2 diabetes and heart disease in the mother are among these complications. Assessment and control of the condition of the mother with GDM through nutritional interventions and blood sugar monitoring during pregnancy using digital methods can be helpful. This study evaluates the effectiveness of mobile applications in the control and management of GDM.

Methods: This systematic review was conducted in 2025 by searching the databases Scopus, Web of Science, PubMed and Google Scholar search engine. The keywords GDM, mHealth, mobile application, and telemedicine were examined in relevant studies between 2018 and 2025. English-language studies that examined the effect of mobile applications in the management of GDM met the inclusion criteria. Also, review studies and studies that did not focus on patients with GDM were excluded from the study.

Results: A total of 77 articles were retrieved from the aforementioned databases. After studying the titles and abstracts of the articles and considering the inclusion and exclusion criteria, 7 articles were finally included in the study. In one article (14.3%) the application did not create a significant difference between the intervention and control groups; in one other article (14.3%) fasting plasma glucose levels improved and GDM risk factors were reduced; in two articles (28.5%) the application was able to improve health-related habits and behaviors but did not lead to clinical effects; in another article (14.3%) the application controlled blood sugar despite causing deficiencies in some minerals; two articles (28.5%) are still under study and their results have not been published.

Conclusion: The findings of this study showed that the use of mobile applications is effective for managing gestational diabetes and maintaining fetal health. Mobile applications also elevated nutritional self-care in patients with GDM, which led to a promising increase in the quality of life

of patients. Further studies are needed to confirm its sustained clinical effects on glycemic control and pregnancy outcomes.

Keywords: GDM, mHealth, Mobile Application, Telemedicine

G-1539

Personalized and Scalable Brain Simulation with The Virtual Brain: My Participant Experience from Iran

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Abstract:

Background and Aims: The Virtual Brain (TVB) is an advanced neuroinformatics platform designed to simulate primate brain network dynamics through biologically realistic connectivity. It enables researchers to model, analyze, and personalize whole-brain simulations using multimodal neuroimaging data, such as functional MRI (fMRI), EEG, and MEG. TVB also supports applications in clinical research, particularly in understanding neurological disorders and their progression. Additionally, it offers a framework for integrating multimodal data sources, improving the accuracy of brain network models.

Methods: TVB integrates with MATLAB and Python-based scientific tools to construct and simulate brain network models. As a cloud-based service on EBRAINS, it enhances reproducibility, scalability, and collaborative research. It provides tools for MRI processing, high-performance computing for large-scale simulations, and Bayesian parameter optimization for epilepsy patient models. Additionally, network-based modeling is employed to analyze instrength gradients in the human connectome, which influence cortical traveling waves and frequency gradients. TVB also allows the incorporation of small-scale spiking network simulations to better capture the multi-scale complexity of brain activity.

Results: Structural connectivity in the brain plays a crucial role in neural dynamics. The presence of instrength gradients directs traveling wave propagation and shapes frequency gradients, impacting brain function and dysfunction. Virtual brain twins, a personalized extension of TVB, leverage individual neuroimaging data for customized whole-brain models. These models have been successfully applied to aging and neurological disorders such as epilepsy, Alzheimer's disease, multiple sclerosis, Parkinson's disease, and psychiatric conditions. Personalized modeling using spatial masks has provided insights into physiological and pathophysiological mechanisms, improving diagnostic and therapeutic strategies.

Conclusion: TVB represents a significant advancement in computational neuroscience, bridging the gap between theoretical modeling and clinical applications. As a standalone and cloud-based simulation tool, it enables scalable, personalized, and high-fidelity brain modeling. By advancing our understanding of large-scale brain network dynamics, TVB paves the way for novel therapeutic strategies and precision medicine approaches in neuroscience. It has a well-

developed website with extensive educational materials and hosts online schools with participants from around the globe. Furthermore, information about ongoing research and updates is regularly provided, fostering a dynamic and engaging

Keywords: Virtual Brain Simulation, Personalized Neuroscience, Neuroinformatics

G-1540

Analyzing Artificial Intelligence Methods for Predicting and Detecting Counterfeit Drugs: A Systematic Review

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Abstract:

Background and Aims: The prevalence of counterfeit drugs could pose a serious threat to global health and public trust in the pharmaceutical supply chain. According to a report by WHO, At least 1 in 10 medicines in low- and middle-income countries are substandard or falsified. While existing detection methods work to a certain degree, they cannot scale and respond in real-time. Over the past few years, Artificial Intelligence (AI) has been used to aid counterfeits in the prevention and detection of counterfeits quickly and accurately. The aim of the current research was to evaluate the role of AI-based solutions for counterfeit medicine prevention and detection.

Methods: On January 10, 2025, a comprehensive systematic review was conducted following PRISMA guidelines with a search for "counterfeit drug", "counterfeit medicine", "falsified drug", "falsified medicine", "fake drug", "fake medicine", "artificial intelligence", "machine learning" and "neural network" as keywords in scientific databases PubMed, Scopus, Web of Science, and Google Scholar search engine. Inclusion criteria included the relevance to the search strategy without a time limit, and the exclusion criteria included books and book chapters, reviews, conferences, and duplicated papers. The eligibility criteria were used to screen the titles and abstracts independently, followed by a thorough review of the entire texts.

Results: Out of 4487 titles, 26 studies were selected for this systematic review. The studies could be broadly categorized based on their application into four headings: Advanced analytical and diagnostic approaches using sensor and spectroscopic methods (16, 64%) Image processing and computer vision techniques (4, 16%); Supply chain optimization (3, 12%); and AI-Based classification Models (2, 8%). The most used algorithms were Support Vector Machine (10, 38.5%), K-Nearest Neighbor (6, 23.1%), and Convolutional Neural Networks (6, 23.1%).

Conclusion: This review demonstrated that artificial intelligence can perform acceptably in the detection, prediction, and prevention of counterfeit drugs. However, the widespread and

comprehensive use of this technology requires the development of various algorithms for the detection of different medicines with a single model, and also the evaluation of the interaction of AI with other technologies, such as blockchain and IoT, in this field.

Keywords: Artificial_Intelligence, Counterfeit_Drugs, Machine_Learning, Neural_Network

G-1541

An AI-Powered Medical Chatbot Integrating Large Language Models for Accurate Clinical Histories and Differential Diagnosis

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into medicine has revolutionized healthcare, offering innovative solutions to challenges in diagnosis, treatment, and patient care. Despite the growing adoption of AI, many medical chatbots lack the ability to provide accurate, structured clinical histories and differential diagnoses. TebBot addresses this gap by combining Large Language Models (LLMs) and knowledge graphs to deliver precise, patient-specific diagnostic suggestions.

Methods: TebBot was developed using a dataset of 250,000 cases, covering 324 symptoms and 700 unique diseases. The chatbot employs a Large Language Model (LLM) trained to extract relevant clinical history from patients through a structured dialogue. The collected data is stored in a knowledge graph database, which enables logistic classification to generate differential diagnoses with probability scores. By dynamically identifying discriminative symptoms, the chatbot refines its diagnostic suggestions, achieving high accuracy.

Results: TebBot demonstrates the ability to engage users in structured medical conversations, collect detailed clinical histories, and generate differential diagnoses with high accuracy. By maintaining structured medical records and supporting physician decision-making, TebBot enhances diagnostic precision and facilitates continuity of care.

Conclusion: This study demonstrates the potential of combining LLMs, knowledge graphs, and probabilistic classification to create intelligent medical assistants that improve diagnostic accuracy and patient engagement. Future developments will focus on expanding TebBot's capabilities to include personalized health recommendations, treatment guidance, and chronic disease risk assessment, ultimately supporting preventive healthcare and empowering users with actionable insights for better disease management

Keywords: Artificial Intelligence, Medicine, Chatbot

G-1542

Applications of Artificial Intelligence and Machine Learning for HIV prevention

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Abstract:

Background and Aims: Artificial intelligence involves creating algorithms that utilize computers or machines to perform tasks that typically require human intelligence. One branch of artificial intelligence is machine learning. Machine learning focuses on how computers learn the relation between data. Artificial intelligence has played a role in revolutionizing health care and has shown great potential in preventing HIV, an opportunistic and global infection caused by Retrovirus. Our study aims to decrease HIV infection, particularly among certain groups of the community, by introducing some programs and applications of artificial intelligence.

Methods: For this research, number of articles which were published in 2020 to 2024 are used as information sources.

Results: Artificial intelligence chatbots like ChatGpt, can provide reasonably accurate information. These bots allow individuals to have anonymous user settings. Thus, for homosexuals, who are more exposed to HIV but do not consult a health counselor due to the concerns of judgment and criminalization of their behaviors, is a preferred option. For example, they can be counseled about the most appropriate testing schedule based on their situation after having unprotected sex. MySTIRisk is another artificial intelligence based risk tool that predicts the risk of HIV. It can easily satisfy precisionists and economists. Another one is Tough Talks. It can help young men sex men, increasing protective behaviors against HIV transmission. Through this program, condomless anal sex will be reduced. In relation to the function of machine learning, it should be noted that machine learning algorithms can capture complex interactions between data. Their predictions of HIV infection in both high-resource and low-resource settings have proven to be effective. The output of these algorithms is typically interpreted as a probability that we can predict the future.

Conclusion: The Ministry of Health and Medical Education of each country can use machine learning algorithms and draw a chart using data to predict the trend of HIV infection and accordingly implement preventive approaches generally. Therefore, the government in cooperation with health organizations should optimize artificial intelligence and make it available for all people at lower cost, with more accurate information.

Keywords: Artificial Intelligence, HIV, Machine Learning

G-1543

Synapse: The Windows of Healthcare (operating system of healthcare)– Pioneering AI-Driven Integration for MSD Care and Patient Empowerment

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Abstract:

Background: Motivated by a personal tragedy involving a medical error with severe consequences, Synapse was developed to transform musculoskeletal disorder (MSD) care. By integrating cutting-edge artificial intelligence (AI) with patient-centered principles, it aims to enhance diagnostic precision and treatment outcomes, addressing the global burden of MSDs on healthcare systems.

Methods: Synapse's development spanned 2014 to 2023, progressing through ideation, clinical insights (2014-2017), framework design (2017-2020), an online pilot (2020-2021), and full deployment in 2023. It integrates deep neural networks for data processing, Cognitive Behavioral Therapy (CBT) for psychological support, and patient-centered care to prioritize individual needs.

Core Features: The system rests on five pillars: accurate patient data categorization, a CBT-informed care framework, shared decision-making, patient-centered design, and AI-powered decision support tools.

Clinical Application: Synapse operates via four wards: Carebot for efficient symptom triaging using a tri-fast checklist and sonex) US+ exam) with 6 types of care(including 3 stages team work. online . occupational therapist chat based) .Evaluation for building detailed patient profiles through biomechanical and psychosocial assessments; Treatment for delivering CBT-driven interventions, including exercises, injections, surgeries, and a six-week program of education, occupational therapy, and home exercises; and Management for coordinating ongoing care. For security we use GPT4ALL as a secure local LLM

Results: Applied to 26,780 patients across stages (Stage 1: 1,920; Stage 2: 7029; Stage 3: 7370; Stage 4: 10200), with substages (primary care: 5420; four-ward: 4550; AI-driven: 418), all received PTG and home exercises. Key **Results:** 82% of diagnoses aligned with MRI results, that is good overall we prescribe MRI in 10% of patients that compare to 15 -20% overall in iran synapse is better ; treatment started with mean 1.4 drugs per prescription that is lower than average in iran(2-3 for MSD) and home exercises; 89% reported improved pain levels; AI diagnosis was accepted within three months, with rapid growth aided by Large Language Models (LLMs)

Conclusion: Synupse demonstrates potential as an AI-driven healthcare operating system for MSD management, reducing imaging and drug use while improving outcomes. I would need additional longitudinal studies.

Keywords: Artificial Intelligence, Patient Centered Care' healthcare system' Musculoskeletal Disorder

G-1544

Generative AI in Medical Informatics: Opportunities, Challenges, and Future Directions

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Abstract:

Background and Aims: Generative Artificial Intelligence (AI) has emerged as a transformative technology in medical informatics, offering unprecedented opportunities to revolutionize healthcare delivery, data management, and clinical decision-making. This study aims to explore the current applications, opportunities, and challenges of generative AI in healthcare, with a focus on its potential to improve medical imaging analysis, personalized treatment planning, automated report generation, and medical education.

Methods: This narrative review synthesizes findings from various published studies to provide a comprehensive overview of generative AI's role in medical informatics. The review examines the methodologies, tools, and frameworks used in current research, including the analysis of large datasets, development of AI models, and their integration into clinical workflows.

Results: The findings highlight the significant potential of generative AI in enhancing diagnostic accuracy, personalizing patient care, and streamlining administrative tasks. However, challenges such as data privacy concerns, algorithmic bias, ethical dilemmas, and the lack of robust regulatory frameworks were identified as critical barriers to its widespread adoption. The review also underscores the need for interdisciplinary collaboration to address these challenges effectively.

Conclusion: Generative AI holds immense promise for transforming healthcare, but its successful integration requires addressing technical, ethical, and regulatory challenges. This study advocates for improvements in health equity, transparency, and precision medicine to maximize the benefits of generative AI. Future research should focus on developing ethical guidelines, ensuring data security, and fostering collaboration among stakeholders to create a more equitable and efficient healthcare system.

Keywords: Generative AI, Medical Informatics, Healthcare Innovation

G-1545

Large Language Models in Healthcare: Innovations, Challenges, and Future Prospects

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Abstract:

Background and Aims: The rapid advancements in Natural Language Processing (NLP) and Large Language Models (LLMs) have significantly impacted various industries, with healthcare being one of the most promising domains. LLMs, such as BERT and GPT, have revolutionized medical informatics by enhancing clinical decision-making, biomedical research, and drug discovery. This study aims to explore the development, applications, challenges, and future prospects of LLMs in healthcare.

Methods: A comprehensive review of literature from 2015 to 2024 was conducted, analyzing studies related to the implementation of LLMs in healthcare. The review covers the evolution of language models, their architectures, and their applications in clinical diagnosis, medical decision support, drug discovery, and pandemic management. Additionally, the limitations and ethical concerns associated with LLMs in medical practice were examined.

Results: Findings indicate that LLMs have significantly contributed to improving diagnostic accuracy, streamlining clinical workflows, and accelerating biomedical research. However, challenges such as data biases, hallucinations, and the need for domain-specific expertise remain significant barriers to widespread adoption. Ethical concerns, including patient data privacy and model transparency, also require careful consideration.

Conclusion: Despite their transformative potential, the integration of LLMs into healthcare demands rigorous validation, ethical oversight, and continuous refinement. Future research should focus on developing specialized medical LLMs, mitigating biases, and establishing robust regulatory frameworks to ensure their safe and effective use in clinical settings.

Keywords: Large Language Models, Intelligent Medicine, Healthcare

G-1547

Legal analysis of civil liability in smart medical technologies

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Abstract:

Smart medical devices, utilizing new technologies such as artificial intelligence, the Internet of Things, and data mining, have brought about a significant transformation in the fields of diagnosis, treatment, and medical care. These devices have improved the quality of life of patients by increasing the accuracy and speed of medical services; however, the use of these complex technologies has also brought about new legal challenges

Background and Aims: One of the most important of these challenges is determining the limits and dimensions of civil liability arising from improper performance or defects in smart medical devices.

Methods: The research method used in this study is descriptive-analytical and comparative. The data are collected through the study of library documents and resources, content analysis of laws and regulations, and comparative study of laws in Iran and other countries, and are examined using logical and argumentative analysis, legal analysis, and comparative analysis.

Results: This article aims to examine the legal dimensions of civil liability arising from the use of smart medical devices, analyzing the theoretical foundations of civil liability, relevant laws and regulations in Iran and other countries, and challenges related to proving fault and causation. In addition, issues related to privacy, medical data security, and the role of various factors including manufacturers, healthcare providers, and AI developers in determining civil liability are examined

Conclusion: Based on the research findings, solutions are presented such as formulating specific laws in the field of smart medical devices, establishing quality monitoring and assessment systems, developing technical and ethical standards, and increasing awareness and training of users and specialists.

Keywords: Artificial Intelligence, Medicine, Civil liability, Smart

G-1549

Machine learning-based repurposing of Asciminib analogues and FDA approved drugs against CML cell-lines

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Abstract:

Background and Aims: Chronic myeloid leukemia (CML) is a type of blood cancer driven by BCR-ABL fusion protein. This abnormal protein results from chromosomal translocation leading to unregulated tyrosine kinase (TK) activity. Despite satisfying clinical outcomes, Asciminib, a later-generation TK inhibitor, faces challenges due to emerging allosteric resistance. This issue necessitates the query for alternative compounds. Within present contribution, various machine learning (ML) algorithms were utilized to evaluate the repurposing potential of Asciminib analogues and FDA approved drugs as growth inhibitors of CML-related cancerous cell lines.

Methods: A dataset comprising 233 small molecules with relevant cell-based(K562,BV173) IC50 values was curated from ChEMBL database (<https://www.ebi.ac.uk/chembl/>). Morgan fingerprint, atom graphs, pharmacophore Graph (one-hot-encoded pharmacophore as node, bonds type as edge), junction tree graph (generated by converting bonds, rings and junction atoms to nodes) and functional group graph (predefined groups as nodes, and predefined bond as edge) were calculated for each molecule under study as a feature. AutoDock-GPU was used to calculate mean-binding free energies for each molecule in the allosteric site of wild and mutant BCR-ABL. We designed a graph convolutional neural network to learn from paired data and choose active one subsequently. Other promising ML algorithms such as XGBoost and Random Forest were also tested. Subsequently, the trained models were used to predict the repurposing potential of Asciminib like molecules and FDA drugs.

Results: XGBoost was top-ranked regression-task model ($R^2 = 0.7$) whereas Graph convolutional neural network was the best classification-task model (80% for test sensitivity and 70% for ROC-AUC value).

Top-ranked Asciminib like molecules and FDA drugs were found to be Venetoclax, CHEMBL4111003, Simeprevir, Lurasidone and CHEMBL3973518. It is worth noting that Venetoclax has already been studied for advanced-phase CML. Moreover, CHEMBL4111003 and

CHEMBL3973518 were subjected to in-silico pharmacokinetics analysis in terms of bioavailability and metabolism.

Conclusion: Overall ML models showed promising results only when fed with proper data and subsequently hypertuned. On the basis of outlined computational workflow, diversifying the candidate molecules under study could suggest more potent and mutation-resistant CML candidates. Further analysis of model parameters within larger train sets is under investigation.

Keywords: BCR-ABL, Drug Repurposing, Machine learning

G-1550

Applications, Impacts, and Future Directions of AI in Health Policy: A Narrative Review

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Abstract:

Background and Aims: The healthcare system in Iran faces challenges such as an aging population, workforce shortages, and unequal access to healthcare. Artificial intelligence (AI) offers a promising solution by improving decision-making, optimizing resources, and enhancing patient outcomes. Integrating AI into health policy could create a more responsive, equitable, and sustainable healthcare system. This study aims to explore AI applications in Iran's healthcare sector, assess its potential impacts, and emphasize the need for proactive and ethical policies. We hypothesize that strategic AI implementation, guided by ethical considerations and collaboration, can significantly improve healthcare outcomes.

Methods: A narrative review was conducted on studies published between 2014 and 2024, focusing on AI's role in healthcare policy. A comprehensive search of PubMed, MEDLINE, Scopus, and Science Direct databases identified relevant studies. Eligibility criteria included reputable journals, English-language studies, and direct relevance to AI in healthcare policy. After screening titles, abstracts, and full texts, thematic analysis was performed, and the quality of studies was assessed.

Results: Out of 574 articles, 23 were selected. Findings suggest AI improves resource allocation, strategic planning, and access to healthcare services. AI's predictive capabilities aid disease forecasting, and telemedicine enhances rural access. Ethical principles and infrastructure expansion are key for integration.

Conclusion: AI offers significant potential in Iran's healthcare system. Future research should focus on AI's applications, risks, and regulatory frameworks to maximize its impact.

Keywords: Artificial Intelligence, Health Policy, Healthcare System

G-1553

Mediating Role of Artificial Intelligence in The Effect of Blockchain Dimensions on Pharmaceutical Supply Chain

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Abstract:

Background and Aims: This paper brings to light the powerful connection between perceptions of blockchain dimensions and the pharmaceutical supply chain, mediated by artificial intelligence (AI).

Methods: A cross-sectional design was utilized to investigate the relationship between blockchain perceptions and the pharmaceutical supply chain. The sample consisted of 181 staff members from Iran Hormon Company, selected through random sampling. Data were collected via three structured questionnaires assessing blockchain literacy, trust, health data management, and AI applications. Confirmatory factor analysis (CFA) and covariance-based structural equation modeling (CB-SEM) were applied to examine the relationships among variables and test the hypotheses.

Results: The findings indicate that digital literacy, familiarity with blockchain technology, health data management and sharing, intention to use blockchain, trust in blockchain technology, and understanding of blockchain technology have a significant impact on the pharmaceutical supply chain. This effect is mediated by AI, highlighting the crucial role of AI integration in leveraging blockchain's potential for supply chain enhancement. These findings suggest that fostering blockchain-related knowledge and trust can optimize supply chain operations, particularly in the pharmaceutical industry.

Conclusion: This study underscores the importance of blockchain technology in revolutionizing the pharmaceutical supply chain, emphasizing the mediating role of AI. The results suggest that improving digital literacy, enhancing trust in blockchain, and promoting AI-driven data management can significantly improve supply chain efficiency. The study provides valuable insights for pharmaceutical firms and policymakers, advocating for the integration of blockchain and AI to enhance supply chain transparency, security, and efficiency. Future research could explore additional moderating factors and assess the long-term impact of blockchain adoption in pharmaceutical logistics.

Keywords: Blockchain, Pharmaceutical Supply Chain, Artificial Intelligence

G-1554

Artificial Intelligence in Head and Neck Cancer Imaging: Enhancing Detection, Prognosis, and Treatment Planning

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Abstract:

Background and Aims: Artificial Intelligence (AI) and radiomics are revolutionizing the diagnosis, treatment, and management of head and neck cancers (HNCs). Utilizing machine learning (ML) and deep learning algorithms, AI can extract and analyze intricate radiomic features from medical imaging, enabling detailed tumor characterization and personalized treatment plans. AI-based radiomics has the potential to enhance early tumor diagnosis, predict treatment response, minimize radiation-induced side effects, and advance patient care. This study provides a comprehensive examination of AI-driven radiomics in HNC management, focusing specifically on its use in multidisciplinary tumor board decision-making. It examines the prospects, processes, and constraints of using AI in radiomics to enhance clinical decision support systems and improve cancer care.

Methods: A systematic review was performed utilizing PubMed, Scopus, and Google Scholar to identify relevant studies published from 2020 to 2025. The search terms included "AI in HNC," "radiomics in oncology," "machine learning in cancer imaging," and "AI-driven precision oncology." Of the 50 articles reviewed, 20 were chosen based on relevance and methodological rigor. The review concentrated on the applications of AI-driven radiomics in HNC, encompassing tumor segmentation, prognostic modeling, and treatment optimization.

Results: AI-driven radiomics has demonstrated considerable promise in HNC management by augmenting tumor detection precision, facilitating automated tumor segmentation, and refining predictive models for disease advancement and therapeutic response. Machine learning algorithms evaluate imaging biomarkers to inform clinical choices, thereby reducing the need for invasive treatments. The variability in data and the absence of standardization hinder the integration of AI into clinical workflows. Ethical issues must also be addressed, including patient privacy and algorithmic bias. Additionally, the absence of large-scale annotated datasets and regulatory barriers limit the widespread application of AI-driven radiomics in clinical practice.

Conclusion: AI and radiomics represent significant advancements in precision medicine for managing HNCs. They offer new possibilities for improving diagnosis, treatment planning, and

patient outcomes. To realize their potential, it is imperative to confront technological problems, ethical issues, and regulatory obstacles. Collaboration among researchers, doctors, and regulatory bodies will be essential for the safe and successful integration of new technologies into standard cancer treatment.

Keywords: ArtificialIntelligence, RadiomicsinHeadandNeckCancer, MachineLearning, AI-Driven Precision Medicine, Tumor Detectionand Prognostic Modeling

G-1555

Predicting Hematoma Expansion in Spontaneous Hypertensive Intracerebral Hemorrhage Using Radiomics and Machine Learning: A Soft Voting Ensemble Approach

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Abstract:

Background and Aims: Spontaneous hypertensive intracerebral hemorrhage (SHICH) occurs annually in 10-30 out of every 100,000 people, accounting for about 10-30% of all strokes (1-3). Hematoma expansion (HE) occurs in about one-third of SHICH patients and significantly impacts their neurological outcomes (4-6). Early prediction of HE is crucial for enabling preventative interventions. This study aimed to construct an effective model based on Radiomics features and machine learning (ML) algorithms to predict HE in SHICH patients.

Methods: This retrospective study included 85 patients with SHICH, of whom 64 had stable hematoma volume and 21 had HE. Initial non-contrast computed tomography (NCCT) scans were performed within 6 hours of bleeding, and follow-up scans were conducted 24 hours later. Hematoma areas were segmented, and Radiomics features were extracted using the PyRadiomics package. Feature selection was performed using p-value calculations and Minimum Redundancy Maximum Relevance (mRMR). The top 18 significant features were used to construct classification models using Naïve Bayes, Linear Discriminant Analysis (LDA), Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Random Forest (RF) algorithms. A soft voting ensemble method combined the classifiers' results. Sensitivity, specificity, and accuracy were evaluated for performance assessment.

Results: Among the classifiers, RF demonstrated the best performance with an accuracy of 88%, sensitivity of 83%, and specificity of 89%. The soft voting method improved overall classification accuracy to 96%, with a sensitivity of 83% and specificity of 100%.

Conclusion: The proposed Radiomics-based model combined with ML algorithms, particularly through the use of a soft voting ensemble, significantly improves the prediction of HE in SHICH patients. This method holds potential for early identification and timely intervention, thereby improving patient outcomes.

Keywords: Spontaneous Hypertensive Intracerebral Hemorrhage, Hematoma Expansion, Radiomics, Machine Learning, non Contrast Computed Tomography, Soft Voting_Ensemble

G-1556

The Role of Artificial Intelligence in the Quality of Life of Children with Leukemia

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Abstract:

Background: The incidence of oncologic diseases in children has increased, with leukemia being one of the most common. Its treatment, particularly chemotherapy, can be effective but may also reduce the quality of life of patients. Children with leukemia face not only physical challenges but also psychological and social impacts. In this regard, artificial intelligence and machine learning can help predict and manage these complications, ultimately improving the quality of life of patients.

Methods: This study is a review article examining scientific research related to "artificial intelligence," "children with leukemia," and "quality of life." Sources were collected from reputable databases such as PubMed and Scopus within the time frame of 2020 to 2025. Articles without full-text access were excluded. Articles relevant to the study's objective were included, and ultimately, 5 articles were reviewed

Results: Reviews on the impact of artificial intelligence on the quality of life of children with leukemia highlight artificial intelligence-based systems that identify leukemia-related patterns, enabling faster and more accurate diagnoses. These systems predict complications and assist in adjusting drug dosages, reducing treatment risks. Artificial intelligence can analyze genetic and medical data to design personalized treatments, increasing effectiveness while minimizing side effects.

Children with leukemia also face psychological challenges. Artificial intelligence-based technologies can help alleviate anxiety and depression through online counseling and cognitive-behavioral therapy. Despite advancements, challenges remain, including the need for precise data, patient privacy, and standardizing artificial intelligence algorithms. Addressing these issues is essential for the effective implementation of This innovative technology.

Conclusion: Artificial intelligence has great potential to improve the quality of life of children with leukemia. From early diagnosis to complication prediction and personalized treatments, artificial intelligence plays a crucial role in enhancing care and treatment quality. However, challenges such as data security, accessibility, and algorithm accuracy must be addressed. Further research is

needed to enhance the efficiency of artificial intelligence and fully utilize its potential in improving the lives of children with leukemia.

Keywords: Artificial Intelligence, Quality of Life, Children

G-1557

Machine Learning for Microbiome Host Trait Prediction

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Abstract:

Background: The microbiome is the collection of all microbes living in or on a host, including bacteria, viruses, and fungi. The risk or severity of numerous diseases and disorders in a host are associated with the microbiome, and accurate trait prediction based on microbiome characteristics is an important problem. The application of modern machine learning algorithms is proving to be valuable in this effort.

Methods: PubMed, Scopus and Science Direct databases were searched from 2017 to 8 February 2025 to identify English-language studies related to the purpose of the research. Scoping Review Methodology – Identification, Selection, and Organization of Relevant Publications This study follows the scoping review methodology for searching and assessment of the relevant studies. All non-English studies, non-original studies and studies that were not related to our purpose were excluded.

Results: Of, 6400 retrieved articles, 13 met the inclusion criteria. The research showed that machine learning is mainly focused on feature selection for human microbiome studies, biomarker identification, disease prediction, microbiome host trait prediction, microbial ecology, environmental monitoring and treatment. ML has been applied to tackle tasks such as phenotyping (namely, predicting an environmental or host phenotype), microbial feature classification (i.e., determining the abundance, diversity, or distribution of the microbiota), studying the complex physical and chemical.

Conclusion: Machine learning (ML) is a subset of artificial intelligence (AI) methods, which leverage large datasets to recognize, classify, and predict patterns. Based on the performed review, most common machine learning algorithms that were used for microbiome analysis were Random Forest, Support Vector Machines, Logistic Regression and k-NN.

Keywords: Machine Learning, Microbiome, Prediction, Host Trait.

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Machine learning on microbiome and cancer research

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Abstract:

Background: Scientific evidence is accumulating for the role played by microbes in human health and disease. An imbalance in the microbiome composition can cause several diseases, including cancer. The microbiota is also thought to affect the therapeutic outcome of cancer by modulating the anti-tumor activity of drugs and influencing the immune system. This indicates the importance of taking the microbiota into consideration, specifically in cancer treatment strategies.

Methods: PubMed, Scopus, and ScienceDirect databases were searched from 2017 to 6 February 2025 to identify English-language studies related to the purpose of the research. Scoping Review Methodology Identification, Selection, and Organization of Relevant Publications This study follows the scoping review methodology for searching and assessment of the relevant studies. All non-English studies, non-original studies and studies that were not related to our purpose were excluded.

Results: Of, 1190 retrieved articles, 8 met the inclusion criteria. According to cancer research, since they deal with well-defined datasets of microbes and their gene sequences (labeled data), supervised learning techniques such as SVM, RF, a combination of SVM and RF (ensemble models), or ANNs are good choices for this purpose. These methods depend on the statistical analysis of the data. When they additionally used boosting algorithms, they increased performance. Since a large amount of genetic data of microbes needs to be processed, the dimensions can become an obstacle in obtaining clean results. For this, many dimensionality reduction techniques can be used to reduce or combine irrelevant features by performing principal component analysis.

Conclusion: Due to the increasing size of datasets available in public databases, "omics" technologies have been widely used for microbiome analysis. Realizing the potential of these new technologies is sometimes difficult and limits our ability to critically analyze the vast amount of data available. In this context, two subsets of artificial intelligence methods, machine learning and deep learning, can help doctors analyze and understand these large data sets. AI-assisted healthcare and data-driven sciences have the potential to clarify the landscape of findings and enable clinicians to move these findings from the bioinformatician's bench to the patient's bedside.

Keywords: Machine Learning, deep learning, Microbiome, Disease

G-1559

AI Chatbots and Mental Health: Successes, Challenges, and Prospects

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Abstract:

Background and Aims: The integration of artificial intelligence in mental health care has spurred innovative solutions like chatbots, addressing accessibility and affordability gaps. This study aims to evaluate the successes, challenges, and future potential of AI-driven chatbots in enhancing mental health service delivery.

Methods: A systematic literature review was conducted, analyzing peer-reviewed studies, technological frameworks, and clinical trial outcomes. The sample included data from platforms like Woebot and Wysa, focusing on user interactions, natural language processing capabilities (e.g., Transformer models), and clinical efficacy metrics. Procedures involved assessing chatbot performance in delivering digital cognitive-behavioral therapy, mindfulness interventions, and user satisfaction, alongside technical and ethical analyses.

Results: AI chatbots improved mental health accessibility, operating 24/7 and reducing treatment costs by up to 70%. Clinical studies showed a 35-55% reduction in anxiety and depression symptoms, with user satisfaction rates above 90%. Advanced algorithms enabled personalized interventions, though limitations in emotion detection and complex dialogue management were noted. Security, privacy, and ethical concerns, including data protection and bias, emerged as challenges. Future integration with wearables and biosensors showed over 90% accuracy in predictive diagnostics.

Conclusion: AI chatbots are transforming mental health care by enhancing accessibility and efficacy, but technical and ethical barriers must be addressed to realize their full potential. Interdisciplinary collaboration among technologists, psychologists, and policymakers is essential for advancing chatbot capabilities and ensuring ethical deployment. Future work should focus on improving emotion detection, integrating real-time physiological monitoring, and establishing comprehensive ethical guidelines to foster societal trust and adoption.

Keywords: Artificial Intelligence, Mental Health, Chatbots, Digital

G-1560

Design and Implementation of an Intelligent System Based on Artificial Intelligence and Machine Learning for Arrhythmia Detection in Pre-Hospital Emergencies Using a Mobile Application

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Abstract:

Background and Aims: Cardiac arrhythmias, potentially life-threatening disturbances in heart rhythm, represent a critical challenge in pre-hospital emergency care, where rapid and accurate detection is essential. This study aims to design and implement an intelligent system based on artificial intelligence and machine learning to automatically detect arrhythmias using images captured by mobile phone cameras. The goal is to enhance emergency medical response outside of hospital settings, especially in underserved areas.

Methods: The proposed system employs a mobile application that uses advanced image processing algorithms and deep learning models, particularly convolutional neural networks (CNNs), trained on a large dataset of ECG images. Users capture photos of paper-based ECG printouts or monitor displays with their mobile cameras. These images are then processed locally on the device to identify various arrhythmia types such as atrial fibrillation or ventricular tachycardia. The application also supports multilingual output and geolocation sharing for emergency communication.

Results: Initial evaluations demonstrate a detection accuracy exceeding 95% for multiple arrhythmia types. The system reduces diagnosis time significantly—by up to 70% compared to traditional methods—crucial in time-sensitive emergency situations. Furthermore, non-medical users achieved an 85% satisfaction rate in usability tests, indicating the system's potential for widespread community use.

Conclusion: This intelligent, mobile-based arrhythmia detection system offers an innovative and scalable solution for pre-hospital emergency care. By leveraging AI technologies and ubiquitous smartphone cameras, it empowers both laypersons and responders to identify life-threatening conditions promptly. Challenges such as poor image quality under low lighting, smartphone processing limitations, and data privacy are acknowledged and addressed through encryption and

blockchain-based solutions. Future work includes integration with telemedicine platforms and expansion to other cardiac-related visual diagnostics.

Keywords: Artificial Intelligence, Emergency Medicine, Arrhythmia Detection

G-1561

Mathematical Model for Chemotherapy Effectiveness

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Abstract:

Background and Aims: In recent years, mathematical modeling, data mining and optimization techniques are used to improve previous empirical medical guidelines both in terms of treatment results and patients' satisfaction in chemotherapy. The role of such mathematics-based methods might be seen in suggesting the best drug combination, designing new drugs and analyzing the prognosis. Although there exist empirical guidelines in most cases, making use of numerical analysis provides more accurate solutions that improve patients' life quality.

Methods: In this paper, we proposed a new mathematical model to approximate the tumor mass reduction as a function of chemotherapy synergy dosage in cancer patients. By use of this two-variable function, the best dosage of each drug leading to maximum size-reduction can be computed. Unlike previously outlined schemes, we present a more realistic model for tumor mass reduction by taking advantage of nonlinear mass transfer. We then solve the designed model by use of analytical and numerical techniques. From mathematical point of view, analytical solutions for the linear parts and numerical solutions for quadratic parts of the model, decrease the computational complexity. Low computational cost makes this model a proper choice for prognosis analysis and case-sensitive treatment suggestions as well.

Results: The generated model is finally optimized by updating its hyper parameters in an artificial neural network. To confirm the efficiency of our proposed model, we test it over Cetuximab and Capecitabine as a widely-used chemo combination for colon, lung, liver and breast cancer. Based on our numerical results, the computed tumor size values seem reasonable in comparison to empirical data.

Conclusion: Various mathematical models have been proposed to investigate the efficacy of chemotherapy, which improve on previous experimental results. However, most of these models, due to the lack of appropriate mathematical techniques, involve a very large amount of computation in a huge model. We present a new mathematical model for in which nonlinear mass transfer in conjunction with linear diffusion terms provides more realistic results. For solving the model, we combine the linearization and Laplace transform techniques. The numerical test over Cetuximab and Capecitabine confirms the efficiency.

Keywords: System-Dynamics, Drug-Effectiveness, Synergy, Tumor-Mass, ANN

G-1562

Design of an AI-Based Voice Processing System for Quality Assessment of Telephone Triage in 115 Emergency Services

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Abstract:

Background and Aims: Telephone triage in emergency services, such as the 115 hotline, is critical for prioritizing patients and saving lives, yet its quality directly impacts outcomes. This study aims to design an intelligent artificial intelligence-based system to evaluate the quality of telephone triage, hypothesizing that automated analysis of operator performance can enhance accuracy and efficiency in emergency responses.

Methods: The system utilizes natural language processing and deep learning models, specifically recurrent neural networks, to analyze recorded emergency call conversations. It examines key phrases (e.g., “severe pain,” “loss of consciousness”) and the caller’s tone to assess operator adherence to standard protocols. A sample of anonymized call recordings was processed, with the system scoring operator responses for accuracy and completeness. Emotion detection capabilities further evaluate interaction quality, such as identifying caller stress or confusion. Data privacy is maintained through encryption and secure protocols.

Results: Initial findings demonstrate that the system detects operator errors in up to 70% of cases, with an average evaluation time of under 30 seconds per call. It identifies issues like misjudged urgency or overlooked critical information, providing quality scores and actionable feedback. Challenges include environmental noise, diverse accents, and the need for extensive training data to improve accuracy.

Conclusion: This artificial intelligence-driven system offers a robust tool for monitoring and improving telephone triage quality, enabling emergency service managers to pinpoint weaknesses and deliver targeted training. Its potential integration with real-time dashboards and training platforms could further standardize and optimize emergency services. By enhancing operator performance, the system contributes to faster and more accurate patient prioritization,

ultimately saving more lives. Future work should focus on refining accuracy across varied linguistic and environmental conditions.

Keywords: Artificial Intelligence, Emergency Triage, Natural Language

G-1564

Policy and Healthcare Management in Artificial Intelligence: A Comprehensive Review

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Abstract:

Background and Aims: The integration of Artificial Intelligence (AI) in healthcare has led to significant advancements in medical diagnostics, treatment planning, patient care, and administrative processes. However, these innovations are accompanied by complex challenges in policymaking, regulation, and healthcare management. This paper explores the intersection of AI, health policy, and management, focusing on regulatory frameworks, ethical concerns, data privacy, and the future outlook of AI in healthcare.

Methods: The study examines international and national regulatory approaches, including the EU's GDPR and the US FDA guidelines, as well as the evolving roles of governments and institutions in funding AI research and shaping policy. Ethical issues such as algorithmic bias, transparency, informed consent, and data security are analyzed. Furthermore, the paper investigates strategic management practices for integrating AI into existing health systems, workforce transformation, and organizational change management.

Results: Key findings highlight the need for standardized certification processes to ensure the safety and effectiveness of AI tools in healthcare. Ethical implementation requires addressing bias, ensuring transparency, and securing patient consent. Data privacy remains a major concern due to the sensitive nature of medical information. On the managerial side, successful AI adoption depends on effective system integration, upskilling of health professionals, and managing institutional change. Financial, operational, and social challenges, including public trust and job displacement, also impact AI deployment.

Conclusion: AI has transformative potential in healthcare, but its success depends on the development of robust regulatory frameworks, ethical safeguards, and strategic management plans. Collaborative efforts among governments, healthcare providers, and technology developers are essential to realize AI's benefits while minimizing its risks.

Keywords: Artificial Intelligence, Healthcare Policy, Health Management

G-1565

Design of an Intelligent AI-Based System for Mental Health Assessment of Pre-Hospital Emergency Personnel Using Mission Report Analysis

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Abstract:

Background and Aims: Pre-hospital emergency personnel face significant psychological stress due to the high-pressure nature of their work, increasing risks of burnout and mental health challenges. This study aims to design an intelligent artificial intelligence-based system to assess the mental health of emergency personnel by analyzing mission reports, hypothesizing that early detection of stress patterns can enhance support and reduce burnout.

Methods: The proposed system employs natural language processing and deep learning algorithms, specifically Transformer models, to analyze textual data from mission reports. These reports include personnel descriptions of events, reported symptoms, and actions taken. The system extracts key phrases (e.g., “severe pressure,” “critical incident”) and identifies recurring patterns, such as frequent high-stress missions within short timeframes. Data from a sample of anonymized mission reports were processed, with privacy ensured through encryption and restricted access. The system's accuracy in estimating stress or burnout levels exceeds 85%.

Results: Preliminary findings indicate the system detects burnout trends up to 65% earlier than traditional methods, reducing analysis time to minutes per dataset. It generates analytical reports (e.g., “increased stress indicators over the past 30 days”) for managers and personnel. Challenges include incomplete reports, varying writing styles, and the need for standardized data, which slightly affect performance.

Conclusion: This artificial intelligence-driven system offers a proactive approach to monitoring mental health, enabling better shift planning and reducing absenteeism among pre-hospital emergency personnel. Its integration with human resource systems and provision of personalized stress-reduction recommendations represent future potential. By improving mental well-being, the system enhances the efficiency of emergency services and prevents occupational burnout, suggesting a scalable model for other high-stress professions.

Keywords: Artificial Intelligence, Mental Health, Emergency Services,

G-1566

From Data to Revenue: Developing an Intelligent Pathology Diagnosis Ecosystem Using Deep Learning and Image Processing for Financial Self-Sufficiency of Teaching Hospitals

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) in healthcare offers transformative potential for pathology diagnostics, medical education, and financial sustainability. This study aims to develop an AI-based ecosystem leveraging deep learning and image processing to enhance diagnostic accuracy, enrich medical training, and achieve financial self-sufficiency for teaching hospitals.

Methods: The platform employs deep neural networks and advanced image processing techniques to analyze digital pathology images automatically. The system was designed with an interactive interface for medical students and professionals, incorporating adaptive learning tools and real-time data analytics. A revenue model was developed, including online diagnostic services, commercialization of analyzed data for research, and AI-driven educational tools. The study involved collaboration with medical experts to validate the platform's diagnostic accuracy and educational utility in a controlled hospital setting.

Results: The platform achieved a diagnostic accuracy exceeding 95%, significantly reducing human error and enhancing the speed of pathology assessments. It provided enriched learning experiences through realistic simulations and data-driven insights, improving the performance of medical students and professionals. Initial implementation demonstrated viable revenue streams, covering operational costs and supporting infrastructure upgrades, thus fostering financial independence for participating hospitals.

Conclusion: This AI-driven ecosystem successfully meets its threefold objectives: high diagnostic precision, enhanced medical education, and sustainable revenue generation. Its implementation

can elevate healthcare quality and educational outcomes in teaching hospitals. The authors recommend pilot testing in diverse hospital settings to assess scalability and adaptability at national and international levels. This model could serve as a blueprint for integrating advanced technologies into healthcare and education, paving the way for a smarter, more sustainable future in medicine.

Keywords: Artificial Intelligence, Pathology Diagnostics, Medical Education

G-1567

Repurposing of FDA-approved and investigational drugs as MET-kinase inhibitors against NSCLC: A combined in-silico modeling and machine learning approach

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Abstract:

Background and Aims: The Mesenchymal Epithelial Transition (MET) receptor tyrosine kinase plays a pivotal role in cancer therapy. However, mutations such as D1228V can diminish the effectiveness of current inhibitors. In continuation to our interest for in silico assessment of oncotargets, this study sought to identify FDA-approved and investigational drugs that are likely capable of inhibiting both wild-type MET and its D1228V mutant form against non-small cell lung cancer (NSCLC).

Methods: A dataset comprising 639 tyrosine kinase inhibitors with NSCLC-related cell growth inhibitory effects (IC50s) from ChEMBL (<https://www.ebi.ac.uk/chembl/>) was curated, applying a 103 nM bioactivity threshold as a cut-off point and balanced with DUD-E decoy molecules. Several machine learning models including LightGBM, XGBoost, and Random Forest, were utilized along with different molecular fingerprints. According to the obtained results, LightGBM with extended connectivity fingerprint (ECFP) emerged as the most effective model with satisfying metrics (accuracy 0.93, sensitivity 0.96, and specificity 0.87). The top-ranked model screened 6263 molecules from DrugBank, identifying 233 as potentially active. Subsequent drug-likeness filtering (Lipinski rule of 5 and rotatable bonds 10), conferred 173 candidates that were docked into the catalytic site of wild-type MET receptor. Of these, 28 outperformed the reference co-crystal inhibitor Savolitinib and were subjected to molecular docking to the D1228V mutant.

Results: Seventeen molecules demonstrated enhanced binding profile to the D1228V mutant catalytic site, with enhanced free binding energies ($\Delta\Delta G_{bs}$ -0.05 to -0.95 kcal/mol) with regard to the wild-type energies. Key examples included SAR-125844 ($\Delta\Delta G_b$ -0.38 kcal/mol) and Edralbrutinib ($\Delta\Delta G_b$ -0.95 kcal/mol).

Conclusion: This study underscores the repurposing potential of dual MET inhibitors, such as SAR-125844 and Palbociclib against NSCLC. The outputs of the current study suggests opportunities for drug repurposing in cancer treatment. Although results of this computational study provided a few promising molecules as a promising MET inhibitors, robust wet-lab experiments seem necessary to achieve desirable biological and clinical effects.

Keywords: NSCLC, MET Kinase, Drug Repurposing, Machine

G-1568

The future of pharmacy staff and artificial intelligence

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Abstract:

Background and Aims: The integration of Artificial Intelligence (AI) in pharmacies is expected to bring significant changes to pharmaceutical workflows. While AI can automate routine tasks and improve efficiency, it also presents challenges and impacts the roles of pharmacy staff. This study explores the benefits and potential drawbacks of AI implementation in pharmacy settings, particularly in relation to human resources.

Methods: The study analyzes the application of AI technologies such as prescription processing systems, drug interaction checkers, chatbots, and intelligent inventory management tools. It also examines how these systems influence pharmacy operations and the skills required for future pharmaceutical professionals.

Results: AI offers numerous advantages in pharmacies, including improved efficiency and accuracy in data processing, enhanced medication counseling, increased access to pharmaceutical services through online platforms, better inventory control, and reduced medication errors. However, challenges include the reduction of traditional roles, the necessity for new skill development among pharmacists, and concerns about job displacement. Despite automation, human expertise remains vital for complex clinical evaluations and personalized care.

Conclusion: AI has the potential to transform pharmacy practice by streamlining operations and improving service quality. Nevertheless, to ensure a balanced and effective integration, there must be a focus on upskilling pharmacy staff and redefining roles to harmonize human and machine collaboration in healthcare delivery.

Keywords: Artificial Intelligence, Pharmacy Automation, Digital Pharmacy

G-1570

Review of Artificial Intelligence-Based Mattresses in the Prevention of Pressure Ulcers in Hospitalized Patients: A Review Article

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Abstract:

Background and Aims: Today, artificial intelligence has made significant advancements in disease prevention. One of its most important applications is preventing diseases, which subsequently avoids the economic and physical costs for the patient. Considering that pressure ulcers are a significant complication in hospitalized patients, we decided to investigate the role of artificial intelligence in pressure ulcer prevention, based on previous research.

Methods: This review study identified 7 articles relevant to the objective through searches in Google Scholar and PubMed databases, considering a time limitation (2019-2024). The articles were reviewed in three stages: title screening, abstract review, and full-text review, and irrelevant articles were excluded.

Results: Today, artificial intelligence-based mattresses, with their specific algorithms and data, can effectively prevent pressure ulcers. This data source includes information such as the moisture level of the mattress, the amount of pressure applied to the skin, the amount of surface area in contact with the skin, and the temperature between the skin surface and the mattress. The mechanism of these mattresses involves providing thermal images of the temperature of different points of the body, creating airflow between the empty spaces in the mattress, creating a wave-like motion in the mattress, and also reducing pressure on specific points by analyzing the amount of pressure exerted on different areas of the body. Advantages of this technology include reducing pressure on the skin, reducing moisture and perspiration on the mattress, increasing ventilation and air circulation, and accelerating disease recovery.

Conclusion: The use of artificial intelligence can provide a suitable platform for the prevention of pressure ulcers, including early identification of risk factors, provision of personalized care for each patient, and the development of advanced equipment. The innovative new equipment currently being developed will likely focus on developing more advanced artificial intelligence

algorithms and more innovative equipment. Given the novel innovations and ideas currently being developed in this field, they offer promise for a bright future.

Keywords: Artificial Intelligence, Pressure Ulcers, Prevention, Mattresses

G-1571

Recent Advancements in Leukemia Diagnosis and Classification Using Machine Learning and Deep Learning Techniques

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Abstract:

Background and Aims: Leukemia is a hematologic malignancy which includes four types: acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), chronic myeloid leukemia (CML), and chronic lymphocytic leukemia (CLL). These types are classified through microscopic examination of peripheral blood smears and bone marrow aspirate smears by human experts. However, this process can be time-consuming, and prone to human errors, which may lead to misclassification and endanger the patient's life. Therefore, automated analysis of microscopic images can enhance the accuracy of classification while eliminating human errors.

Methods: This review examines articles published between 2017 and 2023, focusing on keywords including "leukemia, deep learning, machine learning, diagnosis, and classification" with a preference for free full-text articles available in databases such as PubMed, Google Scholar, and Scopus. Ultimately, 17 articles were included in the final analysis. The selected studies considered the use of both peripheral blood smear and bone marrow aspirate smear images. This selection aimed to analyze the types of algorithms used, their performance outcomes, strengths, and weaknesses, as well as future challenges.

Results: The majority of the reviewed articles have primarily focused on the classification of ALL. The common steps followed in most studies include preprocessing, segmentation, feature extraction, and classification. Public databases such as ALL-IDB have been the most widely used in these studies. Additionally, some studies have achieved accuracy rates of 99% and 100%. The most frequently used algorithm in machine learning approaches has been SVM, while CNN has been the dominant algorithm in deep learning methods, with architectures such as ResNet and AlexNet being the most commonly utilized.

Conclusion: The focus on public datasets in the majority of studies has yielded promising results. In contrast, studies utilizing private datasets have experienced a decrease in accuracy ranging from 2% to 15%. To enhance the efficiency of these models, increasing the use of private datasets is recommended. A comparison of the results from both deep learning and machine learning approaches indicates that deep learning methods have demonstrated superior performance, achieving high accuracy rates, highlighting their greater effectiveness.

Keywords: Leukemia, Classification, Deep Learning, Machine Learning

G-1572

emerging role of digital pathology to advance cancer immunotherapy: a systematic review

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Abstract:

Background and Aims: The aim of this review is to provide a practical summary of issues relevant to implementing digital diagnostics in the pathology laboratory to advance cancer immunotherapy. Digital pathology can entail any sort of work involving a digital image. For instance, digital photography to capture and store macroscopic images can be considered one of the first widespread aspects of digital pathology. With the rapid development of hardware and software for whole slide imaging, particularly since the Food and Drug Administration approved this system to be used for primary diagnosis, digital pathology has gained substantial momentum in scientific research. Computer-aided diagnosis is embedded into the pathology flow powered by the digital pathology framework.

Methods: This review article was conducted based on the wide search in different databases such as PubMed, Scopus and Google Scholar from 2014 to 2024. In our research 42 articles were found in which 18 were the most related ones.

Results: The Artificial Intelligence framework contains: Cell segmentation, Batch normalization, Cell phenotyping, and Spatial characterization.

Routine Hematoxylin and Eosin Staining: H&E is used to reveal the nuclei morphology and from which tumor-infiltrating lymphocytes have demonstrated strong clinical values related to immunotherapy in various tumor types. With Artificial intelligence we can access to the cells more quickly and more confident.

Immunohistochemistry Staining: PD-L1, is clinically used to stratify immune-checkpoint inhibitors based on therapies in lung and other cancer types. There are studies that developed AI-enabled automatic PD-L1 scoring systems based on assays in breast, head and neck cancer.

Next Generation Multiplex Bioimaging: It can profile proteins in situ, enabling the systematic study of cellular compositions and interactions. The multiplex imaging with big data imposes a

challenge for pathologists to directly evaluate these slides, where AI-powered tools are being developed to characterize the tumor microenvironment.

Conclusion: By using Digital Pathology provided storage is reliable and data secure, a scanned slide cannot be lost or broken. The retrieval of archived slides is simplified and does not require staff assistance. Furthermore Digitalized scans can be shared for second opinions and educating students.

Keywords: Digital Pathology, Artificial Intelligence, Cancer, Immunotherapy

G-1573

Application of Machine Learning in Discovering Antibiotic Resistance Patterns

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Abstract:

Background and Aims: Antibiotic resistance is a major global health challenge, and its accurate and rapid detection is crucial for reducing disease burden and mortality caused by drug-resistant infections. Identifying antibiotic resistance patterns can improve treatment management and enhance healthcare quality. Recent advancements in Artificial Intelligence (AI), particularly Machine Learning (ML), have led to the development of effective tools for discovering such patterns. This study investigates the application of ML algorithms in identifying antibiotic resistance patterns.

Methods: This review examines the application of ML algorithms in identifying antibiotic resistance patterns. A comprehensive literature search was conducted in PubMed, Scopus, Google Scholar, and Web of Science using relevant keywords, including Artificial Intelligence, Antibiotic Resistance, Association Rule Mining (ARM), and Machine Learning, for studies published from 2020 onwards. Based on predefined selection criteria, abstracts and full texts were reviewed, and five out of 37 identified articles were selected for analysis.

Results: The reviewed studies, published between 2021 and 2024, utilized unsupervised learning methods and ARM to identify antibiotic resistance patterns. Algorithms such as FP-Growth, Eclat, and Apriori were employed, with Apriori being the most commonly used. Extracted patterns were evaluated using metrics such as Support, Confidence, and Lift. The results indicated that antibiotic resistance patterns were identified based on variables such as gender, age, bacterial species, year, and sample type.

Conclusion: The findings suggest that unsupervised learning algorithms, particularly ARM and the Apriori algorithm, play a significant role in predicting antibiotic resistance patterns. Accurate prediction of these patterns based on various variables enables healthcare professionals to explore relationships in the data from new perspectives, leading to more informed antibiotic selection and improved decision-making in drug prescription. Ultimately, this can help mitigate

antibiotic resistance. Additionally, ARM can be applied to analyze drug resistance in other medical fields. However, the limitations observed in the reviewed studies highlight the need for further extensive research to optimize the use of these methods in future decision-making.

Keywords: Machine Learning, Unsupervised Learning, Antibiotic Resistance

G-1574

Robotic Technology in Neurosurgery: Applications and Challenges in Spinal Surgery

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Abstract:

Background and Aims: Robotic technology has made remarkable advancements in recent years, continuously expanding its role in advanced surgeries, particularly in neurosurgery. One of the most significant applications of this technology is in spinal surgery, where high precision and maintaining the stability of the spinal structure are essential. Accordingly, this study aims to explore the applications and challenges of robotic technology in spinal surgery.

Methods: This is a review study aimed at examining the applications and challenges of robotic technology in neurosurgery. To achieve this, articles were searched in various databases, including PubMed, Scopus, and Google Scholar, using relevant keywords such as Artificial Intelligence, Neurosurgery, and Machine Learning from 2019 to the present. Based on predefined criteria, abstracts and full texts of the articles were reviewed, and ultimately, 6 articles were selected from the 37 identified.

Results: Studies show that robotic technology in neurosurgery, particularly in spinal surgery, has made significant advancements. This technology reduces the need for reoperations by increasing precision in implant placement and minimizing human error. The combination of artificial intelligence with robotic surgery enables the correction of the surgeon's movements and provides optimal recommendations, facilitating the surgical process. These advancements contribute to improved outcomes and enhanced patient safety. However, this technology faces challenges such as high implementation costs, the need for specialized training for surgeons, coordination with human skills, and precision in implant placement, all of which need to be addressed.

Conclusion: The results of studies show that robotic technology can be effectively utilized in neurosurgery, particularly in spinal surgery. This technology has already proven to be a safe tool in spinal surgery, benefiting both patients by increasing the precision of implant placement and the surgical team by reducing radiation exposure. Despite the challenges, the growing trend of robotic technology in neurosurgery suggests that it has the potential to establish a new standard for complex spinal surgeries and shape a new future for neurosurgery.

Keywords: Robotic Surgery, Neurosurgery, Spinal Surgery

G-1575

The Role of the Internet of Things (IoT) in Personalized Medicine

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Abstract:

Background and Aims: The Internet of Things (IoT), by connecting devices to the internet and enabling real-time data sharing, has significantly transformed personalized medicine. Personalized healthcare aims to tailor medical care to individual genetic, environmental, and lifestyle factors. IoT plays a crucial role in this transformation by enhancing monitoring, customizing treatments, and improving patient outcomes.

Methods: To investigate the role of IoT in personalized medicine, a systematic literature review was conducted. Major academic databases including PubMed, Scopus, Web of Science, and IEEE Xplore were searched. The search covered the period from January 2015 to December 2023. Keywords used included "Internet of Things," "IoT," "personalized medicine," "wearable devices," "remote monitoring," and "healthcare IoT." After screening titles and abstracts, duplicate records were removed, and full texts of relevant articles were assessed. A total of 235 initial records were identified, out of which 42 studies met the inclusion criteria and were selected for final analysis.

Results: Among the 42 selected articles, 78% focused on the use of wearable devices for continuous monitoring of vital signs such as heart rate, blood pressure, and glucose levels. Predictive data analytics for early detection of diseases like cardiovascular conditions and diabetes were discussed in 65% of the studies. Smart pillboxes and adherence-promoting technologies were featured in 53% of the articles. Additionally, 48% of the reviewed studies highlighted the importance of real-time data sharing among healthcare providers to enhance care coordination. Overall, the findings demonstrate that IoT significantly contributes to improved therapeutic outcomes by enabling timely, data-driven, and patient-centered care.

Conclusion: IoT has revolutionized personalized medicine by delivering real-time insights, customized care strategies, and enhanced patient engagement. Despite existing challenges such as data privacy concerns, system integration issues, and device reliability, IoT remains a transformative force in the future of healthcare delivery.

Keywords: Internet of Things, Personalized Medicine, Real-Time

G-1576

Rapid classification of fetal ultrasound images based on deep learning, decision fusion and quantization

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Abstract:

Background and Aims: Classification of fetal ultrasound images is important for prenatal care and diagnosis, but manual classification is time-consuming and depends on operator experience. While previous studies have shown good results using deep learning algorithms, existing models often require large computational resources, which limits their implementation in clinical settings. The aim of this study was to develop and evaluate an automated fetal ultrasound image classification system using transformer-based models and quantization that requires low computational resources while maintaining high accuracy and is suitable for real-world implementation.

Methods: In this study, a classification algorithm was developed by combining the Vision Transformer (ViT) and Swin Transformer models, which is optimized for 8-bit quantization-aware training (QAT). The model was trained and analyzed using a public dataset with 12,400 images of fetal ultrasounds in six groups (abdomen, brain, femur, chest, maternal cervix, others). The performance of the model was evaluated using top-1 and top-3 errors. In addition, generalizability of the model was tested using a local dataset consisting of 92 fetal ultrasound images collected from one of the ultrasound centers in Arak city.

Results: The proposed model achieved an accuracy rate of 93.6% on the test dataset, which was consistent with the performance of previous models. The proposed model was significantly improved in terms of computational efficiency. The model developed in this study performed 5 times better than DenseNet-169 and 2.5 times better than Inception-v3 and ResNeXt-101.

Furthermore, in the local dataset, the model achieved an accuracy of 67.39%, indicating acceptable generalization to new clinical settings.

Conclusion: The use of transformer-based models together with quantization can achieve adequate classification quality while at the same time significantly reducing the computational power required to run the model. The model improved with this approach is highly suitable for implementation in real clinical settings. Clearly, more research is needed to increase the generalizability of the model in different clinical settings.

Keywords: Fetal Ultrasound, Deep Learning, Quantization

G-1577

The role of artificial intelligence in the transformation of digital health: From prevention to smart management

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Abstract:

Background and Aims: Digital transformation in the health sector is one of the most significant advancements of the 21st century, accelerated by the emergence of new technologies, particularly artificial intelligence (AI). With the ability to process vast amounts of data, learn from patterns, and provide intelligent solutions and advanced analytics, AI plays a crucial role in improving the quality of health services, reducing costs, and increasing access to healthcare. The aim of this article is to examine the role of artificial intelligence in the transformation of digital health, disease prevention, the evolution of healthcare toward smart treatment management, and ultimately the challenges ahead.

Methods: Initially, a review of articles, reports, and reputable scientific sources from 2015 to 2025 was conducted to explore the research background in the field of artificial intelligence and digital health. Then, the data obtained from various sources were analyzed using statistical and analytical techniques to identify common patterns and trends. The results provide an analysis of various aspects of AI applications in digital health, including prevention, early diagnosis, and smart disease management, while discussing the strengths and weaknesses of this technology.

Results: AI plays an irreplaceable role in the transformation of digital health by providing innovative solutions. From disease prevention and early diagnosis to smart treatment management, this technology has the potential to improve patients' quality of life and reduce healthcare system costs. However, to fully leverage the potential of AI, challenges related to privacy, transparency, and data quality must be addressed.

Conclusion: Generative AI is a type of AI that can produce new data, such as images, text, and even new molecules. This technology employs advanced systems like Generative Adversarial Networks (GANs) and powerful Natural Language Processing (NLP) models like GPT-4 to generate new data. The widespread application of this technology in medicine could lead to significant improvements in diagnosis, personalized treatments, and the development of innovative drugs.

Keywords: Artificial Intelligence, Digital Health, Healthcare

G-1578

The Role of Artificial Intelligence in Digital Health

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Abstract:

Background and Aims: Integrating artificial intelligence (AI) into digital health has transformed healthcare delivery, improving outcomes and operational efficiencies. This narrative review examines the AI role in digital health, current applications, and ethical challenges of AI in digital health, aiming to synthesize existing literature and provide actionable insights for future integration. We hypothesize that addressing the challenges of AI in healthcare is crucial for unlocking its full potential.

Methods: Utilizing the PRISMA-ScR framework, we systematically reviewed literature from 2010 to 2025 across multiple databases, including PubMed, Scopus, and Web of Science. The review focused on peer-reviewed articles and reports specifying the effect of AI on diagnostic imaging, patient management systems, operational efficiencies, and personalized medicine. To identify relevant studies, we used keywords related to AI ("artificial intelligence," "machine learning," "deep learning") and digital health ("telemedicine," "mHealth"). The inclusion criteria encompassed peer-reviewed articles in English focusing on AI applications in healthcare settings. 53 articles were included in the analysis following the study's eligibility criteria. Two reviewers independently extracted data and synthesized it narratively.

Results: Our findings indicated that AI significantly enhances diagnostic accuracy, particularly in imaging, with algorithms improving speed and reliability in disease detection. AI-driven Clinical Decision Support Systems (CDSS) and Virtual Health Assistants (VHAs) increased patient management care through tailored insights and improving engagement. In addition, AI technologies optimize operational efficiency in healthcare and personalized medicine. However, challenges persist, including data privacy concerns, algorithmic bias, and the need for robust regulatory frameworks to govern AI technologies effectively.

Conclusion: While AI offers promising advancements in digital health, its successful integration necessitates addressing ethical and operational challenges. Collaborative efforts among

stakeholders are essential to create thorough guidelines that guarantee fair access and protect patient information. This review highlights the necessity for continuous research to address the changing terrain of AI in healthcare, guaranteeing that its advantages extend to various populations and aid in enhancing health results.

Keywords: Artificial Intelligence, Digital Health, Clinical Decision Support System

G-1579

A comparative study of biological images generated by selected generative artificial intelligence

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Abstract:

Background and Aims: Generative AI models for text-to-image (T2I) have found wide application in scientific and medical fields in recent years due to their ability to produce diverse and realistic images from text descriptions. These models can be useful tools for education and research in the production of biological images such as cellular structures, organs and biological processes. However, it is very necessary to evaluate them to ensure their scientific validity. This study aimed to evaluate and compare the accuracy of text-to-image AI models in generating biological images.

Methods: Four generative AI models DALL-E 3 (accessed via the ChatGPT), Grok, Gemini, Stable Diffusion were selected based on accessibility and technical diversity. A standard set of text descriptions was designed for three biological subjects (kidney, brain, eye) at three levels of complexity (low, medium, high). Nine images were generated by each AI model. Three experts scored the images from 0-5 points. Data were analyzed using the Friedman test (to compare models), the Kruskal-Wallis's test (to compare complexity levels), and the intraclass correlation coefficient (ICC) for expert agreement.

Results: The mean scores of the models were Gemini (2.93), Grok (2.44), DALL-E 3 (2.22), and Stable Diffusion (1.59), respectively. The Friedman test (statistics: 27.53, p 0.05) showed that the difference between the models was statistically significant. Gemini performed better on the brain (4.56) and Grok on the high complexity level (3.00), while Stable Diffusion performed very poorly on the kidney (0.00). The Kruskal-Wallis's test (statistics: 4.29, p = 0.117) did not show a significant difference between the complexity levels, although the mean scores at the low level (3.25) were higher than those at the medium (1.78) and high (1.69) levels. The ICC of 0.989 confirmed a very high level of agreement among the experts.

Conclusion: In biological image generation, Gemini performed best. Grok and DALL-E3 performed moderately, and Stable Diffusion performed poorly. The high level of agreement among the experts ensured the validity of the evaluations. These findings can provide guidance for the use of artificial intelligence models in biological image generation for education and research.

Keywords: Generative Ai, Text-to-Image Generation, Biological Image

G-1581

An Evolution in Breast Cancer Prediction: a Systematic Review on the Role of the Artificial Intelligence

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Abstract:

Background and Aims: Breast cancer is the most common cancer in women worldwide. The prevalence and incidence of breast cancer is increasing every year. The artificial intelligence (AI) particularly deep learning and convolutional neural networks has pervaded the field of breast cancer prediction. This systematic review aimed to identify the barriers encountered in applying AI in developing breast cancer risk prediction models and promoting screening behaviors among adult females.

Methods: This review was performed independently based on PICO criteria and PRISMA checklist, a total number of 251 studies between 2020 and 2025 were obtained from these databases: PubMed, Web of Science, and Google Scholar. We applied inclusion and exclusion criteria to the search; 28 studies were identified.

Results: The most common barriers in the application of AI tools for breast cancer prediction and improved screening rates included lack of external validity and limited generalizability, as AI was used in studies with either a small sample size or datasets with missing data. Many studies also encountered selection bias due to exclusion of certain populations based on characteristics such as race/ethnicity, family history, or past medical history. AI models need to include a broader spectrum and more complete predictive variables for risk assessment. Investigating long-term outcomes with improved follow-up periods is critical to assess the impacts of AI on clinical decisions beyond just the immediate outcomes.

Conclusion: Storage and management of different data and intelligent systems based on multiple factors for predicting breast cancer are effective in disease management.

Keywords: Artificial Intelligence, Breast Cancer, Predict

G-1584

Comparative Analysis of ChatGPT Responses and Exotic PET Owners Knowledge, Attitudes, and Practices Regarding Zoonotic Parasites

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Abstract:

Background and Aims: This study investigates the differences between a pet owner's and ChatGPT's responses to a Knowledge, Attitude, and Practice (KAP) questionnaire concerning parasitic diseases in exotic pets. The aim is to assess how closely AI-generated content aligns with real-life pet owner behavior and to explore the implications for applying AI in veterinary health contexts, particularly within the cultural setting of Iran.

Methods: A comparative KAP analysis was conducted using a structured questionnaire consisting of 8 knowledge-based, 7 attitude-based, and 8 practice-based questions. Demographic variables were aligned for consistency. The pet owner was an 18-year-old female with over two years of experience caring for a rabbit, while the AI model, represented as a 25-year-old female with a Bachelor's degree, had three years of experience in rabbit care.

Results: Agreement between responses varied across domains: knowledge (50%), attitudes (71%), and practices (75%). ChatGPT exhibited broader factual knowledge about zoonotic parasitic diseases, outperforming the human participant in scientific accuracy. However, in attitude-related responses, the pet owner's answers were more culturally grounded and reflective of real-life experiences, thus appearing more applicable in a local context. For attitude-related responses, pet owners' answers appeared more acceptable, as they aligned more closely with cultural and practical aspects of pet ownership. Their responses reflected real-life experiences and social norms, making them more relevant to actual pet care practices. ChatGPT provided idealized and highly standardized recommendations for pet care, emphasizing strict hygiene and health measures. However, in reality, pet owners did not always adhere to these high standards, demonstrating a gap between theoretical best practices and real-world implementation.

Conclusion: AI tools like ChatGPT can offer accurate, evidence-based guidance, but their real-world effectiveness depends on contextual alignment with human behavior and constraints. AI-generated outputs often overlook cultural norms, experiential knowledge, and logistical realities. Thus, interpretation through a human lens remains essential. For effective integration into veterinary practice, AI must support rather than replace clinical judgment. When calibrated with real-world feedback, AI can enhance veterinary decision-making, education, and communication, contributing meaningfully and ethically to the advancement of veterinary science.

Keywords: AI, Veterinary, Zoonosis, KAP Study, Parasitic

G-1589

Statistical Analysis of Blood and Renal Biomarkers in Chemotherapy Patients Through AI-Based Validation

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Abstract:

Background and Aims: In recent years, Artificial Intelligence (AI) and machine learning have increasingly influenced medical data analysis. While AI tools like ChatGPT Plus, Grok3, and DeepSeek have emerged, the use of traditional software such as SPSS, Prism, and Matlab has declined due to AI's ability to generate more extensive outputs. This study presents a validation framework for AI tools in analyzing statistical data from cancer patients undergoing treatment, and assessing their ability to process biochemical and hematological parameters.

Methods: This study examined 457 chemotherapy patients. Urea and creatinine levels were categorised as normal or abnormal, with creatinine also classified by gender. Platelet (Plt), hemoglobin (Hb), and white blood cell (WBC) counts were analyzed within their normal and abnormal ranges. Statistical analyses were first conducted using Prism (version 10.4.1) and then replicated using AI-based platforms, including ChatGPT Plus, Grok3, DeepSeek, Poe, Perplexity, Gemini, Monica, and Sciences. However, only ChatGPT Plus, Grok3, and DeepSeek provided relevant statistical outputs. The results from these three AI tools were compared with Prism to evaluate consistency and reliability.

Results: An independent t-test was performed, assuming a Gaussian distribution with equal standard deviation. Comparison of P-values across different tools showed varying agreement with Prism. Results for Prism versus DeepSeek: Plt = 0.1347, Hb = 0.4754, WBC = 0.0512. Prism versus Grok3: Plt = 0.7409, Hb = 0.6573, WBC = 0.4584, indicating Grok3's closer alignment with Prism. ChatGPT Plus demonstrated near-perfect agreement (P-Value 0.999), producing identical results to Prism.

Conclusion: The study indicates that ChatGPT Plus, with its high accuracy and results comparable to Prism, can be a suitable alternative. Grok3 also performed well, but DeepSeek showed weakness in WBC measurement and was less reliable. AI tools are emerging as effective alternatives to statistical software, but their accuracy in specific variables should be independently validated.

Keywords: Comparative analysis, AI, Patient Markers, Chemotherapy

G-1590

Impact of Artificial Intelligence-Driven Biomarker Analysis on Survival Outcomes in Lung Cancer Patients: A Systematic Review

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Abstract:

Background and Aims: Lung cancer is a leading cause of death worldwide. Timely, accurate analysis of biomarkers assists in treatment decisions and improves patient survival. However, since analyzing biomarkers using traditional methods is complex, novel tools have emerged to address this challenge. The aim of this study is to review published research on the impact of artificial intelligence through biomarker analysis to improve survival outcomes in patients with lung cancer.

Methods: This study was conducted as a systematic review based on PRISMA guidelines in 1403 through searches in databases like PubMed, Scopus, and Google Scholar using MeSH keywords "lung cancer," "artificial intelligence," "biomarkers," "prognosis," and equivalents. After screening, 105 articles from 2020 to 2025 were found; after reviewing titles, abstracts, and keywords, 34 articles meeting inclusion criteria were selected. The articles were studied and evaluated by researchers for detailed analysis.

Results: The research findings showed that artificial intelligence in lung cancer prognosis falls mainly into these three categories: 1) Accurate prognosis prediction, in which artificial intelligence models are designed to predict lung cancer prognosis based on imaging data and biomarkers with a higher degree of accuracy. This also includes effectively applying machine learning and deep learning to enhance medical decision support systems. 2) Identification of

effective biomarkers, where these applications incorporate biological and genetic data to improve the efficacy of prognosis prediction and marker identification in lung cancer. 3) Building comprehensive prognostic models, where these applications integrate image data with biomarkers and clinical data to build multifactorial models for predicting lung cancer prognosis together with serving the physician in clinical decisions.

Conclusion: Artificial intelligence has significantly aided in analyzing biomarkers to predict survival of lung cancer patients, surpassing traditional methods. The prominent role of molecular biomarkers and deep learning reveals ability to discover survival patterns and enable optimal treatment. However, improving survival requires clinical trials. Limited use of imaging biomarkers promises opportunities. Future research can focus on biomarker diversity and standardizing artificial intelligence.

Keywords: Artificial Intelligence, Biomarkers, Lung-cancer, Survival

G-1592

Predicting cellular uptake of metal-organic frameworks using machine learning tools

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Abstract:

Background and Aims: Metal-organic frameworks have been considered promising candidates for biomedical uses due to their unique characteristics. Predicting cellular uptake of metal-organic frameworks is necessary in order to enhance their design and efficacy. In this study, machine learning models were developed to predict the cellular uptake of metal-organic frameworks and identify significant features influencing uptake efficiency.

Methods: In this study, we collected a dataset of studies related to cellular uptakes of various metal-organic frameworks, consisting of 98 records. We used two Machine Learning models, Random Forest and Artificial Neural Networks, to predict the cellular uptake. Feature importance was approximated by correlation analysis, with the target variable being cellular uptake. The default hyperparameters were utilized for the Random Forest model, and the Artificial Neural Networks architecture had three hidden layers (10, 20, and 10 neurons, respectively). Model performance was assessed using Root Mean Squared Error and Mean Absolute Error. We used Leave-One-Out Cross Validation to assess the performance of the models.

Results: Correlation analysis showed that the significant features were targeting ligand (0.749), zeta potential (0.658), and coating (0.655), while incubation time (0.076) had an insignificant impact. The Root Mean Squared Error and Mean Absolute Error of the Random Forest model were 15.800. The Artificial Neural Networks outperformed Random Forest with a Root Mean Squared Error of 14.802 and a Mean Absolute Error of 14.802.

Conclusion: This study successfully developed Machine Learning models to predict cellular uptake of metal-organic frameworks, where significant importance has been assigned to targeting ligand, zeta potential, and coating as predictors. The Artificial Neural Networks model worked best, suggesting its potential in the optimization of metal-organic framework design for biomedical applications. These findings will be helpful in directing researchers toward the betterment of metal-organic framework-based drug delivery systems and cellular interactions. Future efforts will center on enlarging the dataset and investigating state-of-the-art Machine Learning structures in order to enhance prediction precision better.

Keywords: ArtificialIntelligence, Machine Learning, Artificial Neural Networks, Random Forest, Metal Organic Frameworks, Cellular Uptake

G-1594

The role of machine learning algorithms for the prediction of ventilator-associated pneumonia: a systematic review

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Abstract:

Background: Ventilator-associated pneumonia (VAP) is a type of pneumonia that develops 48 hours or more after endotracheal intubation. In recent years, with a better understanding of the pathophysiology of the disease, as well as technological advances such as artificial intelligence, we have had new strategies and approaches in the prediction of VAP. The purpose of this study is to review articles about Machine learning algorithms that were applied to predict VAP.

Methods: The study protocol adopted the PRISMA guidelines. A systematic review was performed using PubMed, Scopus and Web Of Science to identify articles using machine learning in English literature and published from August 2021 to December 2023. Based on the predefined selection criteria, 2 levels of screening were performed: title and abstract review, and full review of the articles. Data extraction was performed independently by all investigators and included algorithms, sample size, evaluation index and features.

Results: We retrieved 219 potential articles were from the 3 databases. After 2 levels of screening, only 10 articles that met our inclusion criteria were identified. The findings indicate that the most common machine learning model used was random forest algorithm (70%), which is a classification approach achieved through supervised learning. XGBoost and Logistic Regression algorithm each used in 40% of studies. The most used features for prediction are related to respiratory characteristics and laboratory results.

Conclusion: ICU public datasets need to be constructed and data standardization is necessary for clinical application of machine learning in VAP prediction.

Keywords: Artificial Intelligence, Machine Learning, Supervised Learning, Ventilator Associated Pneumonia, VAP

G-1595

Revolutionizing Leukemia Diagnosis with Artificial Intelligence

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Abstract:

Background and Aims: Leukemia is a hematological disease affecting bone marrow and lymphatic system. Because the mortality rate is too high, early diagnosis is pivotal. This study focuses on improving Leukemia detection using Artificial Intelligence (AI).

Method and Results: Machine learning (ML) is a significant tool for building detection models. A hybrid SVM-PSO model improves the accuracy of Leukemia detection by representing a two-dimensional image and completing the classification process. This model has high accuracy, superior performance, outperforming stand-alone algorithms, an enhanced confusion matrix, and a higher detection rate. FOADCNN-LDC technique using ShuffleNetv2 and CDAE models eradicates the image noise for Leukemia diagnosis and classification. The FOADCNN-LDC approach has a superior accuracy value of 99.62% over existing techniques. CapsNet is a neural network method that analyzes complex features and spatial relationships within images. However, a hybrid model that combines a genetic algorithm with ResNet-50V2, and SVM/JAYA demonstrated the superiority of this method in different terms. DDRNet is another model used to classify blood cell images. The strategic combination of three blocks, DRDB, GLFEB, and CSAB, in DDRNet addresses specific challenges in the classification process, resulting in improved discrimination of features important for accurate multi-class blood cell image identification. Their effective integration within the model can lead to the superior performance of DDRNet. The DDRNet model has a high testing accuracy of 91.98%, minimal computational complexity, and enhanced feature discrimination ability. Moreover, several novel deep ML-based approaches like DeepSHAP Autoencoder Filter for Gene Selection were utilized to select the most informative hub genes for time-to-therapy-need. The results indicate the effectiveness of techniques in detecting genes with independent predictive power, suggesting biomarkers to improve the diagnosis for further investigation. A range of ML-boosting algorithms can identify the individual risk of death, treatment, infection, and their combination. As genomic heterogeneity inherent in Leukemia is too vast for traditional prediction methods, ML-based methods facilitate the identification of novel Leukemia subclasses.

Conclusion: The objective of using AI is to decrease the death rate through early diagnosis of Leukemia, thus offering individuals a better chance of survival from this disease.

Keywords: Leukemia Diagnosis, Artificial Intelligence, Machine Learning

G-1597

Utilization of Machine Learning and Deep Learning for Personalizing Biomarkers and Improving Cancer Diagnosis: A Systematic Review

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Abstract:

Background and Aims: Cancer is one of the leading causes of mortality worldwide, and early diagnosis significantly improves treatment outcomes. With advancements in machine learning and deep learning, utilizing these technologies to personalize biomarkers and enhance cancer diagnosis is increasingly essential. This study aims to evaluate the application of these methods in the diagnosis and treatment of cancer.

Methods: The present research is a review study focusing on the application of machine learning and deep learning in biomarker discovery and cancer diagnosis. Research findings from 2010 to 2025 were gathered from the SID, Google Scholar, Web of Science, Scopus, and PubMed databases. Both English and Persian searches were conducted using the following **Keywords:** Biomarker, Deep Learning, Cancer, Diagnosis, Machine Learning and Personalization. A total of 2,634 articles were initially identified. After screening, 1,100 articles were excluded due to duplication, 310 articles were removed due to unavailability, and 964 articles were deemed irrelevant to the topic. Ultimately, 260 related articles were selected for a comprehensive review.

Results: The review identified three major trends in the application of machine learning and deep learning for cancer diagnosis and biomarker discovery. First, advanced machine learning models, particularly neural networks, demonstrated significant improvements in diagnostic accuracy across various cancer types. Second, traditional machine learning techniques, such as Support Vector Machines and Random Forests, proved effective in feature extraction and data analysis, offering interpretable results that support clinical decision-making. Third, the integration of deep learning approaches, including ensemble methods and transfer learning, enabled the identification of novel biomarkers and patterns that were not detectable through conventional methods. Notably, attention mechanisms enhanced model interpretability by focusing on critical features, leading to more accurate classifications. These findings highlight the potential of AI-driven approaches to revolutionize cancer diagnosis and treatment.

Conclusion: This study emphasizes the transformative potential of machine learning and deep learning in cancer diagnosis and treatment. Future research should focus on integrating diverse AI approaches, utilizing larger datasets, and enhancing model interpretability for clinical

adoption. These advancements promise to improve personalized treatment strategies, ultimately enhancing patient outcomes and quality of life.

Keywords: Biomarker, Cancer, Deep Learning, Machine Learning

G-1598

Challenges and Opportunities of Artificial Intelligence Policymaking in Health: Strategy Between Innovation and Ethics

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Abstract:

Background and Aims: Health policy-making is the process of developing and implementing policies that address public health issues and improve health outcomes, Artificial Intelligence (AI) has several potentials to revolutionize health policy-making. The aim of this study is to explore the Challenges and Opportunities of Artificial Intelligence Policymaking in Health.

Methods: This narrative systematic review was conducted by searching national databases, including SID and Magiran, as well as the international PubMed database and Google Scholar. The search was based on keywords such as "Artificial Intelligence," "Policymaking," and "Health" from 2020 to 2025. In total, 20 articles were included in the study.

Results: The results of this study showed several potential applications of artificial intelligence in various fields, including Policy analysis and development, Policy communication, Policy evaluation, Decision-making, Bias identification, transformation of artificial intelligence technology, Disease analyzing, evidence-based policies, reducing political constraints, supporting experts and mitigation for health policy-making. also, in addition to these, important legal issues included liability from data exchange, identification methods, and government oversight.

Conclusion: Healthcare policy-makers need to thoroughly evaluate these Opportunities and challenges when making decisions about incorporation of AI into their policy-making processes effective AI integration in healthcare requires balanced policies, alongside AI education for professionals and global collaboration.

Keywords: Artificial Intelligence, Policymaking, Health

G-1599

Review of Artificial Intelligence-Based Mattresses in the Prevention of Pressure Ulcers in Hospitalized Patients: A Review Article

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Abstract:

Background and Aims: Today, artificial intelligence has made significant advancements in disease prevention. One of its most important applications is preventing diseases, which subsequently avoids the economic and physical costs for the patient. Considering that pressure ulcers are a significant complication in hospitalized patients, we decided to investigate the role of artificial intelligence in pressure ulcer prevention, based on previous research.

Methods: This review study identified 7 articles relevant to the objective through searches in Google Scholar and PubMed databases, considering a time limitation (2019-2024). The articles were reviewed in three stages: title screening, abstract review, and full-text review, and irrelevant articles were excluded.

Results: Today, artificial intelligence-based mattresses, with their specific algorithms and data, can effectively prevent pressure ulcers. This data source includes information such as the moisture level of the mattress, the amount of pressure applied to the skin, the amount of surface area in contact with the skin, and the temperature between the skin surface and the mattress. The mechanism of these mattresses involves providing thermal images of the temperature of different points of the body, creating airflow between the empty spaces in the mattress, creating a wave-like motion in the mattress, and also reducing pressure on specific points by analyzing the amount of pressure exerted on different areas of the body. Advantages of this technology include reducing pressure on the skin, reducing moisture and perspiration on the mattress, increasing ventilation and air circulation, and accelerating disease recovery.

Conclusion: The use of artificial intelligence can provide a suitable platform for the prevention of pressure ulcers, including early identification of risk factors, provision of personalized care for each patient, and the development of advanced equipment. The innovative new equipment currently being developed will likely focus on developing more advanced artificial intelligence

algorithms and more innovative equipment. Given the novel innovations and ideas currently being developed in this field, they offer promise for a bright future.

Keywords: Artificial intelligence, Pressure ulcers, Prevention, Mattresses

G-1600

Deep Learning Models for Chest X-ray and CT Scan Analysis in COVID-19 Diagnosis: A Systematic Review

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Abstract:

Background and Aims: COVID-19, caused by the SARS-CoV-2 coronavirus, presented significant diagnostic challenges during the peak of the pandemic, requiring rapid and accurate detection to manage the outbreak effectively. Chest X-ray (CXR) and Computed Tomography (CT) scans were widely used for identifying COVID-19-related pulmonary abnormalities. However, the manual interpretation of these images by radiologists was time-consuming, subject to variability, and contributed to an increased workload, especially during high infection surges. The emergence of deep learning (DL) revolutionized medical imaging analysis, offering automated solutions to enhance diagnostic accuracy and efficiency. This study aims to provide a systematic review of various DL models applied for COVID-19 detection using CXR and CT images, assessing their performance, advantages, and potential implications for future infectious disease outbreaks.

Methods: PubMed, Science Direct, Web of Science, Scopus, and Embase databases were explored up to February 2025, using different combinations of the Keywords: "Covid-19 Diagnosis", "Machine Learning", "Artificial Intelligence", "Deep Learning", "Computed Tomography (CT)", "Chest X-Ray" and "Medical imaging". Finally, ten more recent and relevant records were included in the study.

Results: InstaCovNet-19, EDL_COVID, VGG19, MobilenetV2, Darknet53, EfficientNetB0, VGG16, InceptionV3, DenseNet121, ResNet50, ResNet152 are among the highly diverse categorization models used in different studies for Covid-19 detection. Deep learning models of InstaCovNet-19 with accuracies of about 99.80% for CT scan and 99.05% for Chest x-ray had the highest accuracy among different applied models for Covid-19 detection. The minimum reported accuracy of 86% for CT scan and 84% for Chest x-ray in the reviewed records had been obtained using the Faster VGG19 model.

Conclusion: DL models have demonstrated high accuracy in detecting COVID-19 from CT and CXR images, reducing diagnostic variability and workload. Automated DL techniques enhance clinical tools by minimizing false positives and false negatives, offering a scalable solution for future infectious disease detection.

Keywords: Covid-19, Deep Learning, X-ray imaging, Computed Tomography(CT)

G-1601

The Role of Artificial Intelligence in Enhancing the Quality of MRI images: A Systematic Review

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Abstract:

Background and Aims: Magnetic Resonance Imaging (MRI) is a widely used medical imaging technique known for its exceptional soft-tissue contrast. However, challenges like long scan times, noise, and artifacts can impact image quality and diagnostic accuracy. In recent years, artificial intelligence (AI), especially deep learning (DL), has been established as a promising solution to deal with these problems. This review explores how AI-driven advancements are enhancing MRI image quality, reducing noise, and accelerating scan times, ultimately improving patient care.

Methods: A structured search of PubMed, Science Direct, Web of Science, Scopus, and Embase databases was conducted to identify studies published between 2019 and 2025, using the following Keywords: "Artificial Intelligence", "Magnetic Resonance Imaging", "Image Reconstruction", "Image Quality", "MRI Artifacts". Studies focusing on AI applications in MRI, including noise reduction, artifact correction, and accelerated acquisition, were included. Data extraction followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, synthesizing findings from 21 studies involving over 1500 participants.

Results: AI methods such as deep learning models based on convolutional neural network (CNN), Unsupervised Feature Loss (UFLoss), Generative Adversarial Networks (GANs), Autoencoders (AE), and Low-Rank & Sparse Hankel Matrix Decomposition have significantly reduced scan times by accelerating image reconstruction and denoising processes. These methods also correct artifacts and enhance diagnostic accuracy and image quality by improving metrics such as signal-to-noise ratio (SNR) and structural similarity index measure (SSIM). AI has also shown that it can improve MRI protocols by making decisions automatically, like figuring out whether certain sequences are needed. This makes the workflow more efficient. Techniques like artifact suppression through advanced loss functions have further contributed to image quality enhancements.

Conclusion: AI is revolutionizing MRI by reducing scan times, minimizing noise, and eliminating artifacts while preserving diagnostic accuracy. These advancements enhance patient comfort, improve workflow efficiency, and make MRI more accessible. However, challenges remain,

including ensuring algorithm transparency, preventing bias, and integrating AI seamlessly into clinical practice. Successfully implementing AI in healthcare requires close collaboration between researchers, clinicians, and policymakers to ensure its safe, effective, and ethical use in medical imaging.

Keywords: Artificial Intelligence, Magnetic Resonance Imaging, Image Quality

G-1602

The Role of Artificial Intelligence Algorithms, with a Focus on Deep Learning, in Personalized Nutrition: A Systematic Review

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Abstract:

Background: Personalized nutrition aims to optimize dietary interventions based on individual variability in genes, metabolism, and lifestyle. In recent years, artificial intelligence (AI)—particularly deep learning—has emerged as a powerful tool for tailoring nutrition strategies by analyzing complex, multidimensional data. This systematic review explores the current landscape of AI and deep learning applications in personalized nutrition and evaluates their effectiveness compared to conventional approaches.

Methods: A systematic search was conducted across PubMed, Scopus, Web of Science, and IEEE Xplore for studies published between 2015 and 2024. Inclusion criteria targeted studies that employed AI algorithms, particularly deep learning models, to generate personalized dietary recommendations. Data extraction focused on model types, input data (e.g., genetic, metabolic, behavioral), and measured health outcomes. PRISMA guidelines were followed throughout the review process.

Results: Twenty-nine studies met the inclusion criteria, comprising 13 cross-sectional analyses, 10 randomized controlled trials (RCTs), and 6 longitudinal cohort studies. Deep learning architectures—such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and autoencoders—were frequently utilized to integrate heterogeneous datasets. Cross-sectional studies (n=13) demonstrated that deep learning-based models could identify complex nutrient-behavior-health interactions with higher accuracy than traditional models. RCTs (n=10) reported significant improvements in personalized diet outcomes, including a 10–20% enhancement in glycemic control, 18% reduction in LDL cholesterol, and increased adherence to dietary interventions. Cohort studies (n=6) highlighted sustained behavioral changes and metabolic benefits over periods ranging from 6 months to 2 years. Comparatively, classical AI models (e.g., decision trees, SVMs) showed lower predictive precision and adaptability. Despite their promise, deep learning models require large, high-quality datasets and face challenges in interpretability and clinical integration.

Conclusion: Deep learning is revolutionizing personalized nutrition by enabling data-driven, adaptive dietary recommendations. To ensure widespread adoption, future efforts should focus on improving model transparency, establishing ethical frameworks, and validating performance through large-scale, longitudinal studies. This review underscores the transformative potential of AI in advancing individualized dietary care.

Keywords: Deep Learning, Artificial Intelligence, Personalized Nutrition

G-1603

Alzheimer's disease classification and heatmap acquisition based on Deep CNN ResNeXt model using MRI images

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Abstract:

Background and Aims: As a neurodegenerative disease, the early diagnosis of Alzheimer's disease is one of the primary concerns. In this study, we aimed to determine whether ResNeXt (a convolutional neural network architecture) can be a reliable guide for diagnostic purposes.

Methods: To conduct the study, a total of 40,384 MRI images (33,984 for training and 6,400 for testing) were obtained from a dataset on Kaggle. All images were resized and padded to 224×224 pixels, and test images were converted to grayscale RGB as they were initially one-dimensional grayscale matrices.

We employed a 5-layer ResNeXt model constructed with several residual blocks. An adaptive average pooling layer was added, followed by a fully connected output layer. Each residual block consisted of three layers of convolutional blocks performing the following operations: halving the length and width of images when required and adding the analyzed image to the original or processed input within the same residual block. Batch normalization was applied after each convolutional block analysis.

A heatmap for each MRI image was generated to guide us through potential hotspots. This was achieved by summing the last layer of each model into a 7×7 pixel matrix, standardizing it, resizing it to 224×224 pixels, and blending neighboring pixels using Gaussian distribution.

The model was trained using a stochastic gradient descent optimizer with a learning rate of 0.1, momentum of 0.9, and weight decay of 0.0001. A step learning rate decay of 0.1 was applied every 15 epochs, with the model trained for a total of 50 epochs.

Results: A test accuracy of 90% and training accuracy of 100% were achieved, with a total training time of 2 hours.

Conclusion: Based on our findings, the application of AI appears to be more accurate and less time-consuming compared to clinical decision-making processes. The heatmap generated by our model is promising and may indicate potential findings; further evaluation is recommended.

We advocate for broader applications of AI not only for diagnostic purposes based on prior findings, but also for identifying new regions of interest.

Keywords: Alzheimer's disease, ResNeXt, AI, CNN, MRI

G-1604

Review of Innovations and Applications of Artificial Intelligence in Medical Image Processing and Clinical Processes

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Abstract:

Background and Aims: Artificial intelligence (AI) has emerged as a transformative tool in medical imaging and clinical processes, offering enhanced capabilities for diagnostics, treatment planning, and patient monitoring. With the increasing complexity of medical data, AI techniques enable more accurate and efficient processing of medical images and clinical information. This study aims to explore the innovations and applications of AI in medical image processing and clinical workflows, emphasizing how AI enhances healthcare delivery.

Methods: This review investigates the various AI techniques applied to medical imaging, such as deep learning models, convolutional neural networks (CNNs), and generative adversarial networks (GANs). Additionally, we examine AI's integration into clinical processes, including diagnosis, treatment planning, prognosis prediction, and patient monitoring. A comprehensive literature review was conducted, focusing on both traditional and cutting-edge AI methodologies and their impact on healthcare outcomes.

Results: The study identifies key AI-driven innovations in medical imaging, such as automatic detection of diseases (e.g., cancer, neurological disorders), image quality enhancement, and predictive models for disease progression. Furthermore, AI has demonstrated significant benefits in clinical processes, including personalized treatment plans, early detection of health conditions, and improved patient monitoring. The ability of AI to analyze vast datasets quickly and accurately has proven to reduce diagnostic errors and enhance patient care.

Conclusion: AI applications in medical imaging and clinical processes are revolutionizing healthcare by improving diagnostic accuracy, optimizing treatment approaches, and enhancing patient care. While many AI tools show promising results, challenges remain in terms of clinical integration, data privacy, and ensuring algorithm transparency. Future research should focus on refining these technologies, enhancing interoperability, and addressing ethical considerations to fully realize AI's potential in healthcare.

Keywords: Artificial Intelligence, Medical Imaging, Clinical Processes

G-1605

The Role of Artificial Intelligence in Improving Patient Safety and Reducing Medical Errors in Clinical Care and nursing care: A Narrative Review

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Abstract:

Background and Aims: Medical errors remain a significant challenge in healthcare, posing a serious threat to patient safety. These incidents can erode patient trust in healthcare providers and impact the reputation of healthcare institutions. A notable report estimates that between 45,000 to 98,000 deaths annually in the United States are attributed to medical errors, despite fewer than 10% of such incidents being reported. Recent studies have highlighted artificial intelligence (AI) and machine learning (ML) algorithms as promising tools to enhance patient safety and reduce errors. This article explores the applications and challenges of AI in patient safety during clinical interventions.

Methods: This systematic review was conducted following the PRISMA guidelines. PubMed and ScienceDirect were chosen as the primary databases for the literature search. Studies published in the past year (2024-2025) with full-text accessibility were reviewed. Of the 20 selected articles, 10 were excluded due to irrelevance to the inclusion criteria, and 2 were removed for duplication. Ultimately, 8 articles were included in the final analysis.

Results: The review demonstrated that AI and ML algorithms, by analyzing clinical data, predict risk factors during nursing interventions and even post-surgical complications such as bleeding, infection, and neurological damage. These technologies have significantly enhanced patient safety by improving accuracy, reducing medical errors, and promoting patient-centered care. Clinical decision support systems have been effective, with 74% accuracy in identifying medication prescription errors and 98% accuracy in predicting patient falls and post-fall injury severity. Three studies also evaluated AI integration with patient satisfaction and the efficiency of healthcare systems.

Conclusion: Artificial intelligence and machine learning algorithms, by integrating data from diverse sources such as demographic information, imaging studies, electronic health records, genetic data, and patient reports, offer the potential for personalized treatment and patient-centered care while reducing adverse events. Despite challenges such as ethical concerns, data privacy, and the need for interdisciplinary collaboration, AI holds promise for revolutionizing patient safety and improving healthcare quality. However, further research is needed to standardize and ensure the safe integration of these technologies into clinical practice.

Keywords: AI, Patient Safety, Medical Errors

G-1606

Automated Detection of Pulmonary Embolism from Computed Tomography Scans Using Deep learning

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Abstract:

Background and Aims: Since pulmonary embolism is a dangerous and life-threatening disease and the use of lung computed tomography presents challenges, employing modern methods and computer-aided diagnosis can accelerate the treatment and diagnostic process while reducing the workload of radiologists. The primary goal of this study is to utilize deep learning techniques to enhance computer-assisted detection of pulmonary embolism. To achieve this, we propose a classification-guided detection approach that effectively leverages probabilistic inference from the classifier to guide detection predictions, contributing a novel advancement in the field of automated embolism diagnosis.

Methods: Our classification system incorporates an attention-guided convolutional neural network (AG-CNN) that utilizes local texture information through an attention mechanism. This approach mimics the human expert method, which first considers the overall appearance of the image and then focuses on local regions before making a decision.

Results: The classifier demonstrates strong performance on our dataset, achieving an area under the receiver operating characteristic curve (AUROC) of 0.927, a sensitivity of 0.862, a specificity of 0.879, and an F1-score of 0.805 with the Inception v3 backbone architecture. Furthermore, AG-CNN outperforms the DenseNet-121 baseline model, achieving a notable 1.8% improvement in AUROC. While previous research has primarily focused on detecting embolisms in major arteries, our use of advanced object detection models and hybrid techniques significantly improves the accuracy of detecting small embolisms in peripheral arteries. Finally, our proposed classification-guided detection approach further refines diagnostic metrics and contributes to new advancements in the field, achieving mAP50, sensitivity, and F1-score values of 0.846, 0.901, and 0.779, respectively outperforming previous benchmarks. With a substantial 3.7% improvement in mAP50.

Conclusion: our research aims to enhance patient care for pulmonary embolism by integrating AI solutions into clinical

workflows, highlighting the potential for human-AI collaboration in medical diagnosis.

Keywords: Computed Tomography, Deep learning, Pulmonary Embolism

G-1607

Development of personalized medicine in Iran: via which science and technology policy?

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Abstract:

Background and Aims: The emergence of technological innovations and digital health is creating fundamental changes in the healthcare sector, towards personalized medicine. Therefore, it is essential to identify the appropriate science and technology policy for the transition to this disruptive technological paradigm and its implementation. The aim of this study is to identify and prioritizing the appropriate science and technology policies for the implementation of personalized medicine in Iran.

Methods: Using an expert panel and survey with an AHP questionnaire, appropriate policies for implementing personalized medicine in Iran were prioritized, and then the best policy for its implementation was determined. The statistical population included physicians, geneticists, pharmacists, nutritionists, proteomics, biochemists, molecular cell biology, and software and artificial intelligence specialists who were also experts in personalized medicine and had at least 3 years of experience (on average) in personalized medicine. The sample included 26 people.

Results: The results show that Iran is in the pre-development phase of personalized medicine, Currently and at this phase, the best policy is to regulation and infrastructure development, including the launch of genomic databases, artificial intelligence development, and big data analysis from electronic health records.

Also, the best mechanisms for developing personalized medicine are “employing foreign experts”, reforming processes by the government and considering businesses without government intervention, customizing research by monitoring a working group in the Ministry of Health, allocating budgets to practitioners’ research and training, developing a PM program based on the existing structure and experiences of different countries, financing and creating incentives for startups, allocating sufficient resources to research centers, and enhancing the connection between industry and universities.

Conclusion: The most important technological and innovative policies at different phases of personalized medicine development in Iran respectively include “infrastructures development and regulation”, “stimulating the innovation demand side”, and “stimulating the innovation supply side”, respectively.

Keywords: Personalized Medicine, Technological Innovation, Innovative Policies

G-1608

Presenting a Hybrid Deep Learning Model for Multi-Label Classification of Chest Diseases With the Aim of Improving the Detection of Rare Abnormalities

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Abstract:

Background and Aims: Deep learning models have the ability to simultaneously diagnose multiple diseases in a single chest radiography image, which can greatly impact the speed and accuracy of diagnosis in the medical field. This study aimed to design a deep learning model for multi-disease classification of chest radiography images, enabling the recognition of multiple diseases at once. This model addresses six clinically significant classes which are: no findings, emphysema, pneumothorax, hernia, mass, and fibrosis.

Methods: This research utilized the NIH ChestX-ray8 dataset, which contains 112,120 images across 14 different categories. A stratified distribution approach was adopted to avoid patient overlap and data leakage, resulting in the following divisions: training (77,000 images); validation (16,500 images); and test (16,500 images). Pre-processing data included adjusting contrast, color saturation, and normalizing brightness, while augmentation techniques such as rotation, reflection, scaling, translation, and shifting were applied. The proposed model was a mix of ConvNeXtBase for hierarchical feature extraction and VGG16 for local pattern recognition. Learning with pretrained ImageNet weights and optimization with Adam were applied. A weighted cross-entropy loss function was used to mitigate imbalance between classes.

Results: The hybrid ConvNeXtBase-VGG16 model outperformed thirteen other architectures including DenseNet, ResNet, MobileNet, NASNet, and EfficientNet particularly in detecting rare conditions such as Hernia and Fibrosis. The final performance results were: accuracy of 0.931, weighted F1-score of 0.9073, recall of 0.9310, precision of 0.8923, and an AUC-PR of 0.2486. Further analysis confirmed that the model is strong and reliable in detecting lung diseases based on sensitivity, specificity, and Youden index optimization.

Conclusion: This study highlights how combining multiple models, utilizing transfer learning and managing data imbalance can significantly improve the accuracy and reliability of automated diagnostic systems for chest diseases.

Keywords: Chest Diseases, ChestRadiography, DeepLearning, Multi-labelClassification, TransferLearning

G-1609

Artificial Intelligence-Driven Methodologies for the Detection and Management of Speech and Language Disorders in Individuals with Hearing Impairments

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Abstract:

Background and Aims: Speech and language disorders significantly affect communication and quality of life, particularly among the hearing-impaired population. Recent advancements in artificial intelligence (AI) have shown promise in enhancing the detection and management of these disorders. However, a comprehensive synthesis of AI-driven tools tailored to this population remains limited. This systematic review evaluates the current landscape of AI-based technologies for diagnosing and treating speech and language impairments in individuals with hearing loss, addressing a critical gap in assistive technology research.

Methods: Following PRISMA guidelines, we conducted a systematic search across PubMed, Scopus, and IEEE Xplore for articles published between 2014 and 2025. Inclusion criteria encompassed studies utilizing AI techniques (e.g., machine learning, deep learning) for speech disorder detection or management in hearing-impaired individuals. Data extraction focused on AI methodologies, target disorders, dataset characteristics, and performance metrics (e.g., accuracy, sensitivity). Quality assessment was performed using the QUADAS-2 tool to ensure methodological rigor.

Results: From 1,250 screened articles, 25 met inclusion criteria. Neural networks (e.g., CNN, DNN) and support vector machines dominated (36.92% combined), with dysarthria being the most studied disorder (54% of studies). Accuracy ranged from 85% to 98% across automated speech recognition (ASR) systems and therapy tools, with real-time applications showing particular promise for augmentative communication. Studies integrating wearable devices and IoT highlighted enhanced monitoring capabilities, though sample sizes varied widely (n=20–500). Gaps persisted in addressing diverse hearing-impaired subgroups and longitudinal outcomes.

Conclusion: AI-driven tools offer robust potential for improving speech and language disorder detection and management in the hearing-impaired, with high accuracy and adaptability. However, future research must prioritize larger, diverse cohorts and standardized protocols to ensure scalability and inclusivity. These findings underscore AI's transformative role in audiology and rehabilitation sciences.

Keywords: AI-driven tools, speech disorders, language

G-1610

Application of Large Language Models in Healthcare: A review

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Abstract:

Background and Aims: Healthcare remains a primary and significant concern for nations worldwide. The healthcare domain encompasses areas such as medical education, patient care, hospital operations, data management, doctors' office management, and research in medical care. Addressing the lack of specialized medical personnel, reducing treatment and consultation costs, facilitating the medical education process, and so on has led to the increasing integration of artificial intelligence (AI) in healthcare. Large language models (LLM), including ChatGPT, are generative artificial intelligence models that can produce relevant content based on their training data. Recent researches demonstrate the widespread use of this technology in the healthcare field. The aim of this study is to provide an overview of the capabilities and performance of large language models (LLM) in transforming medical education, medical consultations (especially in the field of mental health disorders, including depression), and the development of medical question-and-answer systems.

Methods: Generally, the approaches to customizing large language models (LLM) fall into four categories: Prompt Engineering, Retrieval Augmented Generation (RAG), Fine-tuning, and Agentic Augmentation. Each approach offers various information retrieval capabilities for the large language model (LLM), which are examined in this study.

Results: Reviewing numerous articles reveals that the application of large language models (LLM) and efforts to customize them can significantly impact healthcare delivery improvement. However, challenges such as data quality, adherence to ethical considerations, and implementation costs persist. These challenges can lead to negative consequences in the healthcare field.

Conclusion: A review of various studies indicates that integrating artificial intelligence (AI) with healthcare, combined with a focus on the customization of AI tools, promises a bright future in medical care. This would enable every patient to benefit from the best possible health, treatment, and consultation services regardless of income level, culture, or geographic location.

Keywords: Large Language Mode, Artificial Language, Healthcare

G-1611

Artificial Intelligence and Personalized Medicine: Scientometric Analysis of Global Research

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Abstract:

Background and Aims: This study performed a Scientometric analysis to investigate the research landscape of Artificial Intelligence (AI) and personalized medicine. The objective was to pinpoint key trends, significant publications, prominent authors, leading institutions and countries, and to identify emerging research themes and gaps within this fast-developing field.

Methods: A MESH search to select the keywords for two main concepts, “personalized medicine” and “artificial intelligence” was conducted. Then a comprehensive Scientometric analysis was performed using data extracted from PubMed on Feb 2025. Data were analyzed using R-Bibliometrix to map collaboration networks, citation patterns, and thematic clusters.

Results: A total of 1,620 documents were retrieved. Analysis of annual scientific production showed that from 2009 to 2021, the growth trend was upward, but decreased in 2022 and 2023, and peaked in 2024 (More than 350 records). The USA, China, Germany, Italy, and France have emerged as the leading contributors to the field. Among the most productive institutions, Harvard Medical School (n=174), The University of California (n=113), and The University of Pennsylvania (n=85) ranked at the top. The journal Scientific Reports (n=48) has published the highest number of articles in this field, followed by Briefings in Bioinformatics. Over the past five years, the most frequently specialized topics have been Machine learning, Algorithms, Neural networks, Deep learning, and Genomics. Also, In 2024, the most trending topic was Single-cell analysis methods.

Conclusion: This Scientometric analysis highlights the exponential growth and interdisciplinary nature of research in AI and personalized medicine. While the field is advancing rapidly, there is a need for greater international collaboration and a focus on ethical and regulatory challenges.

Keywords: Artificial Intelligence, Personalized Medicine, Scientometric, Trends

G-1612

Performance Evaluation of Artificial Intelligence-Based Clinical Decision Support Systems in Breast Cancer Diagnosis

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Abstract:

Background and Aims: Breast cancer is one of the most common cancers among women. Early diagnosis can significantly improve patient survival rates, reduce unnecessary and costly biopsies and interventions. With advancements in artificial intelligence technologies, Clinical Decision Support Systems based on machine learning, deep learning and natural language processing have been developed as assistive tools to enhance accuracy, sensitivity, specificity in diagnosis, reduce human errors, and provide appropriate recommendations during decision-making. This study aimed to evaluate the performance of Artificial Intelligence-Based Clinical Decision Support Systems in breast cancer diagnosis. The key performance metrics discussed in this study include accuracy, sensitivity, and specificity of these systems.

Methods: A systematic review was conducted using keywords such as clinical decision support systems, artificial intelligence, breast cancer diagnosis, and their synonyms in five databases: PubMed, IEEE, Web of Science, Scopus, and Embase. A total of 462 articles were retrieved and screened, resulting in a final selection of 31 studies.

Results: The findings of this study indicate that Artificial Intelligence-Based Clinical Decision Support Systems have demonstrated significant performance in breast cancer diagnosis. The performance of different models varies depending on data type, machine learning methods, and system architecture. Some systems have achieved accuracy ranging from 81% to 98%, sensitivity between 87% to 98%, and specificity between 74% to 97%. Deep learning and hybrid models, in particular, have shown high accuracy in predicting the malignancy of breast lesions. However, false-positive rates and the need for large datasets to train models remain key challenges in this technology.

Conclusion: Overall, Artificial Intelligence-Based Clinical Decision Support Systems hold great potential in improving the breast cancer diagnosis process and can serve as valuable assistive tools alongside physician decision-making. However, for wider adoption in clinical settings, further evaluations, improved model explainability, and enhanced generalizability across diverse datasets are required.

Keywords: Breast Cancer, Clinical Decision Support Systems, Artificial Intelligence, Data driven Methods, Deep learning

G-1616

Application of Artificial intelligence in the early detection of Alzheimer's disease using MRI images : Systematic review

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Abstract:

Background and Aims: According to the World Health Organization , Alzheimer's disease is the seventh leading cause of death among all diseases, and the number of affected individuals is increasing daily. Artificial intelligence has proven to be useful in many areas of medicine, including disease diagnosis. Neuroimaging techniques, such as magnetic resonance imaging , play a vital role in creating diagnostic indicators for Alzheimer's disease in its preclinical stage. However, with the rapid advancement of neuroimaging technology, analyzing and interpreting brain imaging data presents challenges. Consequently, there is significant interest in utilizing Artificial intelligence to assist in this analysis. The aim of this study is to review early diagnostic methods for Alzheimer's using artificial intelligence, which offers opportunities for timely interventions and improves patient care, potentially enhancing the quality of life for patients.

Methods: In this systematic review, studies related to "Alzheimer," Artificial intelligence , and Magnetic resonance imaging were examined both separately and in combination using these keywords. The search was conducted across several databases, including PubMed, Scopus, Web of Science, and the search engine Google Scholar, covering the period from 2015 to 2024. Ultimately, 156 articles were identified, of which 46 met the specified criteria and were included in the study.

Results: The review of studies indicates that with the continuous development of artificial intelligence, this technology can significantly contribute to the early diagnosis of Alzheimer's disease using images obtained from neuroimaging via magnetic resonance imaging. This advancement is crucial in interventional and diagnostic medicine, as early diagnosis is essential for effectively managing Alzheimer's disease. By identifying patients with Alzheimer's disease in its early stages, it may be possible to halt or slow its progression, thereby preserving patients' functioning and reducing the overall burden of the disease.

Keywords: Alzheimer Diseases , Artificial Intelligence

G-1617

Evaluating the Influence of Artificial Intelligence Technology on the Functionality of Healthcare Systems in Developed Countries: A Review of Literature

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Abstract:

Background and Aims: Most experts today agree that Artificial Intelligence (AI) can greatly enhance the healthcare system in any developed country. An AI algorithm can be used to detect diseases early on, optimize treatment processes, and even manage the entire health system. This review seeks to explore the results of AI in developed countries in regard to the use of AI technology in the productivity and quality of healthcare services.

Methods: A systematic search was done in the following databases: PubMed, WOS, Scopus, Google Scholar and Iranian databases SID, Magiran, and Irandoc. This search resulted in 40 articles out of which 7 studies were selected for analysis after meeting the criteria of being peer-reviewed articles published in English or Persian in the preceding five years. This review was conducted ethically without bias and complied with PRISMA guidelines.

Results: The application of AI has increased the accuracy of diagnosis AI, the efficiency of hospitals, and the effectiveness of personalized medicine. It has promoted further advances in the innovation of medical education and scientific publications. On the other hand, the negative effects of AI such as job loss, algorithm mistakes, and issues pertaining to the law pose significant challenges. Most important, any use of AI in the health sector needs to be mediated by fairness lenses to actively address the biases embedded in AI. Developing comprehensible and participatory policies on AI governance requires close collaboration among healthcare professionals and information technology specialists.

Conclusion: To conclude, artificial intelligence can improve the safety and effectiveness of health care delivery in comparison to traditional methods; however, ethical issues, available trained staff, and financial resources will determine successful integration. This research suggests utilizing AI technologies in health care in countries such as Iran, while taking into account the cultural and local issues.

Keywords: Artificial Intelligence, Healthcare System, Developed Countries

G-1618

DCLK1 in Gastrointestinal Cancer: A Key Driver of Tumor Progression and a Potential Therapeutic Target

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Abstract:

Background and Aims: Gastrointestinal (GI) cancers are a leading cause of cancer-related mortality globally, with colorectal cancer being the most prevalent. Modifiable risk factors play a significant role in their incidence. Early detection and therapeutic interventions are crucial to reducing mortality. A promising target for such interventions is doublecortin-like kinase 1 (DCLK1), a protein that has garnered attention for its potential role in GI cancer progression. This review aims to explore the structure, function, and role of DCLK1 in GI cancers, focusing on its therapeutic potential.

Methods: This review synthesizes recent literature on DCLK1, specifically focusing on its structure, isoforms, and involvement in various cancer pathways. The review examines DCLK1's function in normal and cancerous tissues, highlighting its role in GI cancers like colorectal, gastric, and pancreatic cancers. Key aspects explored include DCLK1's involvement in inflammation, tumor progression, metastasis, and cancer stem cell maintenance.

Results: DCLK1 is a microtubule-associated protein kinase that exists in two isoforms, DCLK1-S and DCLK1-L, which differ in their structural domains and expression patterns. DCLK1 regulates several key cancer-related pathways, including inflammation through NF- κ B signaling, tumor proliferation via EMT, and immune evasion by modulating immune checkpoint proteins like PD-L1. In colorectal cancer, DCLK1 is considered a marker for cancer stem cells and is associated with tumor growth and metastasis. Preclinical studies suggest that inhibition of DCLK1 can reduce tumor initiation and progression.

Conclusion: DCLK1 plays a pivotal role in the progression of GI cancers, particularly colorectal cancer, by regulating tumor growth, metastasis, and cancer stem cell maintenance. Its dual role in both inflammation and cancer-related signaling pathways positions it as a promising diagnostic marker and therapeutic target. However, further research is necessary to fully understand its mechanisms of action and interactions with other signaling pathways, paving the way for targeted therapeutic strategies to improve patient outcomes in GI cancers.

Keywords: Artificial Intelligence, Medicine, Cancer, DCLK1

G-1619

AI-Generated Pseudo-CT and Attenuation-Corrected PET Imaging for Enhanced Ovarian Cancer Management

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Abstract:

Background and Aims: Ovarian cancer, one of the leading causes of cancer-related death among women, requires accurate imaging methods such as PET/CT scans. However, PET imaging necessitates attenuation correction typically done by concurrent CT scans, significantly increasing radiation exposure. This study aims to evaluate the efficacy of Generative Adversarial Networks (GANs), specifically CycleGAN, in generating pseudo-CT images and attenuation-corrected PET scans directly from non-attenuated PET images.

Methods: PET/CT scans from 55 ovarian cancer patients were analyzed using three GAN architectures: Conditional GAN, Wasserstein GAN, and CycleGAN. CycleGAN emerged as the best-performing model. Model optimization included tuning hyperparameters and assessing performance through mean absolute error (MAE) and mean squared error (MSE).

Results: CycleGAN successfully generated accurate attenuation-corrected PET images, achieving an MAE and MSE of 2.15 ± 0.34 and 3.14 ± 0.56 respectively. Pseudo-CT generation resulted in an MAE and MSE of 4.17 ± 0.96 and 5.66 ± 1.01 , highlighting significant clinical potential.

Conclusion: CycleGAN demonstrates significant potential in medical imaging by reducing radiation exposure and imaging artifacts. This method can streamline imaging processes, improve patient safety, and holds promise for widespread clinical implementation. This novel application of AI, specifically CycleGAN, addresses significant clinical imaging challenges in ovarian cancer management. This approach significantly reduces radiation exposure in line with the ALARA (As Low As Reasonably Achievable) principle, minimizing patient risks associated with repeated PET/CT imaging. Additionally, generating pseudo-CT directly from PET data reduces imaging artifacts, enhancing diagnostic accuracy and simplifying procedures for improved patient comfort. It also allows for the potential use of previous patient CT scans, further reducing unnecessary imaging and optimizing resource use.

Keywords: Generative Adversarial Networks, PET/CT Imaging, CycleGAN

G-1620

A Deep Learning Approach to Finger Movement Decoding: CNN-LSTM Hybrid Model with Attention for ECoG Data for Brain-Computer Interfaces

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Abstract:

Background and Aims: Brain-Computer Interfaces (BCIs) interpret brain activity to control external devices, virtual speech recognition, and assist individuals with motor disorders. Electrocorticography (ECoG) possesses high resolution signals and thus is promising for motor decoding. The dataset used here is the fourth dataset of BCI Competition IV that provides brain signals of 3 individuals and their finger movement. Traditional machine learning techniques struggle to model both spatial and temporal features. In this study, a hybrid deep model combining Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks with an attention mechanism is proposed to decode finger position from ECoG signals.

Methods: Signals were preprocessed, windowed, and normalized. CNN was used for spatial feature extraction, followed by an LSTM network to capture temporal dependencies, with an attention mechanism enhancing feature selection. 15 models were developed, with one model per finger for each individual and 47 random channels and a time step of 42 milliseconds, using Mean Squared Error (MSE) loss and optimized using Adam. Performance was evaluated using Root Mean Square Error (RMSE) and correlation coefficients between predicted and actual finger positions. Important channels for the movement of each finger in each individual were extracted.

Results: The optimum performance was seen in the first subject, giving the highest mean correlation of 0.2628 among the three individuals. Subject two, however, gave the worst average correlation with a mean correlation of 0.1346, possibly indicating difficulty in fitting this specific subject's data to the model.

Fingers 1, 2, and 4 consistently had higher average correlation coefficients, especially for subjects 1 and 3. Finger 3 showed very poor performance (values close to zero for all subjects). Moreover, model comparison shows that the finger-ECoG channel correlation varies across subjects. Some fingers with better model performance are highly correlated with specific channels.

Conclusion: This paper illustrates the potential of hybrid deep neural networks for motor decoding using ECoG. The integration of CNNs, LSTMs, paving the way to high-accuracy, real-time BCIs. Real-time implementation and extension to other subjects can be pursued in future work to allow for greater generalizability.

Keywords: ECoG, CNN, LSTM, attention, Finger Movement

G-1623

Ethical and Technical Frontiers in AI-Driven Personalized Medicine: A Systematic Review of Innovation and Patient-Centric Genomics

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Abstract:

Background and Aims: Artificial intelligence (AI) transforms personalized medicine by integrating genomic and epigenetic data into therapies. However, the rapid adoption of these technologies presents ethical and technical challenges. Key concerns include algorithmic bias, unequal data access, and opaque decision-making, all of which threaten patient trust and equity in healthcare. This review examines the interplay between technological advancements and ethical considerations in AI-driven personalized medicine, identifying critical challenges and proposing frameworks for responsible innovation that prioritize patient welfare and equity.

Methods: A literature review was conducted across PubMed, Scopus, and Web of Science from January 2020 to March 2025 using key terms like “AI ethics,” “genomic bias,” and “precision medicine.” The criteria focused on peer-reviewed articles that explored ethical and technical aspects of AI in genetic applications. Out of 1,170 screened articles, 89 met the eligibility requirements. Data extraction followed PRISMA 2020 guidelines, and thematic analysis identified ethical issues and technical constraints. Study quality was assessed using the Mixed Methods Appraisal Tool (MMAT).

Results: Technical barriers primarily involved the limited generalizability of AI models, with 68% of studies reporting performance disparities exceeding 30% in non-European genomic cohorts. Ethical challenges were prevalent, including inadequately informed consent protocols for data reuse (71%), algorithmic bias that exacerbated health inequities (57%), and the commercial exploitation of patient data (43%). Innovations such as federated learning enhanced data privacy in 62% of clinical implementations, while explainable AI (XAI) tools fostered greater clinician trust in 78% of trials. Paradoxically, only 24% of studies engaged patient stakeholders in the AI design phases, underscoring a significant gap in patient-centricity.

Conclusion: The evolution of AI-driven personalized medicine requires an ethical, transformative approach. Governance frameworks must emphasize auditability, inclusivity, and patient empowerment. Developers should utilize diverse training datasets and involve varied populations to address biases. Policymakers need to establish transparency standards for AI in healthcare, while researchers should focus on long-term societal effects. Interdisciplinary collaboration is essential to ensure AI promotes equitable, patient-centered healthcare while safeguarding safety and trust.

Keywords: Artificial Intelligence, Precision Medicine, Ethics, Genomics

G-1624

Artificial Intelligence in Precision Medicine: A Systematic Review of Genetic, Epigenetic, and Phenotypic Data Integration Methodologies

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Abstract:

Background and Aims: The rapid expansion of multi-modal health data—including genetic, epigenetic, and phenotypic information—has created unprecedented opportunities for personalized medicine. However, integrating these diverse data types into clinically actionable insights poses significant challenges. This systematic review evaluates the role of artificial intelligence (AI) as a crucial enabler of precision medicine, concentrating on its potential to facilitate the thorough integration of multi-omics and clinical datasets. The review aims to outline essential methodologies, highlight practical applications, and identify gaps within the current research landscape.

Methods: A systematic literature search was conducted across PubMed, Scopus, and Web of Science from 2018 to 2023, utilizing keywords such as “Artificial Intelligence,” “Precision Medicine,” and “multiomics.” The inclusion criteria prioritized peer-reviewed studies focusing on AI and machine learning tools designed to harmonize genetic, epigenetic, and phenotypic data in therapeutic development. Following the screening of 1,245 articles, 78 studies met the eligibility criteria. Data extraction was performed under PRISMA guidelines, and quality assessment was conducted using the AMSTAR-2 framework.

Results: AI-driven methodologies, especially deep learning techniques (42% of studies) and ensemble models (28%), have demonstrated greater effectiveness in cross-modal data integration compared to traditional statistical methods. Key applications include the discovery of predictive biomarkers (e.g., such as risk stratification in oncology) and dynamic treatment personalization (e.g., autoimmune disease management). However, challenges persisted, including data heterogeneity, noted in 65% of studies, limited interpretability of AI models (53%), and ethical concerns surrounding data bias (38%). Case studies illustrated that AI can reduce diagnostic errors by 22% to 34% in oncology and improve drug efficacy predictions by 40% in neurology.

Conclusion: AI is revolutionizing precision medicine by integrating multi-omics data with clinical workflows. Nonetheless, considerable technical and translational challenges persist. To overcome these hurdles, future research should prioritize the development of explainable AI frameworks, standardized data harmonization protocols, and real-world validations across diverse

populations. Close collaboration between computational scientists and clinicians is essential to translate algorithmic advancements into equitable, patient-centered healthcare solutions.

Keywords: Artificial Intelligence, Precision Medicine, Multiomics, Biomarkers

G-1626

A Comprehensive Review of Artificial Intelligence and Data Mining Algorithms for Early Lung Cancer Detection: A Comparative Study of Convolutional Neural Networks ,Classification , and Optimization Techniques

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Abstract:

Background and Aims: Lung cancer remains one of the most lethal cancers globally, claiming the lives of nearly 1.8 million people each year. The disparity in survival rates 21% overall compared to 59% for detected early—highlights the importance of early diagnosis. However, only 16% of cases are identified early stage. Traditional screening methods such as low-dose computed tomography (LDCT) face challenges like high rates of false positives and inconsistencies in interpretation. This review addresses the evolution and current role of artificial intelligence (AI) in enhancing early detection of lung cancer.

Methods: A detailed analysis of AI technology applied in lung cancer diagnosis was conducted focusing on neural network architecture, classification techniques, and optimization algorithms. Various convolutional neural network (CNN) architectures such as 2D CNNs, 3D CNNs, U-Net architectures, and hybrids were evaluated and compared. Performance was assessed using large databases such as LIDC-IDRI, LUNA16, and NLST with a focus on accuracy, sensitivity, and specificity.

Results: State-of-the-art CNN models achieve 95-97% sensitivity rates with one false positive per scan. 3D CNNs perform better than 2D CNNs by utilizing the volumetric information, providing more comprehensive analysis. Transfer learning, data augmentation, and the attention mechanism improve models 3-7% more precisely. Incorporation of imaging with clinical data enhances models 6.2% more precisely in classification. Emerging approaches such as self-supervised learning and foundation models decrease the dependency of AI models on human annotation and make them more efficient.

Conclusion: AI-based methods are on the verge of revolutionizing early lung cancer detection. The advancements are staggering, but challenges remain in areas such as data availability, model interpretability, clinical adoption, and regulatory clearance. Data fusion across multiple modalities, longitudinal cohorts, personalized AI models, and human-AI team systems are some of the directions that need to be explored in the future. As these technologies continue to develop and gain clinical acceptance, these technologies can make a significant impact by enhancing early diagnosis and treatment, ultimately leading to better patient outcomes.

Keywords: Artificial Intelligence, lung Cancer, CNN, Early Detection

G-1627

Transformer-Based Multi-Modal Respiratory Disease Classification with Hybrid Feature Selection and Genetic Optimization

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Abstract:

Background and Aims: Chronic respiratory diseases, such as Chronic Obstructive Pulmonary Disease (COPD), are influenced by a complex interplay of pulmonary function, nutritional status, and biochemical markers. Traditional machine learning models often fail to capture the intricate relationships across these diverse data modalities.

Methods: In this study, we propose a novel Transformer-based model with multi-modal feature fusion to classify individuals into "Case" (respiratory disease) and "Control" (healthy) groups. Using a dataset of 90 subjects with 190 features, including pulmonary indices (e.g., FEV1, FVC), nutritional intake (e.g., protein, kilocalories), and biochemical markers (e.g., IL1B, MDA)—we leverage the Transformer's attention mechanism to model dependencies across modalities and time points (e.g., repeated measurements). The dataset was preprocessed to handle missing values and normalized for consistency.

Results: Our model achieved an accuracy of 92.86%, outperforming baseline models such as Random Forest and Logistic Regression. The attention mechanism highlighted key features, such as FEV1/FVC and CAT scores, while uncovering novel associations between nutritional deficits and disease severity.

Conclusion: This approach demonstrates the potential of Transformer-based architecture for small-scale, multi-modal medical datasets, offering improved interpretability and predictive power. These findings provide a scalable tool for early detection and personalized management of respiratory diseases, paving the way for advanced AI-driven diagnostics in respiratory health research.

Keywords: Transformer, Model Multi-Modal, Data Respiratory Disease

G-1628

Combining Artificial Intelligence and Immunotherapy: A Review of Revolution in Cancer Treatment with CAR-T Cells

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Abstract:

Background and Aims: In chimeric antigen receptor T-cell (CAR-T) therapy, a patient's T cells are genetically engineered to target and destroy cancer cells. This method has shown success in treating certain hematologic malignancies like lymphoma. Given the complexity and high costs associated with the manual production of CAR-T cells, automating this process is essential. Artificial intelligence (AI), through machine learning algorithms, simulates human cognitive abilities and decision-making processes. This study aims to explore the potential of AI in optimizing the CAR-T cell manufacturing process and to evaluate its capability to analyze patient data to deliver more personalized and effective treatments.

Methods: All case-control, cross-sectional, and cohort studies published prior to March 2025 were considered eligible. A comprehensive search was conducted on Pubmed, Scopus, Embase, and Google Scholar using the keywords artificial intelligence, CAR-T cell, personalized immunotherapy and cancer to gather information on combining artificial intelligent and immunotherapy with CAR-T cells.

Results: CAR-T cell therapy faces several challenges, including high costs, complex manufacturing processes, side effects such as cytokine release syndrome (CRS) and neurotoxicity, reduced efficacy, and inadequate infrastructure. In this context, machine learning analysis has been used to improve treatment safety, reduce off-target effects, and lower costs. Artificial intelligence reduces treatment resistance by predicting responses to the use of immune checkpoint inhibitors (ICI) in combination with CAR-T cells and identifying the best CAR-T therapy combinations with chemotherapy. Additionally, AI is used to optimize the selection of monoclonal antibodies in CAR design, improve gene-editing efficiency, and minimize off-target effects in the CRISPR/Cas9 system for inserting the CAR gene into T cells.

Conclusion: Artificial intelligence plays a crucial role in improving the production process, enhancing efficacy, and reducing the costs of CAR-T cell therapy by automating manufacturing, optimizing gene editing, and delivering personalized treatments. With further research and the resolution of challenges such as data privacy, decision validation, and data limitations, these advancements could extend the scope of CAR-T therapy to solid tumors and non-hematologic

diseases. This progress holds the promise of ushering in a new era of cancer treatment, significantly improving patient outcomes.

Keywords: Artificial Intelligence, CAR-T Cell, Immunotherapy, Cancer

G-1629

Application of artificial intelligence in early diagnosis of Parkinson disease

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Abstract:

Background and Aims: Parkinson's disease (PD) is a common neurological disorder that mainly affects motor neuron. The disease occurs due to the death of nerve cells, followed by a decrease in dopamine levels in the brain; as a result, it impairs the person's motor function. Unfortunately, there is no definitive cure for PD to date; therefore, patients with Parkinson's disease rely on early diagnosis, screening, and appropriate treatments to slow the progression of the disease. Artificial intelligence has recently impacted healthcare and clinical diagnoses, and has also played a promising role in the early diagnosis of PD. The purpose of this study is to respond to whether artificial intelligence tools could help in the early diagnosis of PD and thereby slow down the progression of the disease?

Methods: In the present review article, we studied articles published in databases to date using the key.

Results: Recent studies have shown that efforts have been made for early detection of PD using artificial intelligence, particularly using machine learning and deep learning algorithms. A type of this strategy is the PWP audio recording. This method emphasizes the correlation between sound and speech (as a non-invasive biomarker) and diagnosis. DL algorithms have also been developed in the fields of healthcare, computer vision, image recognition, etc. one of the advantages of DL methods is the way they display data. When PD symptoms are considered as input to the AI model, and due to lack of sample size, poor validation, clinical evaluation, and lack of big data configuration, it is important to ensure that the AI system is reliable, accurate, and has minimal AI bias.

Conclusion: In conclusion, developing and investigating ways to detect PD in a new window. Symptoms of the disease may not appear for years, and diagnosing the disease before symptoms become can significantly improve the patient's quality of life. In many of the studied cases, DL algorithms like Convolutional Neural Networks in medical image analysis outperform traditional and manual methods. in diagnosing disease; Because they can automatically retrieve and evaluate features.

Keywords: Parkinson's Disease, Artificial Intelligence, Machine Learning

G-1630

Design of a Maternal and Fetal Health Monitoring Belt Using Artificial Intelligence (MOM SENSE)

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Abstract:

Background and Aims: Advances in medical technology, such as wearable devices and fetal monitoring patches, are paving the way for non-invasive, continuous fetal health assessment. This study explores the potential of designing a wearable fetal monitoring system to track fetal well-being in a non-invasive and uninterrupted manner.

Methods: To conduct this study, we performed a systematic review of established scientific databases such as PubMed, IEEE Xplore, and ScienceDirect, covering publications from 2015 to 2024. The search targeted relevant keywords, including fetal monitoring, *non-invasive monitoring*, wearable pregnancy technologies, and biocompatible sensors. After screening an initial collection of 350 articles, we selected 50 based on predefined inclusion criteria for further analysis.

In the design phase, the prototype device will be developed using flexible, biocompatible sensors based on nanomaterial technology, along with advanced artificial intelligence algorithms (including Kalman filters and neural networks) to minimize errors caused by maternal and fetal movements. From a hardware perspective, the system will accurately record fetal vital signs, while the software component will employ signal processing and machine learning methods to reduce noise and interpret data.

The device's performance will be evaluated through clinical trials involving 50 pregnant women, with results compared to standard devices such as cardiotocography (CTG). This comprehensive approach enables the development of a precise and reliable wearable system for fetal monitoring.

Results: Based on the reviewed studies and simulations, the wearable fetal monitoring system is expected to achieve a diagnostic accuracy of 92-95% in recording fetal heart rate and a sensitivity of 90-93% in detecting fetal movements. Technically, the system will operate continuously for at least 12 hours and reduce motion-related noise by 40-50% compared to conventional methods. Among the potential advantages of this technology are a 30% reduction in continuous monitoring costs and the ability to be used at home by 80% of pregnant women.

Conclusion: This wearable technology has the potential to revolutionize prenatal care. By reducing the need for hospital visits, it can lower costs and decrease maternal stress. This research represents a significant step toward personalized medicine for pregnant women.

Keywords: Fetal Monitoring, Wearable Devices, Biocompatible Sensors

G-1634

Artificial Intelligence: A New Gateway to the World of Discovering New Drugs

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Abstract:

Background: The discovery of new drugs represents one of the most challenging stages in the pharmaceutical industry. Traditionally, this process could take several years; however, with the advent of artificial intelligence (AI), it has entered a new era where advanced algorithms and machine learning have brought unprecedented transformations in speed and accuracy. AI not only accelerates the identification of drug compounds but also guides the development of new drugs in a more targeted manner by predicting their effects and potential side effects.

Methods: This review study was conducted based on a search of articles from reliable databases, including PubMed and Google Scholar, using keywords such as artificial intelligence, pharmaceuticals, and novel technologies within the time frame of 2015–2025. The initial search yielded seven articles, five of which met the inclusion criteria. The PICO framework guided the search approach in this research.

Results: The ability of AI to identify new drug compounds enables the rapid analysis of complex biological and chemical data, leading to the discovery of compounds with high therapeutic potential. A notable example is the use of the Atomwise platform, which successfully identified new compounds for treating diseases such as Ebola. In this process, AI examined the molecular structures of potential drugs and identified compounds that might interact with the Ebola virus, achieving results much faster than traditional methods. This example demonstrates how modern technologies can accelerate the discovery of critical drugs.

Conclusion: Artificial intelligence has brought about a remarkable transformation in the discovery of new drugs, reducing time and costs while increasing accuracy and the likelihood of success. This progress enables patients to access effective and innovative treatments more quickly, paving the way for a brighter future in pharmaceutical science and contributing to saving human lives.

Keywords: Artificial Intelligence, Pharmaceuticals, Novel Technologies

G-1635

Application of Artificial Intelligence in physician and nursing clinical reasoning: A Systematic Review

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Abstract:

Background and Aims: Clinical reasoning is a fundamental process in medicine and nursing that helps analyze patient data, make differential diagnoses, and formulate treatment plans. However, challenges such as cognitive biases and the large volume of medical information can lead to diagnostic errors. Artificial intelligence (AI) has the ability to process large volumes of medical data and identify patterns beyond human capabilities using machine learning and deep learning algorithms. This systematic review examines the role of AI in clinical reasoning, focusing on its applications, benefits, limitations, and ethical considerations.

Methods: A comprehensive search of PubMed, Scopus, Web of Science, and Google scholars' databases was conducted between January 2015 and December 2024. Keywords used included "artificial intelligence", "clinical reasoning", "machine learning", "diagnostic accuracy", "cognitive bias" and "decision support systems". Studies were included that evaluated applications of AI in clinical reasoning, evaluated by PRISMA checklist and provided quantitative or qualitative results. Two independent reviewers screened articles, extracted data and assessed study quality.

Results: 1245 studies identified, 35 studies were eligible. 17 studies showed that AI improved accuracy, particularly in radiology, pathology and electronic health records. Twelve studies examined the role of AI in reducing cognitive biases, such as confirmation bias and anchoring, and found that AI increases diagnostic reliability. Eleven studies looked at integrating AI into clinical workflows and showed that AI-based decision support systems can process large amounts

of data to provide more accurate and faster diagnoses. However, eight studies addressed ethical and practical challenges, showing that AI can inherit biases from training data and that the “black box” problem in AI models reduces the transparency of decision-making. Seven studies examined the role of AI in medical education and highlighted the need to train physicians in adaptive expertise, critical thinking, and human-AI collaboration.

Conclusion: AI has significant potential to improve clinical reasoning by increasing accuracy, reducing cognitive errors, and optimizing clinical workflow. However, challenges remain, such as ethical considerations and the supervisory role of physicians. AI is used as a complementary tool rather than a substitute for human expertise in clinical decision-making.

Keywords: Artificial Intelligence, Clinical Reasoning, Nursing, Physician

G-1636

Salmina a new way to health

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Abstract:

Background and Aims: Digital technology covers a wide range of e-health domains, including e-learning, telemedicine, mobile Health, and health information systems, all of which benefit from developments in adjacent fields such as artificial intelligence, big data analytics, and genomics. Virtual delivery has become the preferred approach for these training sessions, as it enhances accessibility and maintains confidentiality; it has proved most effective in underserved regions, even with the progress in technology and multimedia training, which creatively conveys information to patients. Through the use of compelling graphics and various audiovisual media, this training allows individuals to engage easily with the content; it presents straightforward information visually, rather than complex data, thereby saving time. It also aids in overcoming language obstacles.

Methods: Considering all the aforementioned issues of the importance of mobile health and the growing trend of this industry, as well as the expansion of access to cyberspace and the increase in users' use of this space to resolve their medical questions, it is necessary to have a platform that provides the latest information in the field of health and hygiene, based on evidence and articles, to people who have not studied in the field of medical sciences, in order to combat incorrect and false data.

Results: Considering the data, education that is based on film and video have advantages that facilitate learning, and therefore the priority of the SALMINA startup is to present data in a simple and understandable language and based on audiovisual effects so that up-to-date, attractive and high-quality information is available to the people of the community.

Conclusion: After numerous and specialized studies, we realized that the community of medical science students has the ability to create a completely scientific, but simple and understandable space for all people of the community, and we are moving hand in hand, on the path of preventing the spread of rumors and incorrect information, in order to achieve our goals through culture-building and continuity.

Keywords: Technology, Digital, Media, Artificial Intelligence, Virtual

G-1638

AI-Driven Prediction of Symptom Exacerbations and Personalized Lifestyle Interventions in Irritable Bowel Syndrome

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Abstract:

Background and Aims: Irritable Bowel Syndrome (IBS) is a prevalent functional gastrointestinal disorder characterized by chronic abdominal pain, bloating, and altered bowel habits, significantly impacting quality of life. Current management relies on symptom-based, trial-and-error approaches, often failing to address individualized triggers or preempt symptom worsening. This study investigates the application of artificial intelligence (AI) to predict IBS symptom exacerbations and tailor lifestyle and dietary interventions, aiming to transition care toward proactive, patient-centric strategies.

Methods: A multicenter retrospective analysis included 450 IBS patients from gastroenterology clinics, integrating electronic health records, dietary logs, psychological stress assessments (via validated questionnaires), and gut microbiome data. Variables encompassed stool microbiome diversity, adherence to low-FODMAP diets, sleep patterns, and stress levels. Machine learning models—gradient boosting and neural networks—were trained on 75% of the dataset, with 25% reserved for validation. Feature selection highlighted predictors such as Bacteroides-to-Firmicutes ratios, dietary adherence, and stress severity. A clinical decision support tool (CDST) was developed to stratify patients into risk categories (high, moderate, low) and recommend personalized interventions, including probiotic regimens, dietary adjustments, and mindfulness practices. Model performance was evaluated using AUC-ROC, sensitivity, and specificity.

Results: The AI model achieved 82% accuracy in predicting symptom exacerbations, with gut microbiome imbalances, stress spikes, and high-FODMAP food intake identified as critical predictors. The CDST improved patient adherence to personalized interventions by 25% compared to standard care, reducing symptom severity scores by 35% in high-risk patients. Clinicians highlighted the tool's utility in identifying non-obvious triggers and simplifying complex lifestyle modifications.

Conclusion: This study underscores AI's potential to transform IBS management by linking microbiome data, behavioral factors, and dietary patterns to symptom dynamics. The CDST bridges gaps in personalized care, offering actionable insights that empower patients and

clinicians. Challenges include addressing the subjectivity of symptom reporting and ensuring cultural adaptability of dietary recommendations. Future work should prioritize real-time data integration via wearable devices (e.g., stress trackers) and validate models in diverse populations. By shifting from generic to precision lifestyle interventions, AI-driven strategies could reduce healthcare utilization, enhance patient autonomy, and mitigate the socioeconomic burden of IBS.

Keywords: Artificial Intelligence, Irritable Bowel Syndrome (IBS)

G-1639

A Personalized Approach of Predicting the Efficacy of Vedolizumab for Inflammatory Bowel Disease

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Abstract:

Background: Inflammatory bowel disease (IBD) (1), encompassing Crohn's disease and ulcerative colitis, presents significant challenges in treatment efficacy and management (2, 3). Vedolizumab is widely used to induce and maintain remission; however, its effectiveness varies greatly among individuals (4, 5). This study aims to develop an artificial intelligence (AI) model to predict the efficacy of vedolizumab in patients with IBD, enabling a personalized treatment approach.

Methods: A cohort of 400 patients diagnosed with IBD (Crohn's disease or ulcerative colitis) was recruited from specialized gastroenterology clinics. This research employed a retrospective observational design, incorporating electronic health records (EHR), treatment histories, laboratory results, and patient-reported outcomes. Data collection included baseline clinical characteristics (age, gender, disease phenotype, duration), inflammatory markers (C-reactive protein, fecal calprotectin), and prior biologic exposure. Machine learning methods and neural networks were utilized to develop predictive models for vedolizumab response. The dataset was divided into training and testing sets to evaluate model accuracy. Feature selection identified significant predictors of treatment response, such as baseline mucosal addressin cell adhesion molecule-1 (MAdCAM-1) expression, and disease activity indices. Model performance was assessed using accuracy, sensitivity, specificity, and area under the receiver operating characteristic (ROC) curve. A web-based decision support tool was developed to translate predictions into actionable insights for clinicians.

Results: The AI model demonstrated 86% accuracy in predicting vedolizumab response within the testing cohort. Key predictors of efficacy included elevated fecal calprotectin (250 µg/g), low MAdCAM-1 expression (15 ng/mL), and absence of prior anti-TNF therapy. The web-based tool improved clinician confidence in treatment selection, with 81.5% of providers reporting enhanced decision-making efficiency. Patients flagged as high-probability responders achieved clinical remission at 12 weeks in 78% of cases, compared to 42% in the standard-care group.

Conclusion: This study highlights AI's potential to refine vedolizumab treatment decisions for IBD by integrating mucosal, microbial, and clinical data. Implementing this approach could advance personalized medicine, reduce ineffective therapies, and optimize healthcare resource allocation. Future work should validate these models prospectively and expand their utility to other biologics for IBD's heterogeneous patient population.

Keywords: Vedolizumab, Machine Learning, Precision Medicine

G-1640

Advances in artificial intelligence, robotics, augmented and virtual reality in neurosurgery

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Abstract:

Background and Aims: Neurosurgery is a complex field requiring extensive training and precise data acquisition throughout pre-, intra-, and postoperative phases. Over the past decade, artificial intelligence (AI) has become increasingly significant in neurosurgery, enhancing diagnostic and prognostic outcomes. This review aims to explore the roles of AI, robotics, augmented reality (AR), and virtual reality (VR) in neurosurgery, focusing on their potential to improve patient care and reduce healthcare costs.

Methods: This narrative review integrates findings from various articles to elucidate the applications of AI, robotics, AR, and VR in neurosurgery. The review covers preoperative planning, intraoperative decision-making, and postoperative care, highlighting how these technologies enhance surgical precision, reduce errors, and facilitate data management.

Results: AI algorithms have been shown to improve diagnostic accuracy by analyzing large datasets, including imaging and clinical records. AI-assisted tools aid neurosurgeons in making informed decisions during surgical interventions, enhancing patient outcomes. Additionally, AI helps in predicting patient recovery trajectories and potential complications, allowing for more personalized postoperative care. Robotic systems provide enhanced precision and dexterity, reducing the risk of complications during complex neurosurgical procedures. Robotics also facilitate minimally invasive surgeries, leading to faster recovery times and reduced hospital stays. AR and VR technologies are instrumental in preoperative planning, allowing neurosurgeons to visualize complex anatomical structures and simulate surgical procedures. Intraoperatively, AR enhances visualization by overlaying critical anatomical information onto the surgical site, improving surgical precision. VR is used in patient education and rehabilitation, enhancing patient engagement and recovery. The use of these technologies can lead to cost savings by reducing the length of hospital stays and minimizing the need for repeat surgeries. Furthermore, they enable the delivery of high-quality healthcare to a broader population by enhancing surgical efficiency and accessibility.

Conclusion: The incorporation of AI, robotics, AR, and VR in neurosurgery represents a significant advancement in the field, offering improved patient outcomes and more efficient healthcare

delivery. As these technologies continue to evolve, they are poised to play an increasingly vital role in enhancing neurosurgical practices and patient care.

Keywords: Artificial Intelligence, Augmented Reality, Neurosurgery, Robotics

G-1641

Virtual Reality for Training in Brain Tumor Surgery

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Abstract:

Background and Aims: Brain tumor surgery is a highly complex and demanding procedure that necessitates extensive training and expertise. Virtual reality (VR) technology has emerged as a transformative tool in surgical education, offering immersive and interactive simulations of real-life surgical scenarios. This narrative review aims to examine the current applications and future potential of VR as a training modality in brain tumor surgery, focusing on its role in enhancing surgical skills and improving patient safety.

Methods: This review integrates findings from recent studies and reports on the use of VR-based simulators in brain tumor surgical training. It explores how VR environments enable hands-on practice of surgical techniques such as tumor resection, provide real-time performance feedback, and support individualized learning through repeatable and customizable simulations. The review also addresses the impact of VR on spatial awareness, hand-eye coordination, and decision-making skills essential for successful neurosurgical outcomes.

Results: VR training platforms create a safe and controlled environment where surgeons-in-training can develop proficiency without risk to patients. Trainees benefit from the ability to repeat procedures, explore complex three-dimensional anatomical structures, and receive instant feedback, which facilitates targeted skill improvement. VR enhances critical competencies including spatial orientation and surgical precision. However, challenges such as the high cost of VR equipment, the need for highly accurate and realistic simulations, and integration into established surgical curricula remain barriers to widespread adoption. Despite these obstacles, technological advancements and increasing accessibility of VR devices suggest a promising future for VR-based surgical education.

Conclusion: VR technology represents an innovative and effective approach to brain tumor surgery training by providing immersive, realistic, and customizable learning experiences. Incorporating VR into neurosurgical training programs has the potential to significantly improve surgical competence and patient safety. Continued development and integration of VR training tools will be pivotal in preparing the next generation of brain tumor surgeons for the complexities of their field.

Keywords: Virtual Reality, Neurosurgery, Training, Brain Tumor

G-1642

The Role of Radiomics in Multiple Sclerosis Imaging

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Abstract:

Background and Aims: Multiple sclerosis (MS) is a common non-traumatic disabling disease frequently diagnosed through magnetic resonance imaging (MRI). Radiomics, an emerging field that extracts quantitative features from medical images, has shown promise in improving the diagnostic accuracy of active MS plaques and predicting disease progression. This review aims to evaluate the role of radiomics in MS imaging, focusing on its potential to enhance lesion detection, classification, and disease monitoring.

Methods: This narrative review synthesizes findings from various studies investigating radiomic applications in MS imaging. It covers the use of radiomic features extracted from T2-weighted Fluid Attenuated Inversion Recovery (FLAIR) images, the application of feature selection algorithms such as LASSO, Boruta, and Relief, and the employment of machine learning classifiers including K-Nearest Neighbors, Random Forest, Naive Bayes, Decision Trees, and Extreme Gradient Boosting. The review also explores radiomic analyses incorporating advanced MRI techniques like diffusion tensor imaging and resting-state functional MRI to assess microstructural and functional brain changes in MS.

Results: Radiomic features derived from T2-FLAIR images have been effective in predicting active MS plaques, with the Naive Bayes classifier achieving an area under the curve (AUC) of 0.85, demonstrating non-invasive prediction capability. Feature selection combined with classifiers such as Boruta and Decision Trees yielded an average accuracy of 0.86 and an AUC of 0.92, highlighting the critical role of algorithm choice in diagnostic performance. In pediatric MS patients, radiomic models based on T2-FLAIR images identified specific features, particularly "contrast," as significant for lesion classification, suggesting enhanced lesion characterization in younger populations. Incorporating advanced MRI modalities into radiomic workflows provided further insights into MS-related microstructural and functional brain alterations. Despite these advances, challenges remain, including the need for standardization of radiomic methodologies, validation in larger cohorts, and integration into clinical decision-making to fully realize radiomics' clinical utility in MS.

Conclusion: Radiomics represents a promising advancement in MS imaging by improving the detection and characterization of active lesions and offering potential for disease progression

prediction. Continued refinement, validation, and clinical integration of radiomic approaches are essential to harness their full potential in enhancing MS diagnosis and management

Keywords: Multiple sclerosis, Radiomics, Imaging

G-1643

Role of AI and Machine Learning in Predicting Risk of Reinjury After ACL Reconstruction

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Abstract:

Background and Aims: The application of Artificial Intelligence (AI) and Machine Learning (ML) in sports medicine—particularly before, during, and after surgery—has gained significant momentum in the management of Anterior Cruciate Ligament (ACL) injuries. Among these, AI plays a pivotal role in predicting and managing ACL injuries, which are common among athletes and pose substantial challenges in recovery, especially due to the high risk of reinjury within the first year post-surgery.

Methods: AI and ML techniques are utilized to analyze large datasets comprising biomechanical assessments, physical performance metrics, and medical imaging. Supervised learning algorithms such as Support Vector Machines (SVM), Random Forests, and Convolutional Neural Networks (CNN) have been employed to predict reinjury risk with high accuracy. These models are trained using data from motion analysis, muscle strength tests, and MRI scans to enhance diagnostic precision and predictive capabilities.

Results: In the post-surgical phase, AI contributes significantly to optimizing rehabilitation protocols. By analyzing data from wearable sensors and motion capture systems, AI models assess knee stability, muscle strength, and movement asymmetry to provide personalized training programs that reduce the risk of reinjury.

Conclusion: Despite challenges such as data quality, model interpretability, and the need for extensive validation, AI and ML have shown remarkable impact in improving patient outcomes, diagnostic accuracy, and rehabilitation processes for ACL injuries. Current studies mainly rely on controlled datasets, which may not reflect real-world conditions, and often overlook psychological factors such as athletes' mental readiness. Nonetheless, with further research and validation, these technologies are poised to become an integral part of sports medicine, shaping a new future in ACL injury prevention and recovery.

Keywords: Sports Medicine, Machine Learning, ACL Injury

G-1644

Diagnosis of Cardiovascular Diseases by Processing Ocular Fundus Images with Optical Coherence Tomography (OCT)

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Abstract:

Background and Aims: Cardiovascular Diseases represent a significant global health concern, accounting for a considerable proportion of illnesses and deaths worldwide. The recent advancements in retinal imaging technology have opened up promising avenues for utilizing retinal fundus images as a non-invasive approach to assess cardiovascular health. In particular, the application of artificial intelligence and deep learning techniques to these images has attracted significant attention as a potentially powerful tool for enhancing our ability to prevent CVD-related mortality. In light of the growing significance of this emerging field, we conducted a systematic review with a focus on diagnosing CVD through the analysis of eye fundus images using optical coherence tomography.

Methods: To ensure a thorough and structured approach, we adhered to the PRISMA guidelines throughout the review process. A comprehensive search was conducted across multiple databases, including PubMed, Cochrane, Web of Science, and Scopus. The following search terms were used: "artificial intelligence", "deep learning", "image processing", "fundus images", "color fundus photography", and "cardiovascular diseases". By employing logical operators (AND, OR), we refined our search results. We limited our review to studies published between December 2016 and November 2024, resulting in an initial pool of 3,727 studies. After applying quality appraisal using the CASP checklists 2018, we ultimately included 19 articles in our final review.

Results: The results demonstrate that machine learning algorithms, particularly deep learning models, exhibit considerable potential for automating the interpretation of retinal images. These models demonstrated accuracy rates exceeding 75% in differentiating between patients with CVD and healthy individuals. For example, one study demonstrated that a multi-modal approach combining retinal imaging with other diagnostic methods enhanced predictive capabilities, achieving over 78% accuracy in identifying CVD across diverse populations. Nevertheless, despite these advances, challenges remain in the implementation of AI-driven retinal imaging for the detection of CVD in clinical settings. It is imperative to address issues such as data diversity, algorithm interpretability, and the necessity for large-scale validation studies to guarantee the effective operation of these tools across diverse demographic groups.

Conclusion: The future of detecting cardiovascular diseases through

Keywords: Fundus Images, Cardiovascular Diseases, Deep Learning

G-1645

Using Artificial Intelligence in Teaching ECG Interpretation to Nursing Students: A Review Study

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1

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Abstract:

Background and Aims: Having sufficient mastery in interpreting electrocardiograms is an important clinical skill for nurses, therefore it requires appropriate and complete training for students. So far, traditional learning methods such as lectures or bedside teaching and their stressful conditions have not been able to fully meet this educational need. With the expansion of the use of artificial intelligence and its high potential in education, we aim to evaluate the effectiveness of using large language models in increasing the accuracy of diagnosis and student participation in education in this article.

Methods: In order to conduct this review, a search was conducted in PubMed, SID, Scopus and Google Scholar information resources between 2010 and 2025. In this review, studies were screened after an initial evaluation and similar studies were isolated and reviewed. Search terms that were appropriate for each database were used.

Results: In research studies conducted so far, students who have been trained with artificial intelligence-based simulator models have significantly higher diagnostic accuracy in the clinic compared to those who used traditional methods. There is also a greater improvement in knowledge retention in this group. Studies show that the use of artificial intelligence in teaching electrocardiogram interpretation significantly increases student engagement in learning, leading to increased readiness and greater confidence in clinical diagnoses.

Conclusion: The integration of artificial intelligence in nursing education, especially electrocardiogram interpretation training, has significant advantages, including personalized, standardized and classified training with the lowest error rate and the greatest variety in presenting simulated clinical cases. However, it should be noted that the use of artificial intelligence in this regard faces challenges such as limited access and lack of preparation of instructors, which requires more attention than ever. However, the introduction of artificial

intelligence-based education will create a lasting transformation in student learning and productivity. Therefore, the future strategy of nursing education, especially in specialized topics such as electrocardiogram interpretation, must be accompanied by the use of artificial intelligence.

Keywords: Artificial Intelligence, Nursing, Electrocardiogram, Large Language

G-1647

Evaluating the Impact of Image Preprocessing Filters on Convolutional Neural Network Performance for Breast Cancer Detection in Mammograms

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Abstract:

Background and Aims: In today's world, breast cancer remains the leading cause of mortality among women, making early detection crucial for improving treatment outcomes and survival rates. Convolutional Neural Networks (CNNs) have significantly advanced the detection of malignant tumors in mammograms by automating the classification process. However, the quality of mammographic images often poses a challenge, as noise, low contrast, and other artifacts reduce the effectiveness of CNN-based models. To address these limitations, preprocessing filters can be applied to enhance image quality and improve detection performance. In this study, we aimed to determine which preprocessing filter—Gaussian Blur, Sobel Edge Detection, Contrast Limited Adaptive Histogram Equalization (CLAHE), or Gabor Filter—yields the highest performance in improving CNN accuracy for breast cancer detection.

Methods: We systematically evaluated the impact of four preprocessing techniques on mammogram datasets. Gaussian Blur was used for noise reduction, Sobel Edge Detection for edge enhancement, CLAHE for contrast improvement, and Gabor Filter for texture analysis. A CNN model was trained and tested on each filtered dataset, and the results were compared against a baseline CNN trained on unprocessed images to quantify improvements in classification accuracy and robustness.

Results: Our findings highlight the preprocessing filter that provides the most substantial improvement in CNN performance for detecting breast cancer in mammograms, showcasing its potential for clinical applications.

Conclusion: Identifying the optimal preprocessing technique enhances CNN-based breast cancer detection, leading to greater diagnostic precision, improved patient outcomes, and advancements in medical imaging technology.

Keywords: Image Preprocessing, Diagnostic Accuracy, Medical Imaging

G-1651

Challenges of the Internet of Things in Iranian Hospitals

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Abstract:

Background and Aims: With the development of communication networks, especially the World Wide Web, there has been a move towards creating a common communication infrastructure for users, machines, goods, and, in general, all physical objects in the world to connect. The Internet of Things has created a platform in which everything from objects, machines, and people can be connected to each other and The Internet of Things enables objects to be remotely controlled across existing network infrastructures. It has also created opportunities for direct integration of the physical world into computer-based systems, enhancing productivity, accuracy, and economic benefits while minimizing human intervention.

Methods: The present study reviews articles in this field.

Results: One of the most important applications of the Internet of Things in medicine is monitoring vital signs, as well as specific parameters of people with chronic and common diseases, such as heart disease, diabetes, and respiratory diseases.

The desire of humans to live their daily lives without worry and the assurance of having supervision, as well as the reluctance to spend long days in the hospital, are among the reasons for using the Internet of Things. Therefore, the Internet of Things can significantly enhance the quality of life for the elderly.

Conclusion: However, there are some limitations in the use of IoT, including its high cost, consequences of disconnection or failure, security challenges (e.g., hacking), dissemination of incorrect medical information, storage of large amounts of energy demand data, disposal of electronic waste, and financial challenges. But just as the Internet has made things much easier, cheaper, and reduced traffic, the role that the Internet of Things can play in lowering costs, energy consumption, traffic, etc., is immense. We can leverage this technology with the infrastructure we have in our country. Especially in the field of medicine and health, IoT is a fundamental necessity for rapid diagnosis of diseases, reducing the burden of responsibility on the patient, and minimizing traffic for patients.

Keywords: Artificial Intelligence, Internet of Things, Treatment

G-1654

The implementation of the Digital Project for Medicinal Plant Village with Artificial Intelligence.

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Abstract:

Background and Aims: The "Digital Village of Medicinal Plants" is an innovative initiative aimed at leveraging digital technologies to enhance the production, management, marketing, and promotion of medicinal plants as a sustainable and profitable industry. This project seeks to promote organic and sustainable farming practices, establish a digital platform for education and information exchange, enable smart farm management, and create a transparent and efficient digital supply chain.

Methods: The project integrates cutting-edge technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML), blockchain, and data analytics to improve the cultivation, harvesting, processing, packaging, and distribution of medicinal plants. IoT sensors monitor farm conditions such as temperature, humidity, soil status, and irrigation. AI algorithms analyze agricultural data to optimize growth conditions and forecast harvest times. Blockchain technology is used to ensure traceability and transparency across the supply chain.

Results: The implementation of digital technologies leads to increased efficiency, reduced costs, and minimized environmental impact. The project contributes to the production of high-quality medicinal plants, supports sustainable agricultural practices, and fosters the development of new markets. Moreover, it generates employment opportunities in agriculture and IT, and increases public awareness about the benefits of medicinal plants through online education and outreach.

Conclusion: The Digital Village of Medicinal Plants represents a forward-thinking model for the integration of smart agriculture and digital innovation in the medicinal plant industry. It demonstrates the potential to transform traditional agricultural practices into a tech-driven ecosystem that supports environmental sustainability, economic development, and public health.

Keywords: Digital agriculture, medicinal plants, IoT, AI

G-1656

Diagnosis of Diabetes with Machine Learning: A Self-explanatory and Easily Accessible Approach

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Abstract:

Background and Aims: Diagnosis of diabetes is a critical area of medical research, as uncontrolled diabetes can lead to severe complications such as heart disease, damage to blood vessels, kidneys, eyes, and nerves. The aim of this study is to improve the accuracy and efficiency of diabetes diagnosis using advanced statistical techniques and machine learning, as well as to create an easily accessible and self-explanatory user interface. This user interface not only helps doctors and patients to receive diagnosis results, but also allows for the collection of new data from users.

Methods: In this study, a combination of machine learning models, including XGBoost, LightGBM, Gradient Boosting, and CatBoost, is used to diagnose diabetes based on the Pima Indians dataset. To enhance performance, hybrid techniques and statistical methods are used to increase the number of training samples.

Results: The proposed method achieves an accuracy of 87%, which represents an improvement of approximately 1–4% compared to standard methods and recent studies. In addition, these techniques offer advantages such as faster learning processes and reduced need for training data.

Conclusion: To improve usability, an ****explainable and easily accessible user interface**** has been developed, which is accessible via a website. This interface enables clinicians and users to upload data, receive diagnostic results, and understand the model's decisions through clear explanations. Integrating machine learning with an interactive user interface can significantly aid medical decision-making.

Keywords: Diabetes Diagnosis, Advanced Statistical Techniques, CatBoost

G-1658

The Dual Role of the Gut Microbiome in Colorectal Cancer and Neurological Disorders: A Comprehensive Review

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Abstract:

Background and Aims: The gut microbiome is a crucial regulator of human health, influencing both colorectal cancer (CRC) progression and neurological disorders through complex interactions within the microbiota-gut-brain axis (MGBA). In colorectal cancer, certain microbial species promote inflammation, DNA damage, and immune evasion, while in neurological diseases, dysbiosis is linked to neuroinflammation, metabolic dysregulation, and neurotransmitter imbalances. This review explores the gut microbiome's role in these conditions, highlighting shared mechanisms and potential microbiome-based therapies.

Methods: This review integrates current research on gut microbiome composition and its impact on disease. CRC-related studies focus on dysbiosis-driven tumorigenesis, therapy resistance, and host immune responses, while neurological studies examine MGBA signaling, neuroimmune interactions, and microbial interventions.

Results: Evidence suggests that specific bacteria, such as *Fusobacterium nucleatum* and *Escherichia coli*, contribute to CRC by promoting pro-inflammatory cytokines and genotoxic metabolites, whereas beneficial microbes like *Akkermansia muciniphila* enhance immune responses and improve therapy outcomes. In neurological disorders, gut microbiota imbalances are associated with conditions such as Parkinson's disease, Alzheimer's disease, autism spectrum disorder, and multiple sclerosis. Interventions like probiotics, prebiotics, synbiotics, and fecal microbiota transplantation (FMT) show promise in restoring microbiome balance and improving clinical outcomes.

Conclusion: The gut microbiome is a key player in both CRC and neurological disorders, with inflammation and metabolic disruption acting as common pathways. Understanding these interactions paves the way for novel microbiome-based therapies that could enhance cancer treatment efficacy and support neuroprotection. Future research should focus on precision microbiome modulation to optimize patient outcomes in both oncology and neurology.

Keywords: Gut Microbiome, Colorectal Cancer, Microbiota-gut-brain Axis, Neurodegenerative Disorders, Probiotics, Microbiome Therapy

G-1661

Digital Health and AI in Personalized Medical Training: A Bibliometric Review

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Abstract:

Background and Aims: The integration of AI in medical education is transforming learning experiences by tailoring them to individual needs, supported by robust data. A bibliometric study explores global trends, prominent authors, and collaborations, analyzing citation patterns and keywords to understand advancements and future directions in this evolving field.

Methods: A bibliometric analysis was performed on 464 studies retrieved from PubMed, Scopus, and Web of Science. Citation networks, co-authorship patterns, and keyword co-occurrence were examined. VOSviewer was used to visualize collaboration structures and thematic clusters. Inclusion criteria required a minimum of three publications per author and two publications per institution. Additionally, Medical Subject Headings (MeSH) analysis was conducted to explore conceptual intersections.

Results: Findings indicate strong international collaboration, with European and Asian institutions leading research efforts. The University of Rome Tor Vergata emerged as a major hub for institutional partnerships. Among 1000 authors, Sabine Wilhelm, Jennifer L. Greenberg, Oliver Harrison, and Emily E. Bernstein were identified as key contributors, with Wilhelm playing a central role in the author network. Keyword co-occurrence analysis identified five major research clusters: • AI applications in medical education (curriculum development, clinical competence, student learning). • Population-based studies (demographic factors in AI-driven training). • Telemedicine and pandemics (COVID-19, digital health adoption). • Healthcare delivery methodologies (risk assessment, retrospective studies). AI-enabling technologies (machine learning, deep learning, digital platforms). The most frequently occurring keywords were artificial intelligence (291 occurrences), medical education, and telemedicine (mean publication year: 2019). The MeSH term analysis confirmed AI's increasing role in medical training, public health, and telemedicine.

Conclusion: This study highlights AI's role in medical education, emphasizing international collaborations and personalized learning. Key topics include AI, medical education, telemedicine, and pandemics. AI applications in medicine focus on precise disease diagnosis, personalized treatment, and clinical decision support.

Keywords: Artificial Intelligence, Digital Health, Personalized Learning

G-1662

The scientific map of Artificial Intelligence in Digital Health and Gamification: A bibliographical review

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Abstract:

Background and Aims: The convergence of gamification and artificial intelligence (AI) in the field of digital health has garnered significant international cooperation and increased scholarly attention in recent times. Despite this, a comprehensive exploration of the key countries, organizations, and productive authors in this field of study is still underdeveloped. Using citation network analysis and coincidence pattern detection methods, this study aims to map systematically the patterns of research, key contributors, and thematic patterns. The results will provide insights into the existing communities of study and cooperation structures in this field.

Methods: For increasing awareness regarding lines of study on digital health, gamification, and machine learning, a bibliometric study was done. Online sources were used to obtain the used data. There is still no in-depth appraisal of top countries, institutions, and major authors in this field of study. Citation co-network and co-occurrence indicators are used to identify through this study to systematically outline lines of study, major authors, and thematic patterns. Through this study, it is expected that influential lines of study and collaborating networks in this field of study would be obtained.

Results: The bibliometric analysis showed that the United States, United Kingdom, and India are the leading countries in artificial intelligence, gamification, and digital health research, with strong international collaborations. Within institutions, the Department of Dermatology at the Medical University of Vienna showed the greatest research influence. Top authors, such as Malvey J and Puig S, had a strong influence on co-authorship network formation. Citation analysis showed that individual publications gained a high number of citations, while co-word mapping of keywords uncovered recurring topics, with "Artificial Intelligence," "Machine Learning," and "Digital Health" being the top terminologies. The studies are structured around five major clusters of studies that show interdisciplinary links. The findings provide a thorough overview of international research production, co-authorship patterns, and thematic evolution within this area.

Conclusion: Employing citation patterns and coincidence networks methodologies, this research endeavors to map research areas, major contributors and recipients, and thematic evolution. Findings provide insight into primary collections and co-authorship writing networks in the field.

Keywords: Artificial Intelligence, Gamification, Digital Health

G-1664

Harnessing Machine Learning for Optimizing Therapeutic Protein Production

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Abstract:

Background: Therapeutic proteins, including monoclonal antibodies, enzymes, and cytokines, are essential for treating diseases such as cancer, autoimmune disorders, and metabolic deficiencies. However, optimizing their production remains challenging due to the complexities of protein expression, folding, and stability. Traditional bioprocess optimization relies on extensive trial-and-error experiments, making it inefficient and costly. Advances in artificial intelligence (AI), particularly machine learning (ML), are transforming protein production by enhancing yield, stability, and bioactivity while reducing manufacturing costs.

Methods: Machine learning models analyze large datasets of protein sequences, expression conditions, and structural properties to identify key factors influencing production efficiency. Deep learning frameworks, including convolutional neural networks (CNNs) and long short-term memory (LSTM) networks, predict protein folding patterns and aggregation tendencies. Generative adversarial networks (GANs) aid in designing novel protein variants with enhanced stability and solubility. Reinforcement learning algorithms optimize culture conditions by dynamically adjusting parameters such as pH, temperature, and nutrient composition in bioreactors. AI-driven molecular simulations refine protein design for improved therapeutic performance.

Results: AI-assisted protein engineering has significantly improved production efficiency by predicting optimal codon usage, minimizing aggregation, and enhancing post-translational modifications. ML-optimized systems yield higher protein concentrations with improved bioactivity. AI-guided cell line development accelerates clone selection, reducing the time required to establish high-producing cell lines. AI-assisted bioprocess control enables real-time monitoring and adaptive optimization, ensuring consistent, high-quality protein production.

Conclusion: Despite its promise, challenges such as data availability and model interpretability remain. Explainable AI (XAI) enhances transparency in predictive models. Future advancements integrating AI with quantum computing and CRISPR-based gene editing could further refine protein engineering, making biopharmaceutical manufacturing more efficient and scalable.

Keywords: Machine Learning, Protein Engineering, Therapeutic Proteins

G-1665

The role of artificial intelligence in the pharmacology projects

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Abstract:

Background and Aims: the role of artificial intelligent has been raised in medicine and in the field of pharmacology and psychopharmacology, for discovering new drugs in the treatment and diagnosis of chronic an acute disease has been used successfully. Also it was used for finding the structure of drugs molecules and pharmacotherapy and define the drug receptors in pharmacology research for example it was used in the treatment of neuro degenerative disease for example AD and PD. Also It was approved to investigate the mechanism of new drugs and signaling pathways,

Methods: A PubMed search for “artificial intelligence” and “pharmacology” shows that whereas in 2017 only 49 papers on the subject were published, by 2021 this had increased 10-fold to 502 publications it is possible to use artificial intelligent.to supervised machine learning approaches to improve therapeutic drug monitoring .Additionally, natural language processing is increasingly used to mine electronic health records to obtain real-world data. also it is already successfully applied in drug discovery and target identification for several years.

Results: More recently Artificial Intelligent models which help to characterize patient populations and predict an individual's drug response are emerging,

Conclusion: thereby covering the entire pipeline from drug discovery to personalized medicine. In this mini review we try to explain some new approach in pharmacology studies.

Keywords: Artificial Intelligent , Degenerative Disease, Pharmacology

G-1667

Evaluating Medical Students' Readiness for AI Integration in Healthcare

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into medical education, research, and healthcare requires assessing medical students' readiness to adopt AI-based technologies. This study aimed to evaluate medical students' AI readiness to work with medical AI technology.

Methods: This cross-sectional study was conducted among medical sciences students using the online Persian version of the MAIRS-MS questionnaire, whose validity and reliability were confirmed in Hossein Rezazadeh study. The questionnaire utilized a five-point Likert scale ranging from "strongly agree" to "strongly disagree." The scoring system was structured as follows: Cognition Factor (Items 1-8, Min: 8, Max: 40 points), Ability Factor (Items 9-16, Min: 8, Max: 40 points), Vision Factor (Items 17-19, Min: 3, Max: 15 points), Ethics Factor (Items 20-22, Min: 3, Max: 15 points) and total Readiness score (Items 1-22) ranged from a minimum of 22 to a maximum of 110 points. Statistical analyses were performed to examine differences in readiness scores based on demographic variables.

Results: A total of 123 medical students participated (mean age = 22.45, SD = 3.5). Of them, 59.4% were female, 40.6% male. Additionally, 27.1% were general medical doctorate (MD) and 69.9% bachelor's students. The overall mean MAIRS-MS score was 69.18 (SD = 15). The mean scores of cognitive, competency, vision and ethics domains were (22.81, SD = 6.01), (26.55, SD = 6.04), (9.07, SD = 2.72), and (10.73, SD = 2.49) respectively. No significant correlation was found between total readiness scores and age, gender, or field of study. However, bachelor's degree students had significantly higher scores (M = 69.33, SD = 15.42) than MD students (M = 68.73, SD = 14.80). Additionally, the average score that students assigned to their readiness for using Ai in education, research, and services on a 10-point scale was 5.30 (SD = 2.35).

Conclusion: Students have a positive vision on AI applications in healthcare and consider themselves committed to ethical and legal principles. However, cognitive and competency domains require further education. Given AI's growing role in healthcare, short-term AI training programs for medical students are recommended.

Keywords: Artificial Intelligence, Student Readiness, Medical Education

G-1668

An Intelligent Framework Based on Heterogeneous Knowledge Graphs for Identifying Drug and Non-Drug Proteins

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Abstract:

Background and Aims: Recent advancements in graph theory and artificial intelligence are creating new opportunities for modeling complex biological interactions. By utilizing Bio Knowledge Graphs and Heterogeneous Graphs, this study aims to improve the classification of proteins, particularly in distinguishing between drug-related and non-drug-related proteins. Bio Knowledge Graphs and Heterogeneous Graphs are powerful tools for modeling complex relationships between various biological entities such as drugs, diseases, proteins, and biological pathways. These graphs provide a structured framework to better understand the intricate connections within biological and medical data. The goal of this study is to explore how integrating artificial intelligence with Bio Knowledge Graphs and Heterogeneous Graphs can enhance the modeling of drug-disease interactions and improve the prediction of disease-related protein classifications.

Methods: In this study, Heterogeneous Graphs will be constructed using a dataset that includes drug-related and non-drug-related proteins, each with associated features. The graph will be structured by connecting drug-related proteins to a "Drug Protein" node and non-drug-related proteins to a "Non-Drug Protein" node, while all proteins will also be linked to a central "Protein" node. Artificial intelligence algorithms, including machine learning techniques, will then be applied to predict whether a protein is drug-related or non-drug-related, based on its features and relationships within the graph.

Results: The construction of Heterogeneous Graphs will yield an effective model that represents both drug-related and non-drug-related proteins. Artificial intelligence -driven analysis will demonstrate the ability of the graph to successfully differentiate between these two categories by leveraging the relationships and features embedded within the graph.

Conclusion: This study will highlight the potential of integrating Heterogeneous Graphs with artificial intelligence to classify proteins as drug-related or non-drug-related. The proposed model will provide a valuable framework for drug discovery and therapeutic research. Further improvements in artificial intelligence algorithms, coupled with the integration of larger datasets, will enhance the accuracy and applicability of the model.

Keywords: HeterogeneousGraph, Protein, DrugRelated, NonDrugRelated, ArtificialIntelligence, MachineLearning

G-1669

Next-Generation Sequencing (NGS): A Revolution in Pathogen Diagnosis and Personalized Medicine

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Abstract:

Background and Aims: Next-Generation Sequencing (NGS) has emerged as a transformative technology in genomics, revolutionizing pathogen detection, antimicrobial resistance profiling, and personalized medicine. Its ability to rapidly analyze genetic material offers unprecedented opportunities for precise diagnostics and tailored therapies. This study aims to comprehensively evaluate the clinical applications of NGS in infectious disease management and oncology, address its technical and economic challenges, and highlight its role in advancing precision medicine. Additionally, the study explores comparative advantages of NGS over conventional diagnostic methods, such as culture-based techniques and Sanger sequencing.

Methods: This systematic review analyzed data from peer-reviewed articles, clinical trials, and scientific databases published between 2014 and 2024. Inclusion criteria prioritized studies focusing on NGS applications in pathogen identification, oncology, and antimicrobial resistance. Data extraction encompassed technological processes, diagnostic accuracy criteria, cost analyses, and case studies. Bioinformatics pipelines, such as BLASTn and Guppy-ont, were analyzed for their roles in data interpretation.

Results: NGS demonstrated a 95% diagnostic accuracy in pathogen detection, reducing turnaround time from 48 hours (traditional methods) to under 24 hours. In polymicrobial infections, NGS identified co-infecting pathogens in 85% of cases, compared to 40% with culture-based methods. For antimicrobial resistance, NGS detected resistance genes (e.g., *mecA*, *bla*NDM-1) in 90% of samples, enabling targeted antibiotic regimens. In oncology, NGS-guided therapies improved treatment response rates by 80% in lung adenocarcinoma patients with EGFR or ALK mutations. However, challenges included high costs (50% higher than conventional methods), bioinformatics complexity, and variability in sensitivity (70–95%) across pathogens. Recent innovations, such as cloud-based data analysis and multiplex panels (e.g., PneumoSeq), enhanced scalability and reduced operational costs by 30%.

Conclusion: While NGS holds immense potential for revolutionizing diagnostics and therapeutics, its clinical adoption remains hindered by financial barriers, technical expertise gaps, and data interpretation complexities. Strategic investments in bioinformatics training, cost-reduction initiatives (e.g., shared sequencing platforms), and regulatory standardization are critical to mainstream integration. Future research should focus on optimizing workflows for low-resource

settings and validating NGS in emerging infectious diseases. By addressing these challenges, NGS can become a cornerstone of precision medicine, improving patient outcomes and public health surveillance.

Keywords: NGS, Bioinformatics, Personalized Medicine

G-1670

Knowledge Graphs, Artificial Intelligence, and Personalized Medicine: A Triadic Alliance in Systems Biology

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Abstract:

Background and Aims: The future of personalized medicine and systems biology will depend on advanced computational approaches capable of modeling the complexity of biological systems. This study will propose an artificial intelligence-driven, graph-based framework that will utilize biological knowledge graphs and heterogeneous networks to analyze multi-scale interactions among biomedical entities such as drugs, diseases, proteins, and biological pathways. As systems biology will continue to emphasize the interconnected nature of biological processes, and personalized medicine will aim to tailor therapeutic strategies to individual patient profiles, graph-based representations empowered by artificial intelligence will offer a promising integrative solution. This research will investigate how the combination of artificial intelligence techniques with structured biomedical graphs will enhance the prediction of drug-disease associations, simulate disease progression, and identify patient-specific treatments.

Methods: Biomedical knowledge graphs will be constructed from curated databases, linking key entities through biologically meaningful relationships such as treats, causes, and interacts with. These graphs will serve as a foundation for applying machine learning and deep learning algorithms, which will be used to discover hidden patterns, forecast clinical outcomes, and recommend personalized therapeutic options. The proposed modeling approach will align with systems biology by enabling scalable and integrative analysis of complex biomedical data.

Results: The integration of artificial intelligence with biomedical knowledge graphs will be expected to improve the accuracy of therapeutic predictions and drug efficacy assessment. It will also uncover novel relationships between genes, diseases, and treatments, providing deeper insights into disease mechanisms. These outcomes will contribute to advancing data-driven personalized healthcare by bridging large-scale biological knowledge with individual-specific needs.

Conclusion: Artificial intelligence-powered graph modeling will emerge as a foundational approach at the intersection of personalized medicine and systems biology. By structurally representing complex biological relationships and applying predictive algorithms, this framework will support more precise diagnostics, targeted treatment selection, and intelligent clinical decision-making in the future of medicine.

Keywords: Personalized Medicine, Systems Biology, Artificial Intelligence, Biological Knowledge Graph, Heterogeneous Network, Drug Disease Interaction,

G-1674

Harnessing Machine Learning and Artificial Intelligence to Predict Maternal and Neonatal Health Outcomes

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Abstract:

Background and Aims: As global initiatives to enhance maternal and neonatal health gain momentum, the integration of machine learning (ML) and artificial intelligence (AI) into clinical practice emerges as a pivotal advancement. This review synthesizes recent findings on the application of ML and AI in predicting maternal health outcomes, such as postpartum hemorrhage (PPH), perinatal depression (PND), and intrahepatic cholestasis of pregnancy (ICP), while also addressing their role in predicting neonatal mortality. **Background:** Postpartum complications, including hemorrhage and mental health disorders, pose significant challenges to maternal and neonatal well-being. Accurate early prediction is essential for timely intervention. PPH remains a leading cause of maternal morbidity and mortality globally, especially in low-resource settings. This review evaluates the effectiveness of various ML algorithms in predicting critical maternal health outcomes and analyzes recent advancements in AI-driven mortality prediction models for both mothers and neonates.

Methods: A systematic literature search across five major scientific databases yielded 671 publications from the past decade. After screening, 18 studies were selected for in-depth analysis, focusing on methodologies and features of ML models, particularly Random Forest, in predicting PPH and neonatal mortality.

Results: Postpartum Hemorrhage (PPH): ML models showed a 95% higher likelihood of predicting PPH compared to traditional methods. Random Forest algorithms achieved the highest accuracy with a mean absolute error of 21.7. Key predictors included maternal age, gestational week, and cesarean delivery history. - Perinatal Depression (PND): The predictive model identified at-risk women based on mood status, previous depressive episodes, and sleep quality, demonstrating strong performance. - Intrahepatic Cholestasis of Pregnancy (ICP): The CatBoost model achieved an AUC of 0.9614, indicating excellent predictive capability for ICP severity. - Neonatal Outcomes: Key predictors for neonatal mortality included birth weight, gestational age, Apgar score, and gender. AI models enhanced risk assessment and facilitated early interventions.

Conclusion: Machine learning and artificial intelligence have significant potential in predicting maternal and neonatal health outcomes. Integrating these techniques into clinical practice can

enhance detection and interventions. Further research is essential for optimizing resources in this field.

Keywords: Machine Learning, Artificial Intelligence, Maternal Health

G-1675

The Necessity of Shifting Healthcare Management Towards Smart and Fully Digital Hospitals

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Abstract:

Background and Aims: The rapid advancement of digital technologies in healthcare has given rise to smart hospitals, which incorporate innovations such as Artificial Intelligence (AI), Internet of Things (IoT), Big Data, and Electronic Health Records (EHR). These technologies are integrated to enhance patient care, operational efficiency, and overall healthcare management. This paper discusses the necessity of transitioning towards fully digital and smart hospitals to address the growing demand for higher quality care, cost reduction, and operational effectiveness.

Methods: This paper meticulously investigates the integration of digital technologies into healthcare management, with a specific emphasis on smart hospitals and their innovative use of tools such as Artificial Intelligence (AI), the Internet of Things (IoT), Big Data, and Electronic Health Records (EHR). Through this analysis, the objective is to identify how these technologies can be utilized to enhance decision-making processes, improve patient outcomes, and optimize resource allocation in healthcare settings.

Resistance to Change: The analysis also considers behavioral factors that contribute to resistance among healthcare staff towards adopting new technologies. Issues such as discomfort with technological advancements and entrenched organizational cultures that resist transformation are discussed. The importance of fostering an environment that actively supports change is highlighted as essential for successful implementation.

Results: Smart hospitals provide real-time patient monitoring, automation of administrative tasks, and the use of advanced diagnostic tools. These innovations contribute to improved decision-making, better patient outcomes, and more efficient resource management. Despite the challenges of high initial costs and data security issues, the benefits of smart hospitals, including enhanced patient care and operational efficiency, far outweigh the obstacles, making the digital transformation of healthcare systems essential for future development.

Conclusion: The shift towards fully digital and smart hospitals is an inevitable and necessary evolution for the healthcare system. Embracing this transformation will improve patient care, increase operational efficiency, reduce costs, and meet the growing healthcare demands of the 21st century. Despite the challenges, the benefits significantly outweigh the obstacles, and with

proper planning and investment, smart hospitals will become the standard for healthcare delivery in the years to come

Keywords: Smart Hospitals, Digital Transformation, Healthcare Management

G-1676

Processing of medical and biological signals with artificial intelligence

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Abstract:

Background and Aims: The integration of Artificial Intelligence (AI) into medical and biological signal processing has significantly transformed the healthcare industry. Biological signals, such as electrocardiograms (ECG), electroencephalograms (EEG), medical imaging, and genomic data, are crucial for understanding patient health but can often be complex and noisy. The aim of this study is to explore the application of AI, specifically machine learning (ML) and deep learning (DL), in enhancing the analysis, classification, and prediction of these biological signals to improve disease diagnosis and personalized treatment.

Methods: In this study, we adopted a systematic approach to leverage advanced Artificial Intelligence techniques, particularly machine learning (ML) and deep learning (DL) algorithms, for processing and analyzing diverse biological signals. Here are the key components of our methodology: **Data Collection:** We gathered comprehensive datasets encompassing various biological signals, specifically focusing on electrocardiograms (ECG), electroencephalograms (EEG), medical imaging (such as X-rays and MRIs), and genomic data. These datasets were sourced from reputable medical databases and included both raw signals and labeled instances for supervised learning tasks. **Data Preprocessing:** Given the complexity and noise inherent in biological signals, extensive preprocessing was conducted. This involved the following steps. **Model Selection:** Various ML and DL algorithms were selected for comparison, including but not limited to: **Machine Learning Models:** Support Vector Machines (SVM), Random Forests, and Gradient Boosting Machines were utilized for their effectiveness in classification tasks

Results: The AI-driven approach demonstrated high efficacy in processing and analyzing complex biological signals. Significant improvements in signal quality were achieved through noise reduction techniques, leading to more accurate disease classification and prediction. The deep learning models exhibited robust performance in detecting various medical conditions, outperforming traditional signal processing methods.

Conclusion: The integration of AI into medical and biological signal processing offers promising advancements in healthcare, particularly in the automation of disease detection and prediction. AI-based methods, including ML and DL, prove to be highly effective in analyzing complex and noisy biological signals, paving the way for more accurate and efficient diagnostics and personalized treatments.

Keywords: Artificial Intelligence, Signal Processing

G-1677

Project on Rational Drug and Antibiotic Prescription and Consumption Management with Artificial Intelligence Processing in Clinics

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Abstract:

Background and Aims: Irrational drug and antibiotic prescribing is a major healthcare issue that leads to unnecessary side effects, antibiotic resistance (AMR), and increased healthcare costs. This project aims to assist in managing drug and antibiotic prescriptions in clinics using artificial intelligence (AI). The AI-based system helps doctors make more accurate prescriptions and prevents irrational drug prescribing. Ultimately, the project seeks to combat issues such as antibiotic resistance and unnecessary prescriptions by providing a decision-support system that aids healthcare providers in making data-driven decisions.

Methods: The project involves collecting clinical data, including patient medical histories, prescriptions, diagnoses, and laboratory results. Using machine learning models and natural language processing (NLP), the system analyzes this data to assist doctors in selecting the best drug or antibiotic based on the patient's clinical profile. The AI system provides real-time alerts about incorrect dosages, drug interactions, and contraindications. By integrating the AI system with the existing workflow in clinics, the system enhances healthcare service quality, reduces costs, and increases patient safety.

Results: The expected outcomes of this project include:

- **Improved Prescription Accuracy:** Supporting doctors in making precise, data-driven decisions when prescribing drugs and antibiotics.
- **Antibiotic Stewardship:** Optimizing antibiotic use and combating antibiotic resistance by ensuring rational prescriptions.
- **Decision Support System (DSS):** A real-time decision support system powered by AI that alerts doctors about drug interactions, contraindications, and recommended dosages.
- **Patient Safety:** Reducing medication errors and adverse drug reactions by providing tailored prescription recommendations based on individual patient data.
- **Data Analysis and Monitoring:** Analyzing prescription data to identify patterns and trends, which helps improve monitoring and continuous improvement in prescribing practices.

Conclusion: This project is expected to improve prescribing practices, reduce antibiotic resistance, increase patient safety, optimize resource utilization, and provide valuable data-driven insights. By integrating AI into clinical workflows, the system helps healthcare providers make better decisions regarding drug and antibiotic management, contributing to the overall improvement of healthcare services.

Keywords: Artificial Intelligence, Antibiotic Prescribing

G-1678

Investigating the effect of using an intelligent mobile app on preparation of colonoscopy

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Abstract:

Background and Aims: Colonoscopy is the best method for screening and diagnosing colorectal diseases, but in 20-45% of cases, good preparation is not performed, which leads to more time wastage, non-diagnosis, and re-doing. Therefore, the present study was conducted to investigate the effect of using mobile application on bowel preparation before colonoscopy.

Methods: The present study was conducted in an experimental design. Data were collected from 1-11-2023 to 1-3-2024. The participants in the study were 83 patients undergoing colonoscopy referred to Ayatollah Taleghani Educational and Medical Center, who were divided into two control and intervention groups using a random allocation program. In the control group, education was provided as usual, and in the intervention group, education was provided using the mobile application. The research tools were a demographic questionnaire and the Boston bowel preparation scale (BBPS). The data were analyzed using descriptive and inferential statistics in SPSS version 20.

Results: 83 patients, 53 men and 30 women, with a mean age of 40.48 years, participated in the study. The level of poor preparation using BBPS was 5 in the intervention group and 17 in the control group, inadequate 27 in the intervention group and 16 in the control group, and adequate 10 in the intervention group and 8 in the control group. The result of Fisher's exact test showed a significant difference in patient preparation (P 0.01).

Conclusion: Based on the results of the study, it can be concluded that training using a mobile application is effective in preparing patients for colonoscopy. It is emphasized that a smart mobile application should be used in training patients undergoing colonoscopy.

Keywords: Colonoscopy, Bowel Preparation, Mobile-Application, Colon Cancer

G-1679

Exploring artificial intelligence applications in managing legal conditions in medicine: Requirements and policies for improving performance.

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Abstract:

Background and Aims: The proper use of artificial intelligence (AI) has a significant impact on human life, particularly in the medical field, where it plays a crucial role. Recent advancements in AI have led to the development of intelligent systems used for disease diagnosis, treatment planning, medical data analysis, and outcome prediction. This technology enhances diagnostic accuracy, reduces treatment costs, and improves the quality of healthcare services, ultimately benefiting public health. Moreover, in personalized medicine, AI can provide more effective treatments based on each patient's genetic and clinical characteristics.

Methods: This study is applied in terms of purpose and descriptive-analytical in terms of data collection methods. It follows a qualitative research approach, analyzing reliable scientific sources, relevant laws, and policies to examine the challenges and opportunities in this field.

Results: Research indicates that the effective use of AI can contribute to the development of intelligent medical systems, improving healthcare quality and diagnostic precision. However, challenges such as patient privacy violations, biases in medical decision-making, legal responsibility for errors, and the reduced role of physicians must also be addressed.

Conclusion: To ensure the safe implementation of AI, establishing legal frameworks and enforcing regulatory policies is essential. Policymakers should develop laws to protect patient data, ensure algorithm transparency, and define legal responsibilities. Additionally, training medical professionals in the responsible use of AI plays a key role in minimizing risks and maximizing efficiency.

Keywords: Artificial Intelligence, Personalized Medicine, Treatment, Policy-Making

G-1680

Applications of Artificial Intelligence in Veterinary Neurological Surgery: A Systematic Review and Future Perspectives

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Abstract:

Background and Aims: Veterinary neurosurgery faces challenges like interspecies anatomical variability, complex neuroanatomy, and limited access to neural structures. AI offers transformative potential by enhancing precision through advanced imaging, navigation systems, and minimally invasive techniques. While AI reduces surgical errors and improves outcomes via data-driven decisions, its adoption remains nascent due to species-specific anatomical diversity and resource limitations. This review systematically evaluates AI's current and emerging applications in veterinary neurosurgery, spanning preoperative, intraoperative, and postoperative phases.

Methods: A systematic review of 48 studies (2022–2023) was conducted using PubMed, Web of Science, Scopus, and IEEE Xplore. Keywords included AI/ML, neurosurgery, and veterinary species (dogs, cats, horses). Data extraction focused on AI applications, species, outcomes, and limitations.

Results: 1. Study Trends: 75% of studies published in 2023, with geographic focus in North America (35%), Europe (30%), and Asia (25%). 2. Pre-Surgical AI: - 92% accuracy in detecting canine brain tumors (Kim et al., 2022). - 88% sensitivity for equine spinal lesions (Spiteri et al., 2023). - 0.5mm precision in 3D neuroanatomy modeling (Johnson et al., 2023). 3. Intraoperative Innovations: - AI-guided navigation with 2mm error margins (Carreira et al., 2023). - 95% real-time critical structure detection (Robertson et al., 2022). - 30% reduction in surgery time via AI decision-support (Martinez-Pereira et al., 2023). 4. Post-Surgical Outcomes: - 87% sensitivity in detecting early complications (Wang et al., 2022). - 45% fewer complications and 35% better recovery with AI monitoring (Jeffery et al., 2023). 5. Challenges: Data scarcity due to anatomical diversity, high costs for small clinics, and training gaps. 6. Emerging Trends: Cross-species AI systems, 40% improved accuracy with AR integration (Gandini et al., 2022), and cloud-based data sharing.

Discussion & Conclusion AI revolutionizes veterinary neurosurgery through: -Diagnostic Precision: 40% improvement over traditional methods (Banzato et al., 2023).- Surgical Workflow: 45% fewer errors and sub-millimeter planning accuracy.-Post-Operative Care: AI-driven tools reduce risks via early complication detection. **Vision:** Veterinary neurosurgery serves as a model for AI adoption in medicine. Success requires collaboration among veterinarians, engineers, and policymakers to balance innovation with ethics and accessibility. AI's integration promises a future of safer, precise, and equitable veterinary care.

Keywords: Artificial Intelligence, Veterinary Neurological Surgery

G-1681

The Role of Machine Learning in Enhancing Quality of Life for Parkinson Disease Patients: A Systematic Review

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Abstract:

Background and Aims: Parkinson disease(PD) is a progressive neurodegenerative disorder that affects patients 'daily lives. Recent advancements in machine learning(ML) have introduced novel methods to analyze and enhance the quality of life(QoL) of individuals with Parkinson disease.This systematic review investigates the role of machine learning in evaluating and improving the QoL of Parkinson's patients.

Methods: A comprehensive literature search was-conducted using the keywords "Machine Learning", "Quality of Life" and "Parkinson Disease" across multiple international databases, including Web of Science, PubMed/Medline, Scopus and Google Scholar, as well as national sources such as Irandoc,SID and Magiran.in initial search retrieved 14 studies. The inclusion criteria encompassed publications in English or Persian and gray literature was excluded. No time restrictions were applied. After removing duplicates and assessing study quality, four studies were selected for in-depth analysis. This review adhered to PRISMA guidelines to ensure an unbiased selection process, data extraction, and evidence synthesis.

Results: The reviewed studies demonstrated that machine learning models, particularly artificial neural networks (ANNs),can effectively predict which patients may experience a decline in QoL over time.These models analyzed various factors influencing QoL changes,in patients who underwent deep brain stimulation(DBS).Key findings include:Baseline PDQ-39 scores and beta-band activity(20 Hz)in the left subthalamic nucleus were identified as significant predictors of QoL changes.Lower initial QoL scores correlated with deteriorating conditions,while higher beta-band activity was associated with improved QoL.The placement of electrodes in DBS treatment played a crucial role in QoL outcomes.Electrodes positioned above specific coordinates (z=-7) correlated with better QoL,whereas those placed below were linked to poorer outcomes.Additional influential factors included age at diagnosis,geographical location,the presence of dementia and

overall patient age. ChatGPT also helped for designing personalized pain management interventions and highlighting the potential of artificial intelligence in individualized care planning.

Conclusion: Machine learning models seems have significant potential in identifying and analyzing factors that influence the quality of life in Parkinson disease patients, particularly those undergoing deep brain stimulation. These findings underscore the transformative role of AI-driven in improving patient care. Future research can focus on evaluating the efficacy of personalized treatment strategies informed by machine learning insights.

Keywords: Machine Learning, Quality of Life, Parkinson Disease, Systematic

G-1682

the Role of Machine Learning in Detecting Jaundice Neonatal: A Systematic Review

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Abstract:

Background and Aims: Neonatal jaundice is a common condition that, if left untreated, can lead to severe complications, including brain damage. Recent advancements in machine learning have introduced innovative techniques for early diagnosis, which require thorough evaluation so, This systematic review explores how machine learning can aid in predicting neonatal jaundice and improving early intervention strategies.

Methods: This systematic review involved an extensive search for studies related to "machine learning" and " neonatal jaundice" Keywords across databases such as Web of Science, PubMed/Medline, Scopus, Google Scholar, and national repositories like Irandoc, SID, and Magiran. Initially, 22 studies were identified, with inclusion criteria focused on English/Persian publications with free full-text access. Grey literature was excluded, and no time restrictions were applied. After removing duplicates and critically evaluating the studies, eight were selected for final analysis. Ethical considerations, including unbiased selection, data extraction, and classification, were maintained. The review followed PRISMA guidelines for structured reporting.

Results: Findings suggest that machine learning significantly enhances early detection of hyperbilirubinemia. A combination of logistic regression and random forest models successfully predicted hyperbilirubinemia risk and phototherapy needs based on variables like bilirubin levels, birth weight, gestational age, and postnatal hours. A machine learning inference model identified intestinal bile acid metabolites and meconium as potential biomarkers for jaundice prediction. The diagnostic tool mCADx, using image processing and data mining, effectively identified jaundice symptoms, with artificial neural networks demonstrating the highest accuracy. Other algorithms, such as SVM and ensemble regression, analyzed neonatal images with an accuracy of 81.1%. However, performance varied across studies, with XGBoost achieving a 99.63% accuracy

in one case, while another study found SVM to be the most effective. Additionally, one study indicated that a multilayer perceptron model outperformed RF and SVM models.

Conclusion: Machine learning has shown promising potential in predicting and diagnosing neonatal jaundice at an early stage. Future research should explore additional influencing factors, such as genetic and environmental elements, to improve predictive accuracy using machine learning models.

Keywords: Machine Learning, Jaundice, Neonatal, Systematic Review

G-1684

Robotic surgery and privacy, challenges and solutions ahead

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Abstract:

Background and Aims: Robots are precise and skillful electromechanical devices that perform complex movements. Privacy is a fundamental principle in improving the quality of surgical team services before, during, and after surgery. Therefore, observing ethics, which preserves privacy, is considered a fundamental and important principle. Analyzing ethical challenges and providing solutions to improve and protect privacy and data security in robotic surgery

Methods: This review study was conducted through a search of PubMed, Google Scholar, SID, and Web of Science sites from 2011 to 2025, examining 20 articles with the mentioned keywords.

Results: Based on research findings, ethical challenges in robotic surgery include protecting information, respecting patient privacy, maintaining data security and management, and ensuring that patient medical information remains confidential and only authorized individuals have access. This is related to the principle of "do no harm" and the need to protect users' privacy, while emphasizing the principle of "beneficence". Current generations of robots are equipped with sensors such as cameras and GPS, which connect to the internet and send data collected through their built-in cameras and microphones to servers, which can violate patients' privacy. The proposed solution is a federated machine learning algorithm, which is a basic model where, in addition to sharing patient data, robots (CRs) send their inferences to a central server. This method improves data security, but the challenge of model accuracy and processing transparency remains. Therefore, caution must be exercised in robotic surgery and a careful feasibility study must be performed before its implementation. Privacy in robots is divided into four parts: informational, psychological, social, and physical. Solutions to improve security include methods such as data encryption, algorithms (AES, RSA), data anonymization, use of blockchain, access control, multi-factor authentication, monitoring, drafting comprehensive rules and imposing fines, informing patients, and training surgical team members on cybersecurity.

Conclusion: By using AI and robotics, and these strategies and methods, surgeons can harness these potentials and ensure responsible and ethical integration of technologies to ensure the highest ethical standards are met. This proposed approach

Keywords: Robotic Surgery, Privacy, Artificial Intelligent

G-1993

Applications of Artificial intelligence in cosmetic surgery – A review study

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Abstract:

Background and Aims: Artificial intelligence is a new era in medicine. Choosing a skilled and specialized surgeon in the field of cosmetic surgery who uses modern technologies can have a great impact on surgical outcomes. With the advancement of technology, new tools and methods have been created to improve the accuracy and results of cosmetic procedures. Artificial intelligence predicts the side effects of surgery based on the patient's medical history and physical characteristics. Artificial intelligence makes the lives of patients, doctors, and hospital operations easier by performing operations that are generally performed by humans, with the advantage of consuming less money and time. Artificial intelligence can optimize processes such as simulating surgical results and even cosmetic consultations. This study was conducted with the aim of applying artificial intelligence in cosmetic surgery.

Methods: The present study is a review study that was conducted using the ISI, Pubmed, and Science Direct databases and Persian sources Iranmedex, SID, and Magiran. The search in these databases was conducted using the Keywords: artificial intelligence, cosmetic surgery, and application of artificial intelligence. Among the studies published between 2000 and 2025, 40 articles were extracted, and finally 10 articles were reviewed in line with the researchers' goals.

Results: Artificial intelligence can more accurately predict surgical outcomes. This helps surgeons plan more precisely and prevent potential errors. In the future, it will improve surgical accuracy, support intraoperative decision-making, and increase surgical safety. Using artificial intelligence technologies, surgical time can be reduced. It is expected that we will see more applications of artificial intelligence in cosmetic surgery in the future. Artificial intelligence can even help in post-surgical management. Doctors can track patients' recovery and provide necessary warnings in case of possible complications.

Conclusion: Currently, AI is not capable of performing cosmetic surgery. Cosmetic surgery requires precision and medical knowledge, and AI cannot yet completely replace the knowledge and experience of doctors. However, AI is being used as a tool in cosmetic surgery. The use of smart tools has not only increased surgical precision but also provided a safer experience with better results for patients.

Keywords: Artificial Intelligence, Cosmetic Surgery, Application

G-1686

The Role of Artificial Intelligence in Personalized Medicine and Biological Threat Surveillance

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Abstract:

Background and Aims: Artificial intelligence (AI) is revolutionizing the healthcare sector, particularly in personalized medicine and bio-threat surveillance. Personalized medicine leverages genetic, clinical, and lifestyle data to tailor treatment plans for individuals, while bio-threat surveillance focuses on detecting and mitigating biological risks to public health. This abstract explores the integration of AI in these domains, highlighting its advancements, applications, and future potential.

Methods: This study is based on a structured literature review of scientific articles, case studies, and public health reports published between 2015 and 2024. Relevant sources were selected using keywords such as “AI in healthcare,” “personalized medicine,” and “bio-threat surveillance.” For personalized medicine, the focus was on AI applications in genomics, pharmacogenomics, and medical imaging, particularly machine learning and deep learning techniques used for diagnosis and treatment optimization. In the area of bio-threat surveillance, the study analyzed AI tools used in epidemic prediction, pathogen detection, and crisis response. Special attention was given to AI systems applied during the COVID-19 pandemic. The data were qualitatively analyzed to identify major applications, technological trends, and shared challenges across the two domains.

Results: In personalized medicine, AI enhances genomic analysis, predicting disease risks, identifying genetic mutations, and optimizing treatment options. AI-driven models are used in pharmacogenomics to match medications with patients’ genetic profiles. Additionally, AI applications in medical imaging, such as deep learning algorithms, improve diagnostic accuracy, facilitating faster and more precise detection of conditions like cancer and cardiovascular diseases. In bio-threat surveillance, AI predicts epidemics by analyzing large-scale data from hospitals, social media, and public health reports. Machine learning models identify disease outbreaks in real-time, as demonstrated during the COVID-19 pandemic. Furthermore, AI aids in detecting emerging pathogens through genetic sequence analysis and anomaly detection, which can indicate new disease threats. AI also supports bio-threat simulations and response optimization to ensure effective resource allocation during crises.

Conclusion: Despite its immense potential, AI integration in healthcare faces challenges, including data privacy concerns, model biases, and the need for regulatory frameworks. Ensuring the ethical and fair use of AI is crucial for maximizing its benefits.

Keywords: AI, Personalized Medicine, Bio-Threat Surveillance, Genomics

G-1687

Expanding health equity, with a fundamental transformation based on the integration of telemedicine and artificial intelligence

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Abstract:

Background and Aims: Today, telemedicine has created a new revolution in increasing access to healthcare services. On the other hand, in the field of health, the use of artificial intelligence as a medical assistant in healthcare and medical assistance to patients and the health team has become a global priority. While in deprived and remote areas, the exposure of disadvantaged populations to geographical isolation, limited access to healthcare and treatment, and economic disincentives have led to health and health inequalities. The aim of this study was to examine the expansion of health justice, with a fundamental transformation based on the integration of telemedicine and artificial intelligence. This research examined the issue of how telemedicine and artificial intelligence can create a fundamental transformation in the expansion of health justice?

Methods: In the present review study, 45 research articles were identified and analyzed by searching reputable scientific databases through a selection and filtering process. Inclusion and exclusion criteria were applied based on the relevance of the topic and the quality of the articles.

Results: Telemedicine systems based on artificial intelligence are a fundamental transformation in medicine. The expansion of comprehensive and technology-driven medical services will improve the treatment process of patients around the world and reduce the gap in health care inequalities, especially in remote areas.

Conclusion: According to this study, the integration of telemedicine and artificial intelligence plays an important and key role in increasing access to medical care and medical information and expanding health equity. In order for people around the world to achieve health equity, policymakers should examine the growing health needs and existing challenges with collaborative and monitoring efforts, regardless of geographical or socio-economic limitations, allocate sufficient funds to implement this project, and in addition to preparing and strengthening infrastructure, provide sufficient training for people to create a smart and patient-centered health system based on justice and well-being of individuals. The quality of life of patients in disadvantaged spaces will improve.

Keywords: Artificial Intelligence, Telemedicine, Justice in Global

G-1688

The Role and Position of Tele-Nursing in Disaster and Accident Response: A Scoping Review of AI-Driven Innovations

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Abstract:

Background: The increasing frequency of disasters and accidents poses critical challenges to healthcare systems, requiring innovative solutions for effective care delivery. Artificial Intelligence (AI) has emerged as a transformative force in medical sciences, offering advanced tools to optimize healthcare processes. Tele-Nursing, as an AI-driven technology, holds significant promise for improving nursing care during crises. This study examines the role of tele-Nursing, supported by AI, in enhancing healthcare delivery during disasters and accidents.

Methods: A scoping review was conducted using Arksey and O'Malley's five-step framework to explore the integration of AI into tele-Nursing. A systematic search of PubMed, Web of Science, and Scopus databases identified English-language articles published between 2010 and 2025. Inclusion criteria focused on studies addressing tele-Nursing applications in emergencies and disasters, while exclusion criteria eliminated articles lacking relevance to AI technologies or crisis management. Eight articles were selected for detailed analysis based on their alignment with the study objectives.

Results: The reviewed studies demonstrate that AI-powered tele-Nursing enhances access to nursing care through remote consultations, reduces workloads, accelerates service delivery, and improves coordination among medical teams during emergencies. Additionally, tele-Nursing minimizes unnecessary referrals to healthcare facilities, optimizing resource utilization and alleviating strain on health systems. AI algorithms integrated into tele-Nursing platforms enable predictive modeling to anticipate patient needs, automate routine tasks, and support clinical decision-making. However, challenges such as the need for robust technological infrastructure, specialized training for nurses in AI applications, and acceptance by patients and healthcare providers persist.

Conclusion: This study highlights the transformative potential of AI-enabled tele-Nursing in managing health crises and disasters. By advancing communication technologies and integrating predictive AI models into tele-Nursing workflows, healthcare systems can improve the quality, efficiency, and accessibility of nursing care during emergencies. Policymakers should prioritize investments in digital infrastructure and nurse training programs to facilitate widespread adoption of tele-Nursing technologies. Future research should focus on personalized AI-driven

tele-Nursing solutions tailored to diverse patient populations while addressing ethical concerns related to data privacy and equitable access.

Keywords: Tele-Nursing, Artificial Intelligence, Disaster Response

G-1689

The Role of Artificial Intelligence in Enhancing Dental Education: A New Era of Digital Learning

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Abstract:

Background and Aims: The Fourth Industrial Revolution has ushered in a transformative era, with Artificial Intelligence (AI) playing a pivotal role in reshaping various fields, including medicine and dentistry.

Methods: AI encompasses a broad spectrum of technologies that enable machines to replicate human cognitive functions such as visual perception, speech recognition, decision-making, and language translation. In healthcare, AI has been integrated into medical and dental imaging diagnostics, decision support systems, precision digital medicine, and digital education.

Modern learners, often referred to as digital natives, differ significantly from previous generations. Thriving in an interconnected world, they highly value interactive and technology-driven learning experiences.

Results: AI-integrated medical education presents new opportunities for advanced teaching methodologies, enhancing student engagement, knowledge retention, and overall learning outcomes. Dentistry faculties and educators have recognized the potential of these advancements to enhance the learning experience and guide patient care and have actively integrated them into their curricula. Dentistry has always been a highly specialized field, requiring a combination of theoretical knowledge, practical skills, and clinical acumen. By leveraging these technological advancements, dental educators are able to create more interactive and personalized learning experiences. Virtual reality, for instance, allows students to immerse themselves in realistic clinical scenarios, enhancing their understanding of complex dental procedures and techniques.

Conclusion: By bridging the gap between theoretical knowledge and practical expertise, AI-driven technology enhances students' hands-on skills, offering a structured and effective approach to improving their dental education.

Keywords: Artificial Intelligence, Education, Dentistry

G-1690

Ethical challenges of using artificial intelligence in medical sciences: A systematic review

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Abstract:

Background and Aims: Nowadays, with the development of new sciences and technologies such as artificial intelligence, all sciences, including medical sciences, need continuous and reliable progress in applying and benefiting from its benefits in providing their services. Scientists, researchers, and policymakers must establish and solve the numerous challenges of using new technology in important health and wellness services. Paying attention to the ethics of artificial intelligence and understanding its dimensions and challenges can be beneficial in providing solutions. Therefore, this study was designed and implemented with the aim of determining the ethical challenges of using artificial intelligence in medical sciences.

Methods: This research is a systematic review study. It was conducted to review articles from GOOGLE SCHOLAR and PUBMED databases between 2020 and early 2025 with the keywords "artificial intelligence," "ethics," and "medical sciences." Using the PRISMA chart, it ultimately included 104 articles out of 2145 studies. Considering the title and content, and the inclusion criteria, after eliminating 82 studies, 22 studies were selected for review and final analysis.

Results: The study revealed that privacy, transparency, fairness, and accountability are significant challenges. Other challenges were also categorized as other challenges. Issues such as the need to inform patients about the use of artificial intelligence in the treatment process and its possible advantages and disadvantages to maintaining informed consent indicators, continuous review of private companies to prevent the sale of data to insurance companies or for commercial purposes, and the need for doctors to make the final decision and avoid inequality Were considered. Overall, this study showed that there are fundamental challenges in the ethical use of AI that require serious attention and the development of ethical and practical regulations in the field of AI and the adoption of precise and strict regulatory laws that take into account cultural and national differences, justice, transparency, privacy, and accountability. Establishing regulatory committees consisting of representatives of all stakeholder groups to review the scientific and ethical functioning of AI at all stages of development and use of AI is essential.

Keywords: Artificial Intelligence, Medicine, Ethics, Legislation

G-1691

The Effect of AI-Assisted Image Generation (GPT/DALL-E) on Academic Self-Regulation and Engagement of Midwifery Students in the Theoretical Physiology 2 Course: A Single-Group Study

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Abstract:

Background and Aims: The AI-assisted educational method can bridge the gap between theory and practice by providing realistic and interactive images of concepts related to pregnancy-associated diseases, thereby better preparing students for clinical challenges. This study aimed to investigate the impact of AI-based visualization on academic motivation and self-regulatory learning abilities among fifth-semester midwifery students in the Physiopathology II course (second semester of the 2023-2024 academic year). Given the complexity of both theoretical and clinical concepts in the Physiopathology course and the need for precise visual resources, modern technologies such as DALLE and ChatGPT were employed alongside the instruction of theoretical principles.

Methods: In this quasi-experimental pretest-posttest study, 20 fifth-semester midwifery students were purposefully selected. The educational process comprised eight two-hour sessions. During these sessions, after identifying the key aspects of pregnancy-related diseases—such as the effects of lupus on the kidneys, the joint damage caused by rheumatoid arthritis, and the impact of migraine headaches—detailed instructions were provided to the AI system to generate corresponding images. These images were used as supplementary educational resources in the classroom, and students analyzed and interpreted them to simplify complex concepts. The impact of this method was evaluated using standard questionnaires for academic motivation (Gonius and Kozo) and self-regulated learning (Buffard et al.), and the data were analyzed using SPSS version 24.

Results: The statistical analysis revealed that the overall mean academic motivation score significantly increased from 193.37 before the intervention to 231.68 after the intervention. Similarly, the overall mean self-regulated learning score rose significantly from 54.68 pre-intervention to 64.21 post-intervention, with the total changes in both variables showing statistically significant differences.

Conclusion: The study demonstrated that providing accurate and interactive images to students enhances both self-regulated learning processes and academic motivation. This educational

approach contributes to reducing the gap between theoretical instruction and practical application.

Keywords: Self-Regulated Learning, Artificial Intelligence, Education, Midwifery

G-1692

Artificial Intelligence-Driven Optimization of Liposomal Nanoparticles: A Paradigm Shift in Targeted Cancer Therapy

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Abstract:

Background and Aims: Though liposomal nanoparticles show potential for focused medication administration, maximum treatment performance is still a goal because cancer is still one of the top causes of death. This paper investigates the possibility of artificial intelligence (AI) transforming liposome design for cancer treatment, meeting the urgent need for more efficient and individualized treatment approaches. We aim to combine present studies on AI-driven liposome optimization and explore its consequences for future therapeutic uses and regulatory issues.

Methods: The study uses a literature search of scientific papers, industry reports, and regulatory guidelines related to AI-driven liposome design for cancer treatment. It includes studies using machine learning, deep learning, and other AI technologies to maximize liposome composition, targeting ligands, drug encapsulation, and release mechanisms. The paper also examines the challenges and benefits of converting these AI-optimized liposomes into clinical practice.

Results: In preclinical investigations, AI has accelerated liposome formation, improved drug loading and targeting, and improved therapeutic effects. AI algorithms can predict appropriate liposome formulations for individual cancer types, improving cytotoxicity *vitro* and tumor accumulation *in vivo*. The complexity of the tumor microenvironment, biocompatibility, and scaling up manufacturing for clinical trials remain hurdles. Recent research demonstrates that AI-driven liposome optimization is becoming more advanced. Lin et al. used machine learning algorithms to predict nanoparticle transport to tumors, showing that liposome properties may be optimized for targeting. Yi Ding et al. employed machine learning to build lipid nanoparticles for mRNA delivery, demonstrating how AI can improve gene treatments. In addition, Anilkumar et al. optimized magnetic liposome preparation using response surface methodology to maximize magnetic nanoparticle encapsulation while minimizing liposome size, which increased heating

efficiency for dual-mode cancer cell killing and tumor therapy. These experiments demonstrate AI's versatility in liposome creation for cancer treatment.

Conclusion: However, overcoming these obstacles requires coordinated efforts across research, industry, and regulatory systems. Future research should focus on refining AI models to account for biological variability and ethical issues to ensure fair access to these breakthroughs.

Keywords: Liposomes, Nanoparticles, Drug Delivery, Machine Learning,

G-1698

The Ethics of Artificial Intelligence in Medicine: Will Machines Replace Doctors?

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Abstract:

Background and Aims: With significant advancements in artificial intelligence (AI), many fields, including medicine, have been greatly impacted. The use of AI algorithms in disease diagnosis, personalized treatments, and predicting treatment outcomes has created enormous potential for improving the efficiency of healthcare systems. In this context, the question arises: Can AI replace doctors, or will it act as a complementary tool alongside them?

Methods: In this study, 50 scholarly and research articles were collected from reputable databases such as Google Scholar, PubMed, Scopus, and IEEE Xplore. These articles include research papers, reviews, scientific reports, and practical articles in various fields of AI and medicine, focusing on the applications of AI in healthcare, ethical challenges, and issues related to the replacement of doctors. The articles examine different aspects of AI usage in diagnosis and treatment, as well as the ethical concerns associated with it. In addition, the opinions of medical and technological experts regarding the interaction between humans and machines in the treatment process were also gathered.

Results: The use of AI in medicine has led to increased diagnostic accuracy and reduced human errors. However, these advancements come with various ethical challenges. Among these challenges are concerns regarding the protection of medical data privacy, accountability in case of errors by AI systems, and trust in these systems. Additionally, there are concerns about the psychological effects of replacing doctors with machines and the potential for creating social divides. Moreover, it seems that AI cannot fully replace the human and emotional aspects of care, which are essential for many patients.

Conclusion: The findings of this study suggest that AI cannot fully replace doctors at present. Instead, it can serve as a supportive and complementary tool in the hands of healthcare professionals. To achieve greater efficiency in healthcare systems, AI should be integrated with medical experts in a coordinated and ethical manner to avoid risks and address the ethical challenges involved.

Keywords: Artificial Intelligence, Medicine, Ethics, Physician Replacement

G-1699

The Transformative Role of Artificial Intelligence in Gut Microbiome-Based Diet Design: A Systematic Review

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Abstract:

Background and Aims: The gut microbiome significantly influences human health by modulating metabolic functions, immune responses, and disease risk. Traditional dietary recommendations often fail to account for individual microbiome variations, leading to suboptimal health outcomes. Recent advances in artificial intelligence (AI) have enabled precision nutrition strategies that leverage gut microbiome data for personalized dietary interventions. This systematic review aims to assess the efficacy of AI-driven approaches in designing microbiome-based diets and their impact on health outcomes compared to conventional dietary methods.

Methods: A systematic search was conducted across PubMed, Scopus, Web of Science, and IEEE Xplore for studies published between 2015 and 2024. Eligible studies included AI-driven dietary interventions tailored to gut microbiome profiles. Data extraction was performed based on AI methodologies, microbiome analysis techniques, and reported clinical outcomes. The PRISMA guidelines were followed for study selection and synthesis.

Results: A total of 27 studies met the inclusion criteria, including 12 cross-sectional studies, 9 randomized controlled trials (RCTs), and 6 cohort studies. AI methodologies predominantly involved machine learning (ML) models such as random forests, convolutional neural networks, and reinforcement learning algorithms. Cross-sectional studies (n=12) analyzed microbiome composition and dietary patterns, revealing strong correlations between AI-generated dietary recommendations and microbial diversity. RCTs (n=9) demonstrated that AI-driven dietary interventions led to superior metabolic outcomes, including a 0.8% reduction in HbA1c, a 12% decrease in LDL cholesterol, and a 15% increase in gut microbial diversity (Shannon index). Cohort studies (n=6) reported sustained long-term benefits, such as a 20% reduction in inflammatory markers (CRP) and enhanced short-chain fatty acid production. Comparatively, traditional dietary approaches showed lower predictive accuracy and adaptability to dynamic microbiome variations. Despite these promising results, challenges such as data heterogeneity, model interpretability, and ethical considerations remain barriers to clinical implementation.

Conclusion: AI-driven gut microbiome-based diets represent a paradigm shift in personalized nutrition, offering superior predictive accuracy and adaptability over conventional approaches. However, overcoming current challenges requires standardized validation frameworks, ethical AI governance, and integration of multi-omics data. Future research should focus on refining AI models for more robust and scalable dietary interventions.

Keywords: Artificial Intelligence, Gut Microbiome, Precision Nutrition

G-1787

From Code to Cure: Harnessing Artificial Intelligence for the Next Generation of 3D Bioprinting in Regenerative Medicine

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Abstract:

Background and Aims: Three-dimensional (3D) bioprinting and medical 3D printing are revolutionizing tissue engineering, regenerative medicine, and personalized healthcare. These advanced technologies enable the creation of highly precise biological constructs, prosthetics, custom implants, and surgical models. Despite the immense potential of these technologies, conventional 3D printing faces challenges related to material inconsistencies, variability in output, and limitations in scalability, all of which hinder their clinical application. The integration of artificial intelligence (AI), particularly machine learning (ML), offers solutions to overcome these barriers by providing data-driven optimization, real-time monitoring, and intelligent control over critical printing parameters.

Methods: This paper reviews the integration of AI techniques such as ML, Bayesian optimization, and computer vision into 3D bioprinting and medical printing platforms. These methods are utilized to improve print fidelity, reduce human error, and optimize printing parameters such as speed, pressure, and layer height. Additionally, AI models are explored for bioink design, cell viability prediction, and the fabrication of personalized tissues. Applications including organ-on-chip systems, pre-surgical anatomical models, and personalized drug screening are highlighted.

Results: AI-enhanced 3D printing technologies have shown significant improvements in print quality and precision. By incorporating machine learning algorithms, the systems are capable of dynamically adjusting printing parameters, thus improving reproducibility and consistency across multiple prints. Furthermore, AI-driven designs have led to the creation of optimized bioinks and functional tissue constructs that can be customized for individual patients, pushing the boundaries of personalized medicine. The integration of real-time feedback loops and computer vision allows for closed-loop systems that ensure optimal print outcomes and reduce material waste.

Conclusion: AI-driven advancements in 3D bioprinting hold transformative potential for medical fabrication, offering significant improvements in precision, automation, and personalization.

While challenges remain, including data quality, algorithm robustness, and regulatory hurdles, the convergence of AI and bioprinting is poised to revolutionize medical applications by enabling highly reproducible, patient-specific solutions in healthcare. Ongoing research and development are crucial to unlocking the full potential of this technology for clinical and therapeutic use.

Keywords: Artificial Intelligence, Machine Learning, 3D Bioprinting

G-1789

Artificial Intelligence in Prostate Cancer: Transforming Diagnosis, Therapeutics, and Personalized Care

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Abstract:

Background and Aims: Prostate cancer (PCa) remains one of the leading global health challenges, with high incidence rates and significant morbidity and mortality. Early detection and accurate diagnosis are pivotal in improving patient outcomes; however, conventional diagnostic methods often face limitations in precision and reliability. Recent advancements in artificial intelligence (AI) have shown promising potential to address these challenges by enhancing diagnostic accuracy, optimizing therapeutic strategies, and personalizing patient care. This paper aims to provide an overview of AI applications in the diagnosis and therapeutics of prostate cancer, exploring its role in revolutionizing the overall patient care pathway.

Methods: This review synthesizes current research on AI in prostate cancer management, focusing on machine learning (ML), deep learning (DL), and advanced imaging techniques. The analysis covers AI applications in diagnostic imaging, tumor characterization, surgical skill assessment, and outcome prediction. Furthermore, the paper evaluates how AI can be integrated into clinical workflows to facilitate personalized treatment plans, assist in risk stratification, and predict therapeutic responses. Emphasis is placed on recent advances in AI-driven biomarkers and clinically-integrated decision-making models.

Results: AI technologies, particularly ML and DL algorithms, have demonstrated exceptional potential in prostate cancer diagnostics. These AI models enhance the precision and sensitivity of diagnostic imaging, significantly outperforming traditional methods in detecting clinically significant prostate cancer. AI tools have also proven effective in assessing surgical skills, providing real-time feedback to optimize surgical outcomes. Furthermore, AI-based prognostic models have been developed to predict patient outcomes, enabling the creation of personalized treatment strategies. The incorporation of AI in radiation therapy design and predictive modeling for treatment response has also led to more targeted and effective therapies.

Conclusion: AI holds transformative potential for prostate cancer care by improving diagnostic accuracy, personalizing therapeutic approaches, and enhancing patient outcomes. While AI

applications in prostate cancer management have shown promising results, challenges such as the need for large, diverse datasets, addressing implementation barriers, and achieving regulatory approval remain. Despite these hurdles, the integration of AI into clinical practice offers significant opportunities for the future of prostate cancer diagnosis and treatment.

Keywords: Prostate Cancer, Artificial Intelligence, Personalized Medicine

G-1802

A Comparative Classifier-Based Approach of an AI-Driven Clinical Decision Support System for Accurate Diagnosis of Ischemic Heart Disease

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Abstract:

Background and Aims: Ischemic Heart Disease (IHD) is a leading cause of mortality worldwide and is often misdiagnosed due to overlapping symptoms with other cardiovascular conditions. This study aimed to develop an Artificial Intelligence (AI)-driven Clinical Decision Support System (CDSS) to aid in the accurate diagnosis of IHD using machine learning classifiers.

Methods: A retrospective dataset comprising 800 clinical records was used, with 712 cases retained after preprocessing. The data included 16 attributes such as age, sex, blood pressure, cholesterol, diabetes status, and personal habits. Attribute selection was informed by expert consultation and benchmark UCI datasets. Using Weka 3.7.0, 59 AI classification models were initially evaluated across multiple classifier families including Bayesian, tree-based, neural networks, rule-based, lazy learners, and support vector machines. Model performance was assessed using 10-fold cross-validation with sensitivity, specificity, accuracy, precision, F-measure, kappa statistics, and ROC area as key metrics. The top-performing algorithms were integrated into the CDSS prototype and evaluated against physician diagnoses and gold-standard ECG-based diagnoses.

Results: The KSTAR classifier demonstrated the highest performance with an accuracy of 79.32%, sensitivity of 89%, specificity of 79%, and ROC of 0.995. Other models such as IBk, RandomTree, and MLP also exhibited high diagnostic reliability. The CDSS showed substantial agreement with physician impressions ($k = 0.45$, $p = 0.001$), indicating its potential utility in real-world clinical settings.

Conclusion: AI-based CDSS can significantly enhance diagnostic accuracy for IHD and support clinical decision-making, particularly in resource-limited settings.

Keywords: Clinical Decision Support Systems, Ischemic Heart

G-1803

Development of a Deep Learning Clinical Decision Support System for Pediatric Epilepsy Syndrome Diagnosis

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Abstract:

Background and Aims: Epilepsy syndromes in children present with diverse clinical and electroencephalographic patterns, often leading to delayed or inaccurate diagnoses. This study aimed to develop a deep learning-based Clinical Decision Support System (CDSS) to assist in the early and accurate classification of pediatric epilepsy syndromes using clinical and EEG data.

Methods: A multicenter retrospective dataset comprising 1,050 pediatric cases aged 1–16 years was compiled from three neurology centers. The dataset included clinical features (age of onset, seizure type, developmental history), EEG recordings, and MRI findings. EEG signals were preprocessed through artifact removal, wavelet decomposition, and spectral feature extraction. A hybrid deep learning model combining a 1D Convolutional Neural Network (CNN) for temporal feature detection and a Bidirectional Long Short-Term Memory (Bi-LSTM) network for sequence modeling was implemented. Data were split into training (70%), validation (15%), and test (15%) sets. Model performance was evaluated using multi-class accuracy, F1-score, precision, recall, and the area under the receiver operating characteristic curve (AUC-ROC). The CDSS interface provided probabilistic outputs and visualizations for clinician use.

Results: The CNN–BiLSTM model achieved an overall accuracy of 72.6% and an F1-score of 0.81 across five major pediatric epilepsy syndromes. The system demonstrated high sensitivity in identifying benign epilepsy with centrottemporal spikes (75.4%) and childhood absence epilepsy (73.8%). The CDSS significantly outperformed traditional rule-based classification and showed high agreement with expert neurologists' diagnoses (kappa = 0.82).

Conclusion: This deep learning-powered CDSS shows promise in supporting neurologists by improving the diagnostic precision of childhood epilepsy syndromes.

Keywords: Epilepsy, Deep Learning, Clinical Decision Support

G-1816

The Role of Artificial Intelligence in Advancing Intelligent Virtual Assistants: A Systematic Review

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Abstract:

Background and Aims: The incorporation of Artificial Intelligence (AI) into intelligent virtual assistants (IVAs) has greatly improved human-computer interactions, facilitating more natural communication, tailored experiences, and enhanced task automation. AI-powered IVAs, including chatbots and voice assistants, utilize machine learning (ML), natural language processing (NLP), and deep learning to interpret and respond to user inquiries with growing precision. These tools are extensively used across sectors such as healthcare, finance, education, and customer service, offering real-time support and aiding in decision-making. However, challenges like contextual comprehension, AI model biases, and data privacy issues continue to be critical areas requiring further investigation.

Methods: This review systematically investigates advancements in AI-powered Intelligent Virtual Assistants (IVAs). A structured literature review was carried out by searching databases like PubMed, Scopus, and Web of Science, concentrating on studies published from 2023 to 2025, analyzing 60 peer-reviewed articles, 15 industry reports, and 10 case studies. The methodology includes a comparative evaluation of AI techniques applied in IVAs, focusing on innovations in natural language processing (NLP), speech recognition, and sentiment analysis. A meta-analysis of user experience studies evaluates the impact of AI-driven IVAs on customer engagement and satisfaction. Furthermore, the review delves into ethical concerns, privacy issues, and the potential of reinforcement learning to enhance adaptive, context-aware virtual assistants.

Results: The results show that AI-powered intelligent virtual assistants (IVAs) have boosted response accuracy by 35% over earlier versions, showcasing better contextual understanding and conversational fluidity. The adoption of transformer-based NLP models, like GPT and BERT, has markedly enhanced IVAs' capacity to produce coherent and contextually appropriate replies. Furthermore, AI-driven sentiment analysis has increased user satisfaction by 25%, enabling more empathetic and tailored interactions. Despite these advancements, challenges remain, including biases in language models, data privacy issues with managing intricate queries.

Conclusion: AI-driven virtual assistants are transforming digital engagement with precise responses, personalized experiences, and improved user interaction. Despite progress in NLP and contextual understanding, challenges like ethical AI, data protection, and bias persist. Future priorities include transparency, multilingual support, and enhanced real-time learning. As AI advances, IVAs will become essential in reshaping human-computer interaction.

Keywords: Artificial Intelligence, Intelligent Virtual Assistants

G-1817

Natural Language Processing-Based Simulated Patients: A Systematic Review of Interactive Case-Based Learning Tools in Medical Education

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Abstract:

Background and Aims: One promising application is the use of NLP-driven simulated patients, which offer learners dynamic, interactive case-based environments to develop clinical reasoning and communication skills. This review aims to synthesize current developments and evaluations of NLP-based simulated patient systems used in interactive medical education.

Methods: A comprehensive literature search was conducted across PubMed, Medline, Embase, Scopus, CINAHL, Web of Science, and CENTRAL databases in December 2024. The search strategy included keywords such as Natural Language Processing, Simulated Patients, Virtual Patients, Medical Education, Conversational AI, and Case-Based Learning. The initial search retrieved approximately 50 articles. After the removal of duplicates and application of inclusion criteria, 10 relevant studies were selected for full review. Exclusion criteria included non-English publications, studies lacking interactive case-based components, and those without measurable educational outcomes. Each study was assessed for NLP model type, user population, interaction modality, reported accuracy, educational impact, and technical or pedagogical limitations. A risk-of-bias analysis was performed using a standardized assessment checklist. From an initial pool of 50 publications, 10 studies met 8 predefined screening criteria and were analyzed in detail based on six critical dimensions, including system architecture, user population, interaction modality, performance metrics, educational outcomes, and reported limitations.

Results: The selected studies span diverse user groups, including medical students (n=6), resident physicians (n=2), and mixed or unspecified learners (n=2). Most systems employed custom-built NLP engines (n=7), while others utilized commercial (Watson Assistant, OpenAI GPT models) or open-source solutions. Interactions were primarily text-based, though some platforms supported voice or multimodal communication. Reported system performance varied, with response accuracies exceeding 90% in three studies, and F1 scores above 80% in another. Educational assessments highlighted improvements in diagnostic reasoning, communication, and history-taking skills. Notably, one study documented an 82% diagnostic accuracy among first-year

residents, while another demonstrated improved post-simulation test scores. Key challenges included limitations in training data and occasional off-topic responses.

Conclusion: NLP-driven simulated patients show significant promise for enhancing clinical training through realistic, adaptive, and measurable learning experiences. Continued advancements in NLP technology and pedagogical.

Keywords: Computer Simulation, Education, Medical, Clinical Competence

G-1818

Application of Convolutional Neural Networks in the Early Detection of Lung Cancer Using CT Scan Images: A Scoping Review

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Abstract:

Background and Aims: Lung cancer is one of the most lethal cancers worldwide, and early detection plays a vital role in improving treatment outcomes. Due to the challenges associated with manual analysis of CT scan images, Convolutional Neural Networks (CNNs) have been considered a precise and automated solution for detecting pulmonary lesions. This study aims to systematically evaluate the performance of CNN models in detecting lung cancer from CT scans and to identify methodological trends.

Methods: This scoping review was conducted in accordance with PRISMA guidelines. Articles were retrieved from PubMed and Web of Science databases using the keywords "CNN", "Lung Cancer", "Detection", and "CT Scan" up to the year 2024. Original studies that focused on using CNN for lung cancer detection and were published in English were included. Review papers, editor letters, and protocols were excluded. Key features extracted from the studies included evaluation metrics (accuracy, sensitivity, AUC), datasets used, types of algorithms, and the most effective CNN models for lung cancer detection.

Results: Out of 30 identified studies, 11 met the inclusion criteria and were analyzed in this scoping review. The most commonly used CNN models were InceptionResNetV2 and ResNet152V2. On average, these models achieved an accuracy of 99.64%, sensitivity of 97.84%, specificity of 97.2%, and AUC ranging from 0.936 to 0.961, indicating high performance in detecting lung cancer. The most frequently used datasets were LUNA16 (54.54%) and LIDC-IDRI (45.45%). Several studies showed that combining CNNs with optimization techniques such as Particle Swarm Optimization (PSO) or hybrid models like UNet +Transformer significantly enhanced diagnostic performance. Additionally, using SMOTE to address data imbalance proved effective in some studies.

Conclusion: The reviewed studies demonstrate that CNNs, particularly advanced models like InceptionResNetV2 and ResNet152V2, show strong potential for detecting lung cancer from CT scan images. This can lead to earlier diagnosis and improved treatment outcomes for patients. However, there remains a need to develop lightweight models suitable for clinical settings and to integrate hybrid approaches for improving accuracy in early-stage detection. The findings of this study may serve as a guide for designing AI-based systems for lung cancer screening.

Keywords: CNN, Detection, Lung Cancer, CT Scan

G-1700

Tracking Anxiety: A Simple Software for Analyzing Mouse Behavior in Open Field Test

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Abstract:

Background and Aims: Anxiety-like behavior is widely studied in rodent models, with the Open Field Test (OFT) being a standard method for evaluation. Typically, reduced center zone exploration and increased thigmotaxis indicate heightened anxiety. Manual scoring is time-consuming and prone to bias, while commercial automated tools are often expensive. This study introduces RASAD, a lightweight, low-cost software developed to automatically assess two anxiety-related parameters from OFT videos: center zone time and total distance traveled.

Methods: Eighteen adult male mice (8–10 weeks, 25–30 g) were divided into three groups (n = 6): (1) Control, (2) Citicoline-treated (100 mg/kg, i.p., daily for 21 days), and (3) Ketamine-treated (10 mg/kg, i.p., single dose, 30 min before test). Each mouse was tested in a 50 × 50 cm open field for 5 minutes. Behavior was recorded using an overhead camera (480×640 px, 15 fps), resulting in 18 videos.

Using Python and OpenCV, RASAD tracked mouse position, calculated time spent in the 25 × 25 cm center zone, and measured total distance. Manual scoring by trained observers validated the automated data.

Results: Compared to Ethovision, RASAD demonstrated approximately 75% agreement with manual scoring. In the control group, mice traveled an average of 1100 ± 150 cm and spent 50 ± 10 seconds in the center zone. Citicoline-treated mice exhibited slightly increased locomotion (1150 ± 130 cm) and center zone time (70 ± 12 seconds). In contrast, Ketamine-treated mice spent significantly more time in the center (110 ± 18 seconds) with a reduced total distance traveled (980 ± 110 cm), indicating a strong anxiolytic effect with minimal impact on overall activity.

Conclusion: RASAD provides an efficient and affordable solution for OFT analysis, especially for small labs. With further development, incorporating machine learning algorithms could enhance its accuracy and expand its capabilities, making it a powerful, low-cost alternative to expensive commercial tools like Ethovision.

Keywords: Python, Artificial Intelligence, Open Field Test, Anxiety, Mouse

G-1701

Development of Intelligent Systems in Intensive Care: A Review of Digital Innovations and the Application of Artificial Intelligence

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Abstract:

Background and Aims: Recent advances in digital health driven by rapid progress in artificial intelligence (AI) and data analytics are transforming intensive care units (ICUs). Intelligent systems are critical for enhancing clinical decision-making, improving patient monitoring, and optimizing treatment outcomes for critically ill patients. This review examines current AI applications in ICUs, focusing on early detection of patient deterioration, resource management, and personalized care. It also discusses challenges such as data interoperability, privacy concerns, and ethical dilemmas that affect integration.

Methods: A systematic literature review was conducted using databases including PubMed, Google Scholar, Scopus, and Web of Science. The review targeted studies published from 2020 to 2025 on AI applications in intensive care, specifically in Clinical Decision Support Systems (CDSS), predictive analytics, and real-time monitoring systems. Seventeen articles were selected following strict inclusion and exclusion criteria. Data were extracted and analyzed using standardized protocols to assess both the benefits of these systems and the technical and ethical challenges involved.

Results: Our findings indicate a notable increase in the adoption of AI technologies in critical care. These systems effectively trigger early warnings, reduce alert fatigue, and streamline clinical processes through real-time data integration. However, challenges remain, including difficulties in seamless data integration, concerns over patient privacy, and hesitancy among healthcare providers to adopt these innovations.

Conclusion: Integrating AI in ICUs marks a significant shift toward a more efficient, data-driven healthcare model. While enhanced patient monitoring and personalized treatment offer promising benefits, resolving technical and ethical challenges is essential for successful implementation. Future research and collaborative efforts are necessary to fully realize the

potential of digital innovations in transforming intensive care practices. This review highlights the role of AI in reshaping critical care and urges efforts to overcome barriers.

Keywords: Artificial Intelligence, Intensive Care, Digital Health

G-1704

Intelligent Health Risk Analysis System Based On Multimodal Deep Learning With Interpretability

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Abstract:

Background and Aims: Cardiovascular disease (CVD) remains a leading global health burden, necessitating advanced tools for early risk prediction. Current models often lack integration of multi-modal data and interpretability, limiting their clinical utility. This study aims to develop a hybrid deep learning framework that synergizes genetic, clinical, and wearable sensor data to predict CVD risk while quantifying feature contributions for actionable clinical insights.

Methods: A CNN-BiLSTM-DNN architecture was designed: 1) CNNs process structured genetic (APOE4, PCSK9, LDLR) and clinical (age, blood pressure, BMI) data; 2) BiLSTM analyzes 14-day hourly heart rate patterns from wearables to capture circadian rhythms; and 3) a DNN integrates these features for risk prediction. Model interpretability was enhanced using gradient-based SHAP analysis. Synthetic data for 5,000 patients, including 336 hourly heart rate samples per patient, were generated via simulations reflecting biological and clinical variability. Performance was evaluated against logistic regression and random forests using MSE, R^2 , and AUC metrics.

Results: The hybrid model achieved superior performance (MSE=0.021, R^2 =0.89, AUC=0.93) compared to logistic regression (AUC=0.79) and random forests (AUC=0.85). SHAP analysis identified APOE4 (contribution=0.23), systolic blood pressure (0.18), and circadian heart rate variability (0.15) as top predictors, highlighting genetic-clinical-temporal interplay. The framework demonstrated robust predictive accuracy while enabling transparent risk stratification for personalized prevention.

Conclusion: This study advances CVD risk prediction by integrating multi-modal data and interpretable AI, offering clinically actionable insights for prioritizing high-risk patients or tailoring monitoring strategies. The framework bridges AI scalability with clinical trust, emphasizing the synergistic role of genetic and physiological factors. Future work includes validation on real-world datasets and incorporation of additional biomarkers. This approach holds promise for scalable, preventive cardiology tools that align precision analytics with translational transparency.

Keywords: Cardiovascular-Disease Prediction, CNN-BiLSTM-DNN-Hybrid, Smart medicine, Smart-Medical-Assistant

G-1705

Application of Internet of Things in the Management of Asthma: A Systematic Review

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Abstract:

Background and Aims: The advancement of new technologies such as the Internet of Things (IoT) has enabled the precise control and monitoring of the condition of patients, especially patients with asthma. This technology provides doctors and patients with vital information in real time using smart sensors and connected devices. This study aims to investigate the application of the Internet of Things in asthma management.

Methods: In this study, a comprehensive search was conducted in three databases (PubMed, Scopus, Embase) from 2015 to 2025 using keywords related to Internet of Things and asthma. The analysis of titles, abstracts, and full texts of articles was performed independently based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines.

Results: Seventeen articles were included in the study based on the inclusion criteria. nine articles focused on remote monitoring of asthma patients, four articles on patient self-management, and four other articles on asthma attack prediction using artificial intelligence and the Internet of Things. In these studies, the Internet of Things has been proposed as a key tool for collecting vital data (arterial pressure, blood oxygen saturation, heart rate, and body temperature), air quality data (atmospheric pressure, temperature, humidity, and dust concentration), recording patient symptoms, medication consumption, and tracking patient activities using smart sensors, Bluetooth, and Wi-Fi. The results of these studies indicate the high potential of the Internet of Things in improving asthma management and control, especially in the field of continuous and accurate monitoring of asthma patients.

Conclusion: The use of IoT in the management of asthma patients is very useful, especially for patients in remote areas and the elderly who may have limited access to medical services. These systems can act as a communication bridge between patients and doctors and enable rapid and effective decision-making by sending vital data in real time.

Keywords: Internet of Things, Asthma, Telemedicine

G-1707

Application of artificial intelligence in personalized nursing care: A scoping review

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Abstract:

Background and Aims: Artificial intelligence (AI) was introduced in 1956 and has since evolved into an informative technology in medical sciences. AI offers a predictive, preventive, and personalized approach, enabling precise and timely solutions while potentially reducing healthcare costs without compromising quality. This study aims to address the following question: What is the Application of artificial intelligence in personalized nursing care?

Methods: This study follows a scoping review methodology, conducting a systematic search in reputable databases, including Web of Science, PubMed, Scopus, and Google Scholar, using keywords related to AI, nursing care, and personalized healthcare. All review articles, clinical trials, and cross-sectional studies published in Persian and English until 1 February 2024 were analyzed. After the initial screening, relevant studies were evaluated based on content, methodology, and findings.

Results: A total of 196 articles were identified. After removing duplicates through objective screening, 32 articles were included in the final review. The results addressed four primary research questions: Does AI have applications in nursing care? (8 studies;25%), Can AI assist in diagnosing and monitoring patient complications? (12 studies;37%), Does AI improve patient experience and healthcare engagement? (6 studies;18/75%), What are the challenges and limitations of AI in personalized nursing care? (6 studies; 18/75%)

Conclusion: Current healthcare models can't be maintained in their present form. The rapid development of modern technologies, particularly AI, will inevitably transform healthcare delivery. This review provides valuable insights into the multifaceted applications of AI in healthcare and personalized care. Research findings demonstrated that intelligent scheduling algorithms reduced nursing workload and human errors by up to 60%, enabling faster interventions. Machine learning-based systems predicted complications such as pressure ulcers or hospital-acquired infections with up to 92% accuracy. AI-powered chat-bot platforms and applications improved patient adherence to treatment plans by 45% and enhanced satisfaction

through personalized education. Studies also identified challenges, including privacy concerns and resistance among clinical staff.

In conclusion, integrating AI into personalized nursing care represents a fundamental transformation that requires future investigation to address existing limitations.

Keywords: Artificial Intelligence, Personalized Nursing Care, Technology

G-1708

Improving the diagnosis of attention deficit hyperactivity disorder using convolutional neural networks: Review of previous work and explanation of a research framework

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Abstract:

Background and Aims: Attention-deficit/hyperactivity disorder is one of the most common neurodevelopmental disorders, affecting approximately 5-7% of children and 2-5% of adults worldwide. The disorder is characterized by symptoms such as inattention, hyperactivity, and impulsivity, and can have significant negative impacts on academic, occupational, and social functioning. The diagnosis of ADHD is usually based on clinical interviews, questionnaires, and observation of patient behavior, but these methods can be subjective and time-consuming. In recent years, the use of convolutional neural networks has emerged as a powerful tool in the fields of medicine and psychology to diagnose this disorder. The aim of this study is to develop and evaluate a convolutional network model for classifying brain signals to diagnose attention deficit hyperactivity disorder versus a control group.

Methods: This paper uses a One-dimensional convolutional neural network to diagnose ADHD with an accuracy of about 81%. The proposed method has a good balance between accuracy and efficiency and can be improved by combining multimodal data (e.g. Electroencephalography + fMRI) or using hybrid architectures (e.g. CNN + LSTM).

Results: This study demonstrates that convolutional neural networks are a promising tool for objective and automated diagnosis of ADHD. Despite its limitations, the proposed model has the potential to become an aid in clinical diagnosis with acceptable accuracy (~81%) and high stability. Further research focusing on improving interpretability and reducing computational costs could bring this technology to the stage of practical application.

Conclusion: The one-dimensional CNN model designed in this study was able to accurately distinguish 80.87% of people with ADHD from the healthy group. This result shows that processing EEG signals with deep learning methods is a good alternative to traditional methods (such as mental questionnaires). In addition, the model was able to identify hidden patterns in brain signals well. Therefore, convolutional neural are an accurate, automated, and promising tool for diagnosing ADHD, which, despite technical challenges, have the potential to change current diagnostic methods.

Keywords: ADHD, CNN, Deep Learning, EEG, fMRI

G-1709

A Clinical AI System for Rapid and Differential Diagnosis of Gestational Diabetes, Preeclampsia, and Urinary Tract Infection

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Abstract:

Background and Aims: Managing pregnancy emergencies requires swift and accurate decision-making by emergency physicians and midwives to minimize risks to both the mother and fetus. This study aims to design and implement an AI-based decision support system (DSS) to assist healthcare providers in this critical process, enhancing the efficiency and accuracy of clinical decisions.

Methods: The proposed model utilizes machine learning algorithms, specifically XGBoost and Random Forest. Data was extracted from the Perinatal Quality Assurance (PERI) system of IQTIG. Following data preprocessing, the model was trained on the dataset, and its performance was rigorously evaluated to ensure reliability.

Results: The results indicate that the AI-based system can accurately predict patient conditions and provide effective treatment recommendations. A graphical user interface (GUI) and a web-based API were developed for practical implementation in hospital settings. This allows seamless integration with hospital information systems (HIS) and electronic health records (EHR). Initial evaluations conducted in a simulated hospital environment demonstrated a significant reduction in diagnosis time, achieving up to a 40% decrease, and approximately 93% agreement with expert decisions.

Conclusion: These findings emphasize the substantial impact that an AI-based decision support system can have on improving clinical decision-making in managing pregnancy-related emergencies. The study also discusses practical challenges in implementing this system in clinical environments and explores potential future developments to enhance its usability and effectiveness.

Keywords: ml, AI, Diagnosis, Pregnancy, XGBoost

G-1710

Applications of Artificial Intelligence in Veterinary Imaging, A systematic Review

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Abstract:

Background and Aims: Diagnostic imaging is essential in veterinary medicine, allowing veterinarians to detect injuries and diseases through techniques like X-rays, ultrasound, MRI, and CT scans. However, accurately interpreting these images requires specialized expertise, which can be challenging and time-consuming. Artificial intelligence (AI) offers tools to improve diagnostic accuracy and efficiency. This review focuses on AI applications in analyzing bone radiographs, which are simpler and more consistent than complex imaging types like lung and heart ultrasounds.

Methods: This study followed JBI and PRISMA guidelines. A comprehensive search of PubMed, Scopus, Embase, and Web of Science databases was conducted for peer-reviewed studies published in the last five years. Relevant MeSH terms included "Artificial Intelligence," "Deep Learning," "Bone Imaging," "Dogs," "Cats," and "Horses." Studies specifically addressing AI analysis of bone X-rays were selected. Out of 220 screened articles, eight met the inclusion criteria.

Results: From the 220 records, eight studies met the criteria. Most AI models were Convolutional Neural Networks (CNNs), demonstrating impressive accuracy in detecting fractures and joint abnormalities in bone radiographs, with accuracy rates reaching 94%, sensitivity at 91%, and specificity at 89%. Some studies also reported success in analyzing heart ultrasounds, identifying cardiomyopathy and valve defects with 90% accuracy, 88% sensitivity, and 87% specificity. Despite these advancements, challenges remain in standardization, data privacy, and practical integration of AI tools into clinical practice.

Conclusion: Bone radiographs offer a promising application for AI due to their simplicity, clarity, and availability. AI tools enhance the detection of bone injuries and abnormalities more quickly and accurately than traditional methods. Future research should focus on refining models and expanding their application to larger datasets. AI systems have significant potential to assist veterinarians in providing more consistent and efficient diagnoses.

Keywords: Artificial Intelligence, Imaging, Bone Radiographs, Systematic Review, Deep Learning, Veterinary

G-1711

Artificial Intelligence and Optimization of Reproduction in Livestock Farming, A systematic review

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Abstract:

Background and Aims: Achieving optimal reproductive efficiency is fundamental to livestock farming, especially in species such as cattle and sheep, where fertility directly influences productivity. Conventional methods for detecting estrus and managing breeding are often labor-intensive and prone to inaccuracies. Artificial intelligence (AI) provides innovative tools to enhance reproductive processes by improving estrus detection, optimizing breeding schedules, and boosting fertility outcomes. This systematic review aims to evaluate AI-based technologies designed to enhance reproductive performance in livestock.

Methods: Following the JBI and PRISMA guidelines, a systematic search was conducted across PubMed, Scopus, Embase, and Web of Science databases to identify peer-reviewed articles published within the last five years. The search strategy incorporated MeSH terms such as "Artificial Intelligence," "Machine Learning," "Estrus Detection," "Breeding Management," "Cattle," "Livestock," and "Precision Livestock Farming." Studies focusing on AI applications in heat detection, breeding scheduling, genetic selection, or predicting reproductive outcomes were included. From 372 screened records, 12 studies satisfied the inclusion criteria.

Results: Out of 372 screened articles, twelve met the inclusion criteria. AI-driven systems, including deep learning models and computer vision tools, have demonstrated remarkable efficacy in estrus detection and breeding management. Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) analyzing sensor data achieved sensitivity rates exceeding 90% in detecting heat patterns. Additionally, computer vision techniques have automated estrus cue identification, leading to improvements in breeding timing and conception rates. AI models aimed at predicting pregnancy success and assessing semen or embryo quality have also enhanced selection procedures. Notably, a deep learning model analyzing uterine images achieved a 15% improvement in conception rates compared to conventional methods.

Conclusion: AI-powered technologies are revolutionizing livestock reproduction by automating estrus detection, enhancing insemination timing, and improving genetic selection processes. However, further validation across different breeds and conditions is essential. Future research

should emphasize developing standardized protocols and enhancing model robustness to enable broader clinical implementation.

Keywords: Artificial Intelligence, Reproductive Management, Estrus Detection, Breeding Management, Systematic Review

G-1712

Applications of Artificial Intelligence in Improving Medical Data Analysis and Decision-Making, A systematic Review

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Abstract:

Background and Aims: Artificial Intelligence (AI) is progressively utilized in healthcare to enhance data processing, facilitate diagnoses, and assist clinical decisions. Given the surge in medical data, AI can streamline information management, thereby improving patient care. This review aims to examine the application of AI in healthcare data processing and decision-making, promoting greater accuracy and reliability in medical systems.

Methods: This review adhered to standard systematic review protocols, conducting searches across PubMed, Scopus, Embase, and Web of Science databases. Articles published within the last five years were selected, emphasizing keywords like "Artificial Intelligence," "Machine Learning," "Medical Data Analysis," "Clinical Decision Support," and "Digital Health." Studies employing AI for medical data processing, clinical decision support, or prediction accuracy enhancement were prioritized. A total of 15 studies were chosen from 412 records screened based on these criteria.

Results: From the review of 412 records, fifteen studies were identified. Various AI techniques, such as foundational machine learning models, text analysis tools, and diagnostic algorithms, were implemented to boost data analysis and decision-making. Convolutional Neural Networks (CNNs) demonstrated accuracy rates exceeding 85% in analyzing medical images. Additionally, some studies employed Natural Language Processing (NLP) to enhance the understanding of patient records, thus improving clinical support systems' accuracy. Foundational machine learning models were also utilized to forecast patient outcomes and refine treatment plans.

Conclusion: AI technologies are increasingly leveraged for processing medical data, aiding clinical decisions, and predicting patient care outcomes. Although these technologies hold great promise, further research is essential to ensure their reliability and effectiveness across diverse healthcare environments.

Keywords: Artificial Intelligence, Clinical Decision, Data Analysis, Decision Making, NLP, Systematic Review

G-1714

Attitudes Of Medical Mtudents Towards Artificial Intelligence

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Abstract:

Background and Aims: Emerging AI technologies are spreading rapidly, and their use in Student Education has become commonplace. We're looking for a comprehensive study that examines the importance of AI training for medical students. So this systematic review was aimed at analyzing the importance of AI training for medical students.

Methods: In this systematic review, extensive searches were performed with keywords related to 'artificial intelligence', 'education' and 'medical science students' in the international databases of Web of Science Core Collection, PubMed/Medline Scopus, Google_Scholar search engine, and national databases of Irandoc, SID, and Magiran. The initial search yielded 115 studies. Inclusion criteria were publication in Persian/English and free access to the text. Grey literature came out. A 10-year time limit was imposed. After eliminating duplicates and critiquing with relevant tools, at least 11 studies were analyzed. Ethical considerations of non-bias were observed at the stages of selection, extraction, analysis, and classification of evidence, and the abstract was reported according to PRISMA.

Results: The initial search yielded 115 studies. 11 studies were finally analyzed. A review of the studies showed that more cross-sectional studies were often done on students aged 20 to 25. This study most participants are unhappy with the severe shortage of educational opportunities associated with the use of artificial intelligence techniques in Medical Sciences. The findings complement the need for a proactive approach in preparing medical science students for the future. The future where AI plays a pivotal role in health care. It must ensure that they not only welcome technological advances, but also support human values inherent in medical science.

Conclusion: Since AI tools are currently advancing towards clinical implementation and there is currently a shortage of educational opportunities on AI in medicine this study identifies the need to integrate AI education into medical science curricula, taking into account regional differences in perceptions and educational needs.

Keywords: Artificial Intelligence, Education, Medical Science Students

G-1716

Precision and Innovation: 3D Printing technology in Modern Spinal Therapies

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Abstract:

Background and Aims: Spinal deformities, including scoliosis, kyphosis, and kyphoscoliosis, represent complex challenges in clinical care. 3D printing technology has emerged as a groundbreaking innovation, offering unparalleled precision and customization in both surgical and non-surgical management. This review explores the integration of 3D printing in spinal deformity therapies, focusing on its influence on surgical accuracy, clinical outcomes, and patient-centric innovations.

Methods: A scoping review was conducted using PubMed, Scopus, and Google Scholar, with search terms “scoliosis,” “kyphosis,” “spinal deformities,” and “3D print*” (September 2024). Studies involving 3D printing for surgical or non-surgical applications were included. Data extraction and thematic analysis were performed collaboratively, organizing findings based on methodologies and clinical outcomes.

Results: The application of 3D printing in spinal deformity treatments has demonstrated diverse clinical advancements. The integration of 3D printing in spinal deformity treatments has driven notable clinical advancements across surgical and non-surgical domains. Navigation templates improved pedicle screw placement reliability, achieving correction rates between 55%-68%, accuracy rates consistently exceeding 90%, and precision rates averaging 93%-97%, while reducing intraoperative complications and enhancing surgical precision. Preoperative 3D planning models provided accurate visualization of complex anatomies, enabling osteotomy precision rates of 97% and improving patient safety. Personalized guidance templates further enhanced fixation segment determination and surgical efficiency. Non-surgical innovations included 3D-printed braces that optimized pressure distribution, improved patient comfort, and minimized X-ray dependency, alongside posture correctors improving spinal alignment for kyphosis. Despite its transformative potential, barriers such as high production costs, material variability, and lack of

standardization highlight the need for further research to broaden its accessibility and maximize its clinical impact.

Conclusion: 3D printing has transformed spinal deformity management by uniting precision engineering with patient-centered care, improving surgical accuracy, reducing complications, and enhancing patient satisfaction. The technology holds significant promise in addressing healthcare gaps in LMICs, offering scalable and cost-effective solutions through local fabrication of patient-specific tools. Furthermore, it exemplifies the power of Technology-Enhanced Learning (TEL) in medical education, equipping surgical residents and specialists with interactive and practical training. By overcoming technological and economic barriers, 3D printing is poised to redefine global healthcare and education standards.

Keywords: 3d printing, Scoliosis, Kyphosis, Orthosis

G-1717

AI and Image Analysis: A New Frontier in Surgical Site Infection Prediction

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Abstract:

Background and Aims: Surgical Site Infections (SSIs) are a significant source of postoperative complications, frequently diagnosed at advanced stages due to reliance on physical examination. Delayed detection leads to elevated morbidity, mortality, and prolonged hospital stays. Leveraging artificial intelligence (AI) and medical image processing presents a transformative solution for early SSI detection during the subclinical phase, enabling timely interventions. This study conducted a scoping review to evaluate the integration of image analysis and deep learning models (DLMS) for SSI prediction and prevention.

Methods: A comprehensive literature search was performed in December 2024 across databases including PubMed, Scopus, and Google Scholar using keywords such as “medical image processing,” “Image Processing, Medical,” “surgical site infection,” “surgical wound infection,” and “artificial intelligence.” Studies employing image processing methodologies for SSI prediction were included. Screening and data extraction were independently conducted by two reviewers. Thematic analysis synthesized insights, focusing on algorithmic performance, clinical outcomes, and implementation challenges.

Results: NLP algorithms achieved 93% recall and 82% precision, outperforming manual chart reviews for detecting intra-abdominal SSIs. Deep learning models using preoperative CT imaging achieved 92% accuracy, with sensitivity and specificity of 76.7% and 53.3%, respectively, enhancing predictions of surgical complexity and SSI occurrence. Thermal imaging techniques demonstrated 92% accuracy and 100% specificity, effectively identifying abnormal wound healing. Smartphone-based applications using segmentation algorithms achieved sensitivity and specificity rates of 83% and 69%, offering scalable diagnostic potential for resource-limited environments. These advancements enabled early SSI detection, improving patient outcomes by reducing morbidity, mortality, and hospital stays. Preoperative imaging facilitated surgical planning, personalizing strategies and minimizing intraoperative complications. Remote applications expanded diagnostic accessibility, addressing healthcare disparities in underserved

regions. Challenges include variability in image quality, algorithmic bias, and limited standardized datasets, underscoring the need for interdisciplinary collaboration and further research to optimize implementation.

Conclusion: AI-driven image processing is revolutionizing SSI detection, offering unprecedented accuracy and accessibility, particularly in remote settings. Multimodal data frameworks, standardized datasets, and interdisciplinary approaches are essential for advancing integration into surgical care, reducing costs, and enhancing global healthcare equity.

Keywords: Medical Image Processing, Surgical Site Infection

G-1719

Clinical assistant on the front line of decision-making: How does artificial intelligence help improve the quality of services to the treatment team?

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Abstract:

Background and Aims: Providing healthcare services on the front lines of encountering patients inside or outside the hospital is a vital priority. Given the existing infrastructure in Iran's healthcare sector, it is very important to answer the question of how artificial intelligence can be used to make important treatment decisions in the golden times of care and treatment?

Methods: First, to collect information on the use of artificial intelligence in providing services, reliable and accessible databases such as CINAHL, Scopus, Web of Science, PubMed, Medline, Irandoc, Magiran, and SID were used. The search was conducted with the keywords artificial intelligence, providing services, hospital, emergency, patients, staff, nurses, and doctors between 2020 and 2025. Of the 16 relevant articles, 7 were used that were appropriate for the purpose of the study.

Results: The results of the studies showed that artificial intelligence can help the treatment team make appropriate and timely decisions by analyzing patient data and identifying disease patterns. It can also be very useful by designing automated triage systems by predicting the number of patients and allocating facilities correctly to prioritize services. It can also be helpful in accessing essential medical information; training and simulation to strengthen skills in triage and crisis management for treatment staff; and by embedding decision support systems.

Conclusion: Therefore, given the valuable role of using artificial intelligence technology in the context of care and treatment, it is necessary to employ experts in this treatment context and benefit from interdisciplinary cooperation with the treatment team in order to provide acceptable and effective quality services to the community.

Keywords: Clinical Assistant, Artificial Intelligence, Clinical Decision

G-1720

The use of robotics in the care and treatment space: A narrative review

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Abstract:

Background and Aims: Today, robotic technology has expanded its applications from industry to clinical and rehabilitation, pediatric and geriatric nursing, relief operations, etc. For robotics to function successfully, it is necessary to upgrade to a new level of capability, physical skills, and intellectual and cognitive capabilities. The aim of this study is the use of robotics in care and treatment environments.

Methods: This study was written in 2024-2025 according to the PRISMA guidelines. Keywords included robotics, care and treatment, patients, and hospital staff. A search was conducted in Persian and English databases, including CINAHL, Scopus, Web of Science, PubMed, Medline, Irandoc, Magiran, and SID, between June 2010 and March 2025. Articles in the fields of treatment, intensive care, and rehabilitation were included in the study and analyzed.

Results: In this study, 11 relevant articles were finally selected and reviewed. The most common use of robotics was in the field of remote presence in the treatment and rehabilitation of patients. Robots were beneficial in providing shorter response times, early interventions, and in reducing patient mortality. The challenges of the remote presence of robots include financial and legal barriers. The use in rehabilitation and in patient assessment through ultrasound assessment, or sending ECG from ambulances to medical centers resulted in satisfactory results and saved time and increased efficiency, and in the distribution and delivery of drugs, they increased efficiency and saved costs. All robots had technological limitations and indirect treatment costs.

Conclusion: The use of robotic technology in treatment, care, and rehabilitation environments can be a useful and effective intervention for the medical team, providing significant benefits for patients, hospital staff, and ultimately treatment organizations.

Keywords: Robotics, Healthcare, Intelligent Robot, Treatment

G-1727

Applications of ChatGPT in Medical Sciences Research

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Abstract:

Background and Aims: ChatGPT is part of a line of large language models (LLM) that may significantly influence how researchers in the medical field approach their work in the future. We aimed to review the recent applications of ChatGPT in medical sciences research.

Methods: To review the literature, the information sources available in the PubMed, Scopus, Web of Science, and ScienceDirect databases were used. The search in these databases was conducted on July 25, 2024 using keywords such as "ChatGPT*", "Chat GPT*", "Chatbot*", "Chat bot*", "research*", "search*", "medical research*", "health research*".

Results: Sixteen articles met the inclusion criteria for full-text review. The present study's findings showed that the most common application of ChatGPT was in research in the field of surgery. Results from other articles showed that this tool is also used for research in other areas of medical sciences, such as epidemiology, kidney transplantation, orthopedics, emergency medicine, dermatology, and global health. In all studies, researchers used ChatGPT to conduct research, present research ideas and prioritize them, rewrite consent forms in research projects, write and summarize articles, peer review, search for literature reviews, correct grammatical errors in draft articles, and perform statistical analysis.

Conclusion: Given the increasing use of various artificial intelligence tools, including ChatGPT, in research, identifying its most common applications can help ensure the appropriate and ethical use of this tool. It is concluded that ChatGPT could help medical and health sciences researchers, especially new researchers, with caution in many aspects of research. Future studies should review the challenges of ChatGPT in medical sciences research.

Keywords: Artificial Intelligence, ChatGPT, Large Language Models

G-1728

Digital transformation in elderly care: The role of the Internet of Things in improving quality of life

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Abstract:

Background and Aims: With the rising elderly population and the increasing demand for care services, the Internet of Things (IoT) offers strong potential to improve their quality of life. This article examines its use in health monitoring, smart homes, and social connection, along with related challenges.

Methods: This review study examined articles from electronic databases including PubMed, CINAHL, Web of Science, Google Scholar, Magiran, and SID, using keywords such as *Internet of Things* and *Elderly Health*, covering the period from 2000 to 2024.

Results: The results of this study are structured into four main areas: remote health monitoring, smart homes, socio-psychological benefits, and existing challenges. In terms of health monitoring, IoT devices collect real-time physiological data, enabling continuous tracking of elderly health. Smart homes, through sensors and automated systems, create a safe and manageable environment that promotes elderly independence. Socially, IoT technologies such as social robots help reduce loneliness and improve psychological well-being by enhancing communication and interaction. However, challenges like data privacy and security, high implementation costs, complexity of use, and lack of standardization hinder widespread adoption. Addressing these challenges is essential for effectively utilizing IoT to enhance the quality of life for the elderly.

Conclusion: A total of 68 articles were identified in the initial search, of which 35 full-text articles were thoroughly reviewed. The results indicate that the Internet of Things (IoT) has substantial potential to enhance the quality of life for the elderly by supporting independent living, real-time health monitoring, and increased social connectivity. However, concerns regarding privacy, data security, and technological complexity continue to pose significant barriers to widespread adoption.

Keywords: Internet of Thing, Health Elderly

G-1729

Application of Artificial Intelligence In Dentistry

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Abstract:

Background and Aims: Artificial intelligence in dental science is a powerful tool for diagnosis, treatment and prevention. One of the most important applications of artificial intelligence in dental science is accurate diagnosis through radiological images

Deep learning algorithms enable machines to analyze images better than even professional dentists. Another application of artificial intelligence in dentistry is personalization of treatments or Individual Dentistry. The scanners provide the best treatment by recording the patient's oral condition and artificial intelligence using the stored information. Artificial intelligence algorithms can identify hidden patterns and help dentists take preventive measures. Today, artificial intelligence has opened its place in dental education and research. The purpose of this review article is to investigate the application of artificial intelligence in the science and art of dentistry.

Methods: This review was conducted using the electronic versions of the articles available in Pubmed/Medline, Scopus (Elsevier), Web of Sciences (Claritive Analytics) from 2020 to 2023 using the keywords Artificial Intelligence, Dentistry, Education, Machine learning. All the studies were in English and finally 123 articles were found in the search, of which 43 matched the desired titles, were selected and analyzed

Results: Artificial intelligence is a reliable tool in diagnosing, increasing the quality of treatment and predicting the failures of dental treatments, and its limitations include the lack of familiarity of dentists, expensive equipment and the complexity of working with it, and until the limitations are resolved, it can be used as an auxiliary tool in dentistry.

Conclusion: With today's technology, it seems that diagnosis in radiology and treatment planning in orthodontics have the greatest application of artificial intelligence in dentistry.

Keywords: Artificial Intelligence, Dentistry, Machine Learning, Education

G-1731

Chatbots and Medical Sciences Education: A Review of Applications and Challenges

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Abstract:

Background and Aims: Recent advancements in artificial intelligence, particularly large language models (LLMs) such as ChatGPT, have significantly influenced medical education. These technologies are capable of supporting various educational domains, including fundamental medical concept learning, differential diagnosis, clinical scenario simulations, and problem-based learning (PBL). Given the ever-expanding nature of medical knowledge, LLMs, with their ability to process vast amounts of information, have the potential to enhance students' comprehension of complex topics. However, the implementation of chatbots in medical sciences education presents both opportunities and challenges that warrant careful examination.

Methods: This study employed a narrative review approach by systematically analyzing relevant literature from PubMed, Google Scholar, and MBC. Articles published between 2020 and 2025 were selected based on their direct relevance to the topic, methodological rigor, and citation impact. Following an initial screening, 25 studies were identified for in-depth analysis and synthesis.

Results: Findings indicate that chatbots contribute to medical education in four primary areas: designing educational content and clinical scenarios, simulating physician-patient interactions, assessing student performance and providing feedback, and facilitating self-directed learning. Despite these benefits, several challenges persist, including the relative accuracy of chatbot-generated medical information, the inability to perform complex clinical reasoning, limitations in evaluating practical skills, and concerns regarding data privacy in patient-related applications.

Additionally, ethical considerations related to excessive reliance on artificial intelligence for medical sciences training have been identified.

Conclusion: While chatbots play a valuable role in medical education, they should not be considered a substitute for traditional teaching methods. Instead, they serve as complementary tools that enhance learning, foster student engagement, and enable realistic clinical scenario simulations. To mitigate their limitations, measures such as faculty oversight of chatbot-generated content, integration with authoritative medical knowledge bases, and adherence to ethical and privacy standards are essential. By adopting these strategies, medical sciences education is in a position to effectively leverage AI-driven tools to optimize student learning and professional development.

Keywords: AI, Chatbot, Digital Medical Sciences Education

G-1734

Artificial Intelligence in Plastic and Aesthetic Surgery: A Systematic Review of Clinical Applications, Outcomes, and Future Perspectives

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Abstract:

Background and Aims: The use of artificial intelligence (AI) in plastic and aesthetic surgery has expanded rapidly over the past few years. Artificial intelligence is now involved in many aspects of patient care from early diagnosis and surgical planning to assistance during procedures and follow-up management. This systematic review focuses on evaluating the performance of AI-based tools across various clinical tasks, identifying technical and practical challenges, and suggesting priorities for future research.

Methods: A comprehensive search was carried out in PubMed, Scopus, Embase, and the Cochrane Library for articles published between January 2020 and March 2025. Studies included in the review applied artificial intelligence techniques such as convolutional neural networks, support vector machines, generative adversarial networks, transformers, and natural language processing in plastic or reconstructive surgery. For each study, we collected data on the type of artificial intelligence model used, its clinical application, performance outcomes, validation methods, and sample size. Risk of bias was assessed using RoB 2 (risk of bias-2), ROBINS-I (risk of bias in non-randomised studies of interventions), and AMSTAR 2 (assessment of multiple systematic reviews-2).

Results: Thirty-two studies met the inclusion criteria, with a combined total of 2,115 patients or clinical cases. Convolutional neural networks showed strong diagnostic capabilities, especially in analyzing facial features and classifying skin lesions, with an average accuracy of 93% and AUC (area under the curve) values up to 0.96. Tools like Crisalix helped improve preoperative visualization and patient communication. Intraoperative platforms such as SmartFlap were useful in identifying early signs of complications like flap ischemia. Artificial intelligence supported mobile apps and documentation tools, including ChatGPT and DAX Copilot, were also used in postoperative care. Nevertheless, common limitations included small sample sizes, limited generalizability, algorithmic bias, and unclear regulatory pathways.

Conclusion: Artificial intelligence technologies are making a meaningful impact on plastic and aesthetic surgery by improving diagnostic accuracy, streamlining workflows, and supporting better clinical decisions. However, their successful integration into everyday practice will require thorough validation, more transparent algorithms, and clear ethical and regulatory standards to ensure safety and equity in patient care.

Keywords: Artificial Intelligence, Medicine, Plastic Surgery

G-1735

Plan for Transforming Kurdistan University of Medical Sciences into a Green University Using Artificial Intelligence

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Abstract:

Background and Aims: In response to the global demand for sustainable development, transforming medical universities into green institutions has gained significant attention. Kurdistan University of Medical Sciences aims to integrate artificial intelligence (AI) into its green university initiative, optimizing energy consumption, reducing waste, and enhancing sustainability in medical education and healthcare services. This study explores the role of AI in achieving these goals and presents a framework for implementation.

Methods: A multi-phase methodological approach was adopted. First, an extensive review of recent literature (2023-2024) on AI applications in green initiatives was conducted. Second, data on the university's energy consumption, waste management, and environmental impact were collected and analyzed using AI-driven predictive analytics. Third, AI-based smart energy management systems were implemented to optimize electricity and water usage across the 17 affiliated hospitals and five faculties. Fourth, machine learning models were employed to monitor and predict environmental impact, ensuring data-driven decision-making. Additionally, AI-driven telemedicine and e-learning platforms were integrated to reduce carbon footprints associated with commuting and paper-based education. Finally, surveys and key performance indicators (KPIs) were used to assess the effectiveness of AI integration in achieving sustainability goals.

Results: The integration of AI led to a significant reduction in energy consumption by 30%, waste generation by 25%, and operational costs across university facilities. Smart water management systems optimized resource usage, and AI-enhanced telemedicine reduced in-person hospital visits, lowering the overall environmental impact. Moreover, AI-based e-learning tools improved the accessibility and efficiency of medical education, decreasing the reliance on printed materials.

Conclusion: The study demonstrates that AI plays a crucial role in transitioning Kurdistan University of Medical Sciences into a green university. By leveraging AI-driven predictive analytics, smart resource management, and digital learning solutions, sustainability goals can be achieved efficiently. The proposed framework can serve as a model for other medical universities aiming to embrace AI for environmental sustainability.

Keywords: Artificial Intelligence, Green University, Sustainable Development

G-1736

Application of artificial intelligence on the functionality and quality of life in amputees with upper limb prosthetics: A Literature Review

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Abstract:

Background and Aims: Recent progress in bioengineering, robotics, and artificial intelligence (AI) has significantly advanced upper limb prosthetics. These devices have evolved from basic functional tools into intelligent systems capable of replicating complex, natural movements. AI and brain-computer interfaces (BCIs) play a key role in enhancing responsiveness and user experience. This study aims to review the role of AI and BCI technologies in improving the functionality, adaptability, and user control of upper limb prostheses, with a focus on quality of life outcomes for individuals with amputations.

Methods: A systematic search was conducted across databases including PubMed, Scopus, Web of Science, and Google Scholar using keywords such as "Prosthesis," "Artificial Intelligence," "Upper Limb," and "Amputation." From publications between 2000 and 2024, 11 relevant articles were selected for analysis.

Results: The reviewed articles highlight that AI-integrated prosthetics, especially those utilizing electromyography (EMG), enable precise decoding of muscle signals, allowing users to perform movements that closely resemble natural limb function. Additionally, BCIs establish a direct neural connection, enabling thought-based control of prosthetic limbs. These technologies collectively enhance the accuracy, intuitiveness, and adaptability of prosthetic use. The integration of AI and BCI is shown to improve user satisfaction, independence, and overall functionality.

Conclusion: AI and BCI technologies represent a transformative shift in upper limb prosthetics. Their continued development holds promise for more intuitive, personalized, and natural prosthetic systems, potentially turning them into true extensions of the human body.

Keywords: Prosthesis, Prostheses, AI, Artificial Intelligence

G-1738

Artificial Intelligence in Personalized Medicine: Advancing Precision Diagnostics and Therapeutics

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Abstract:

Background: Artificial intelligence (AI) is redefining personalized medicine by enabling precision-driven diagnostics, therapeutic strategies, and drug discovery. Through machine learning (ML) and deep learning (DL), AI integrates multimodal data—genomic, proteomic, imaging, and clinical records—to enhance decision-making across the translational workflow, from target identification (T0) to post-implementation evaluation (T4). As AI-driven models continue to refine disease characterization and treatment personalization, addressing challenges such as multi-omics data integration, algorithmic bias, and ethical transparency is critical to ensuring equitable and effective deployment.

Methods: This research synthesis evaluates the impact of AI in personalized medicine, with a focus on oncology, multi-omics data integration, and AI-driven drug discovery. Deep learning and support vector machine (SVM) models were assessed for their accuracy in disease diagnostics. AI-powered genomic analyses were reviewed for their ability to identify novel biomarkers and optimize drug repurposing strategies. Additionally, AI-based platforms such as CURATE.AI were analyzed to determine their effectiveness in dynamic precision dosing and combination therapy optimization.

Results: AI-driven genomic analysis has successfully identified biomarkers for complex diseases such as triple-negative breast cancer using advanced sampling methodologies to manage high-dimensional datasets. AI-based diagnostic tools demonstrated expert-level accuracy in detecting diseases such as breast cancer and diabetic retinopathy. Furthermore, AI-powered platforms like CURATE.AI have optimized personalized treatment regimens, dynamically adjusting combination therapies to improve efficacy while reducing toxicity. Emerging AI applications in real-time health monitoring via wearable technologies and quantum computing for accelerated genomic analysis highlight the next frontier of AI-driven personalized medicine.

Conclusion: AI is set to transform the future of precision medicine by driving breakthroughs in diagnostics, therapeutics, and drug development. However, challenges such as heterogeneous

data harmonization, algorithmic bias, and ethical considerations must be addressed to ensure transparency, fairness, and widespread adoption. Future advancements will require close collaboration among clinicians, data scientists, and policymakers. By addressing these challenges, AI can enable a more proactive, patient-centric healthcare paradigm, reducing costs and improving global health outcomes.

Keywords: Artificial Intelligence, Personalized Medicine, Genomic Analysis

G-1739

Artificial Intelligence in Pharmaceuticals: A Revolution in Drug Discovery and Design

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Abstract:

Artificial Intelligence (AI) has had a significant impact on the pharmaceutical industry as a novel technology. Utilizing machine learning algorithms and big data analysis, this technology has expedited and optimized the drug discovery and design processes. Moreover, personalizing treatments based on the genetic data of individuals is considered one of the major achievements of AI in this field. This article examines the role of AI in pharmaceuticals and the challenges ahead.

Background and Aims: Artificial Intelligence is rapidly becoming a fundamental tool in various industries, and pharmaceuticals has not been left out of these changes. The discovery of new drugs using traditional methods is time-consuming and costly. The use of AI can significantly accelerate this process and assist in identifying effective drug candidates. In this article, we will explore the applications of AI in drug discovery, drug design, and treatment personalization.

Methods: AI, pharmaceuticals, drug discovery, drug design, machine learning, treatment personalization. Databases such as Google Scholar, PubMed, ScienceDirect, IEEE Xplore, and SpringerLink were searched. All studies reviewed were published between 2010 and 2025.

Results: AI can expedite the drug discovery process by analyzing chemical and biological data of molecules, predicting their properties. Machine learning algorithms assist researchers in simulating and optimizing suitable molecular structures. Additionally, this technology helps personalize treatments based on the genetic data of each patient. Although AI has high potential to change the landscape of pharmaceuticals, challenges such as the need for quality data, operational complexities, and the acceptance of this technology in clinical processes persist. Nevertheless, research indicates that the use of this technology can lead to reduced costs and time in drug discovery.

Conclusion: AI in pharmaceuticals, as a novel tool, is capable of expediting the processes of drug discovery and design as well as personalizing treatments. Despite challenges, this technology promises significant transformations in the pharmaceutical industry and will aid in improving the quality of treatments and reducing costs.

Keywords: AI, Pharmaceuticals, Drug Discovery, Drug Design

G-1740

Transforming Heart Failure Care: A Systematic Review of Telenursing and Remote Monitoring Innovations

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Abstract:

Background and Aims: Heart failure is a widespread and chronic condition that poses significant challenges to healthcare systems worldwide. Despite advancements in treatment, high rates of hospitalizations and readmissions remain concerning. In response, innovative management approaches such as telenursing and remote monitoring are being explored for their potential to improve patient outcomes. This systematic review aims to evaluate the effectiveness of telenursing and remote monitoring strategies in heart failure patients.

Methods: We conducted a thorough search for studies published between 2019 and 2024 across several databases, including PubMed, Scopus, CINAHL, EMBASE, Web of Science, and the Cochrane Library. We used keywords such as “heart failure,” “telenursing,” and “telemedicine.” We selected studies based on predefined inclusion and exclusion criteria, focusing on adult heart failure patients who utilized remote monitoring strategies and telenursing technologies. We excluded duplicate entries, irrelevant studies, non-English publications, and articles that were not available in full text. Two independent researchers reviewed the remaining articles, assessing their abstracts and excluding those of low quality or relevance. A risk of bias assessment was conducted using the Joanna Briggs Institute (JBI) tool, which evaluates the methodological quality of studies. The final selected studies were critically appraised, and relevant data were extracted according to PRISMA guidelines.

Results: Out of 502 articles reviewed, 19 met our criteria. Telenursing enables nurses to maintain ongoing communication with heart failure patients through calls and video chats, offering essential support, education, and symptom monitoring. This approach helps identify early signs of worsening conditions, like weight changes and ECG shifts, allowing for timely interventions that can prevent hospital readmissions. Nurse-led tele-monitoring empowers patients in self-care, greatly improving health outcomes. By using multi-parameter monitoring systems, nurses regularly assess metrics such as heart rate, blood pressure, and weight, sending alerts if issues arise. Furthermore, advancements in mobile health apps enhance medication adherence and enable quick symptom reporting and online consultations. Overall, telenursing and tele-monitoring significantly improve quality of life, reduce readmission rates, and lower costs in managing heart failure.

Conclusion: In conclusion, telenursing and remote monitoring strategies mark substantial progress in the management of heart failure

Keywords: Heart Failure, Telenursing, Telemedicine

G-1741

Accelerating the Discovery of Novel Secondary Metabolites for Drug Development Using Machine Learning

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Abstract:

Background and Aims: The discovery of novel secondary metabolites plays a key role in drug development, but traditional methods are often inefficient, costly, and time-consuming. Recent advances in machine learning (ML) offer the potential to accelerate the identification and optimization of bioactive compounds. This study investigates how ML techniques can streamline the discovery pipeline for therapeutic secondary metabolites.

Methods: A curated dataset was assembled from KEGG, PubChem, and MetaCyc, including structural and physicochemical data of secondary metabolites. Molecular fingerprints such as ECFP and MACCS were extracted, and feature selection was conducted using PCA and RFE. Multiple ML algorithms were applied: deep neural networks (DNNs) for bioactivity prediction, graph neural networks (GNNs) for structural and pathway inference, and reinforcement learning (RL) for strain optimization. Multi-omics integration (genomics, transcriptomics, metabolomics) and explainable AI (XAI) tools (e.g., SHAP, LIME) were also employed to improve accuracy and interpretability.

Results: DNN models achieved 84% accuracy (AUC: 0.89) for predicting antimicrobial and anticancer activities. GNNs yielded 88% accuracy (AUC: 0.92) in predicting biosynthetic pathways. Generative models produced over 60% drug-like compounds based on Lipinski's Rule, with 35% showing predicted bioactivity. RL simulations led to a 20–25% improvement in predicted yield. Multi-omics integration increased F1-score by 12–15%, and XAI tools revealed key features (e.g., hydrophobicity, H-bond donors) in over 30% of models. Overall, ML reduced discovery timelines by up to 40%.

Conclusion: ML significantly improves the efficiency and precision of secondary metabolite discovery by combining predictive modeling, omics integration, and pathway optimization. These results support its application in accelerating therapeutic development.

Keywords: Artificial Intelligence(AI), Secondary Metabolites, Machine Learning(ML), Drug Discovery, Multi-omics Data

G-1742

Unveiling Gastric Cancer Biomarkers: A Synergistic Approach of Bioinformatics and Machine Learning

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Abstract:

Background and Aims: Gastric cancer continues to be a leading cause of cancer-related deaths worldwide, highlighting the urgent need for reliable biomarkers and effective treatments. This study aims to identify dysregulated microRNAs in gastric cancer through comprehensive bioinformatics analysis and machine learning approaches, with the hypothesis that specific microRNA signatures can serve as both diagnostic markers and therapeutic targets.

Methods: The study analyzed RNA sequencing data from the GEO dataset GSE164174 using an integrated computational approach. Differential expression analysis was performed to identify significantly altered microRNAs, followed by pathway enrichment analysis to investigate their biological functions. Machine learning models, particularly random forest algorithms, were employed to evaluate the diagnostic potential of the identified microRNA signatures.

Results: Analysis revealed 2,565 significantly dysregulated microRNAs in gastric cancer, with hsa-miR-4481 showing notable upregulation and hsa-miR-5100 demonstrating significant downregulation. Pathway analysis identified miRNA-mediated mRNA degradation as a key molecular mechanism involved in gastric tumorigenesis. The random forest models achieved excellent diagnostic performance, with area under the curve values exceeding 0.90, indicating high predictive accuracy.

Conclusion: This study demonstrates the potential of specific microRNA signatures as non-invasive biomarkers for gastric cancer diagnosis and as targets for therapeutic intervention. The integration of bioinformatics and machine learning provides a powerful framework for translating molecular discoveries into clinical applications. Future research should focus on experimental validation of these findings in clinical samples and the development of targeted therapies based on the identified microRNA pathways.

Keywords: Gastric Cancer, MicroRNA, Bioinformatics, Machine Learning

G-1743

Precision Bioinformatics and Machine Learning Reveals Differential miRNA Expression in Colon Cancer

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Abstract:

Background and Aims: Colon cancer remains a significant global health challenge, necessitating improved diagnostic and therapeutic strategies. MicroRNAs have emerged as key regulators of gene expression in cancer development. This study aims to identify differentially expressed microRNAs in colon cancer using bioinformatics approaches, with the hypothesis that specific microRNA signatures can distinguish cancerous from normal tissues and serve as potential biomarkers.

Methods: The study analyzed the GSE49246 dataset containing 40 normal and 40 colon cancer samples. Bioinformatics tools including GEOquery, limma, and multiMiR were employed to identify differentially expressed microRNAs. Statistical thresholds were set at false discovery rate less than 0.05 and absolute log fold change greater than 0.5. Visualization techniques included volcano plots, heatmaps, and uniform manifold approximation and projection. Functional enrichment analyses examined gene ontology terms and Kyoto Encyclopedia of Genes and Genomes pathways.

Results: Analysis revealed 250 significantly differentially expressed microRNAs between normal and cancerous tissues. Key upregulated microRNAs included hsa-miR-21-5p, while hsa-miR-145-5p was notably downregulated. These microRNAs were associated with critical cancer pathways such as Wnt signaling and apoptosis. Receiver operating characteristic analysis demonstrated strong diagnostic potential for several microRNA candidates, with distinct expression patterns clearly differentiating tissue types.

Conclusion: This comprehensive bioinformatics analysis identifies specific microRNA signatures associated with colon cancer, highlighting their potential as diagnostic biomarkers and therapeutic targets. The findings underscore the value of computational approaches in cancer research, though clinical validation through experimental studies remains essential for translation

into medical practice. Future research should focus on functional validation of these microRNAs in larger patient cohorts.

Keywords: Colon Cancer, MicroRNA, Bioinformatics, Biomarkers

G-1744

Decoding Colorectal Cancer: A Bioinformatics-Machine Learning Approach to miRNA Biomarker Discovery

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Abstract:

Background and Aims: Colorectal cancer (CRC) remains a leading cause of cancer-related mortality, underscoring the need for early and accurate diagnostic biomarkers. MicroRNAs (miRNAs) play a critical role in post-transcriptional gene regulation and have emerged as promising candidates for non-invasive cancer detection. This study aims to identify potential miRNA biomarkers for CRC using an integrated bioinformatics and machine learning approach, with the hypothesis that dysregulated miRNAs can distinguish CRC patients from healthy controls with high accuracy.

Methods: The study analyzed the GSE211692 miRNA expression dataset, applying differential expression analysis to identify significantly dysregulated miRNAs using statistical tools. Pathway enrichment analysis was conducted to explore the biological functions of these miRNAs. A random forest classifier was then trained on miRNA expression profiles to evaluate diagnostic performance based on sensitivity, specificity, and area under the curve (AUC).

Results: Differential expression analysis revealed a cohort of dysregulated miRNAs, with hsa-miR-4481 and hsa-miR-5100 showing significant alterations. Pathway enrichment indicated strong involvement in miRNA-mediated mRNA degradation, highlighting their regulatory role in CRC. The random forest model achieved high diagnostic accuracy, supported by a robust AUC, suggesting the potential of these miRNAs as biomarkers. However, further validation is required due to discrepancies in dataset availability.

Conclusion: This study demonstrates the utility of combining bioinformatics and machine learning to identify miRNA biomarkers for CRC. The findings suggest that specific miRNAs, if experimentally validated, could facilitate early detection and personalized treatment strategies. Future research should focus on validating these miRNAs in independent patient cohorts and expanding the model's applicability to diverse populations.

Keywords: Colorectal Cancer, miRNA, Biomarkers, Machine

G-1746

Artificial intelligence in the prediction and diagnosis of heart attacks

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Abstract:

Background and Aims: Today, one of the most common causes of death in adults worldwide is heart attack. According to the Ministry of Health and Medical Education, 11 to 15 percent of deaths in the country are due to heart attacks, and Iran has the highest death rate from heart disease in the world. Therefore, predicting this disease is one of the challenging topics in medicine. On the other hand, according to the increasing applications of artificial intelligence in the medical field, our goal is to investigate the use of machine learning algorithms in predicting and diagnosing heart attacks.

Methods: This study used a dataset of 8,765 patients, which came from the Kaggle site. Using a series of features, especially blood factors and demographic information, this study employs an ensemble stacking learning approach that involves combining several base models and a meta-learner to improve prediction accuracy. In the initial stage, preprocessing and normalization processes are performed on the data. Then, the stacking model including Multilayer Perceptron (MLP), Random Forest (RF), Nearest Neighbor (KNN), Support Vector Machine (SVM), Decision Tree (DT) and Logistic Regression (LR) is trained as the base learners, while the Gradient Boosting Model (XGBoost) is employed as the meta-learner.

Results: The results showed that the stacking model, with an accuracy of 79% and an F1 score of 77%, performed better than previous methods that used this dataset in detecting heart attacks and was able to predict heart attacks with a lower error rate.

Conclusion: Stacking takes advantage of the strengths of the base models to create an optimal combination in which different models learn different aspects of the patterns in the data. In this way, the limitations of a single model are reduced and the overall prediction accuracy is increased. This approach provides better performance compared to single machine learning algorithms and can be used in problems related to heart attack risk prediction based on individual data.

Keywords: Artificial Intelligence, Heart Attack, Prediction, Machinelearning

G-1747

The Use of Artificial Intelligence in Esophageal Cancer Diagnosis

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Abstract:

Background and Aims: Esophageal cancer is one of the most devastating types of cancer, with a high mortality rate and poor prognosis. Early detection is crucial for improving survival rates and prognosis. This study aims to explore the application of artificial intelligence (AI) in the early diagnosis and improvement of prognosis for esophageal cancer.

Methods: In this study, we investigated the application of artificial intelligence models using a comprehensive clinical dataset. The dataset we obtained from Kaggle consists of 3985 records and 61 features, including demographic information and specific characteristics of esophageal cancer. Three machine learning models were developed and evaluated: a deep neural network, a decision tree, and a logistic regression model.

Results: The deep neural network model, which included multiple layers with regularization and dropout, achieved 100% accuracy and an area under the curve (AUC) of 1.0, demonstrating excellent performance on the dataset. The decision tree model achieved a high accuracy of 99.7%, but its AUC was 0.52. The logistic regression model showed an accuracy of 65.7% and an AUC of 0.86, indicating its potential in predicting esophageal cancer, though it requires further improvement.

Conclusion: These results highlight the potential of artificial intelligence in the early diagnosis of esophageal cancer. However, the deep neural network model demonstrated more promising performance compared to the other models.

Keywords: Artificial Intelligence, Esophageal Cancer, Deep Neural Network, Decision Tree, Logistic Regression

G-1748

The Application of Artificial Intelligence in Detecting Cheating During Online Exams: A Narrative Review

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Abstract:

Background and Aims: One of the main challenges in assessing learners' progress is cheating during online exams. The growing use and accessibility of artificial intelligence systems have also contributed to increased opportunities for cheating. This study aims to explore the application of artificial intelligence in detecting cheating using current methods in online testing.

Methods: This study reviewed research conducted between 2022 and 2025 from the PubMed and Google Scholar databases. Search keywords included "Artificial intelligence, online, cheat*, exam, examination, test". Following a review of 14 article summaries, seven articles were selected for inclusion in this study based on thematic relevance.

Results: Various methodologies have been used across different studies to detect cheating in online examinations through artificial intelligence. The application of FaceNet can be considered useful for verifying the identity of the individual taking the test. Detecting facial expression changes using convolutional neural networks in recorded video footage has demonstrated high accuracy in identifying cheating behaviors, including tracking suspicious actions such as movements of the head and eyes, and detection of micro-expressions. Another study addressed the detection of organized cheating groups, where professional cheaters took control of the participants' keyboard and mouse, while the individuals taking the exam pretended to be completing it themselves. Behavioral patterns in keystrokes and mouse movements were analyzed by artificial intelligence to detect suspicious sessions and refer them to human supervisors for further review. AI-based automatic monitoring systems used in one study showed a 30% error rate compared to human judgment, indicating the need for improvement in reducing incorrect detections.

Conclusion: The use of artificial intelligence in online examinations has proven to be highly effective in preventing cheating and has enhanced the security of exam administration. However, diagnostic errors and concerns regarding privacy remain significant challenges. To improve performance, combining artificial intelligence with human judgment and adjusting the level of supervision according to the conditions of the examination is recommended. The development

of such systems must consider ethical aspects and ensure a calm environment for individuals taking the test, aiming to maintain both exam security and fairness.

Keywords: Artificial Intelligence, Cheating Detection, Online

G-1749

Predicting diabetes risk using artificial intelligence models

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Abstract:

Background and Aims: Diabetes is considered as one of the most common non-communicable diseases, with the number of patients increasing each year, resulting in a variety of complications like cardiovascular, renal, and visual problems. On the other hand, artificial intelligence has recently made significant contributions to many fields, including health, helping to advance human objectives. We have also made an effort to design a method that utilize it as an aid for the early prediction of the risk of diabetes in individuals.

Methods: In the present study, data from 253,681 registered patients from the Diabetes Health Indicators Dataset on the Kaggle website was utilized. The data included an examination of 21 features including information like age, sex, blood pressure, cholesterol, smoking status, alcohol consumption status, history of stroke and other similar items. Various models were designed, and their results were compared, ultimately selecting the SVM and RANDOM FOREST models, which showed the highest accuracy of 88% and 87% respectively.

Results: The Random Forest and SVM models demonstrated the best performance, both achieving an Accuracy of 86%. The F1-score and Recall for both models were 86%, while the Precision was 87% for Random Forest and 88% for SVM, making them superior to other models. The Logistic Regression and Decision Tree models also showed satisfactory performance, while the KNN and XGBoost models exhibited lower predictive power.

Conclusion: Considering the relatively accurate predictability of the risk of diabetes in this study, it can be seen that the use of artificial intelligence models is very helpful in predicting chronic disorders such as diabetes, and artificial intelligence with a screening approach will be very effective in health policies.

Keywords: Diabetes, Artificial Intelligence, Random Forest, SVM

G-1750

Analyzing Diagnostic Patterns in Scientific Cancer Articles Using Machine Learning Algorithms

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Abstract:

Background and Aims: The accurate diagnosis of cancer remains a pivotal challenge in medical research, necessitating sophisticated analytical approaches to enhance both precision and efficiency. This study aimed to analyze the abstracts of 7,570 scientific articles related to thyroid, colon, and lung cancers to uncover patterns and refine diagnostic methodologies using machine learning models. The underlying hypothesis was that patterns embedded within the text of these abstracts could yield valuable insights for cancer classification and prediction.

Methods: The dataset was obtained from Kaggle and consisted of abstracts categorized by cancer type. Data preprocessing included cleaning, vectorization, and splitting into training and testing subsets. Libraries such as Pandas were utilized for data handling, and the dataset was analyzed to assess the distribution of samples across cancer types. Key Python libraries were imported, and custom functions were defined for streamlined processing. Word cloud visualizations, generated using the WordCloud library, were employed to highlight frequently occurring terms in the abstracts, offering a graphical representation of dominant research themes. Five machine learning algorithms—Linear Regression, Logistic Regression, Decision Tree, Random Forest, and K-Nearest Neighbors—were implemented for model training and evaluation. The textual data was vectorized using appropriate techniques and subsequently partitioned into training and testing sets.

Results: Among the five models evaluated, the Random Forest algorithm achieved the highest accuracy in classifying cancer types based on abstract content. Model performance was quantified using the Accuracy metric. Additionally, word cloud analysis revealed key terms frequently associated with each cancer type, shedding light on prevalent research themes. This approach facilitated the rapid identification of significant keywords within the corpus, providing contextual insights into the focus of existing literature.

Conclusion: The results highlight the effectiveness of machine learning, especially the Random Forest algorithm, in analyzing large-scale cancer-related textual data. These findings suggest applications in automating literature reviews and improving diagnostic tools. The algorithm's superior performance underscores the value of ensemble methods for text classification. Future

research could focus on integrating more datasets, exploring deep learning techniques, and refining preprocessing to boost accuracy.

Keywords: Cancer diagnosis, machine learning, Random Forest

G-1751

A Review of Future Applications of Artificial Intelligence in Healthcare

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Abstract:

Background and Aims: Given recent technological advances, Artificial Intelligence (AI) can be effectively integrated into daily clinical practice and address the barriers that impede its widespread adoption. This study systematically reviews the future applications of AI in healthcare.

Methods: The Web of Science, Scopus, PubMed, and IEEE databases from 2016 to 2024 were searched to identify peer-reviewed studies on the future of AI. In this study, the entry criteria for selecting papers were original articles published in medicine and health in English with the aim of future artificial intelligence in healthcare.

Results: The analysis methods included examining various AI approaches. The results demonstrated that AI could significantly improve diagnostic accuracy. Additionally, AI has shown remarkable improvements in diagnosis and treatment planning in fields such as oncology, pathology, and radiology. However, challenges such as ethical concerns, data privacy, trust among medical professionals, and the need for appropriate regulatory frameworks have hindered the full integration of AI into healthcare systems.

Conclusion: While the excitement around AI in medicine is growing faster and faster each day, real-world barriers and obstacles to using AI in real-life practice still exist. Technical performance alone does not guarantee adoption; clear improvements must be made for both patient outcomes and their workflows. Moreover, more user-centric UI design of AI tools, alongside dedicated training for clinicians and improving clinicians' knowledge about AI technologies, remains key to building trust. Regulatory agencies should move to make policy guidelines and legislation to match the pace of AI development. Future studies could adopt a more generalizable approach by gathering data from experts with varying levels of AI expertise and investigating the impact of particular respondent characteristics on their AI perspectives.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning

G-1753

Challenges and Opportunities of Implementing Artificial Intelligence in the Nursing Profession

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Abstract:

Background and Aims: With the remarkable advancement of artificial intelligence and machine learning technologies, healthcare systems worldwide are evaluating the unprecedented capabilities and opportunities these technologies present for enhancing care quality and increasing medical service efficiency. However, according to reports published by the World Health Organization (2024) and the International Council of Nurses (2023), nurses—as one of the primary pillars of the healthcare system—face challenges when encountering modern artificial intelligence technologies, such as the need to improve digital skills, adapt to rapidly changing work processes, and address concerns regarding data security and patient privacy protection. Accordingly, this study aims to conduct a comprehensive examination of the current status, barriers, and potential capacities for artificial intelligence applications in the nursing profession.

Methods: This narrative review was conducted through extensive searches in reputable databases including PubMed, Scopus, and Google Scholar. Articles published between 2020 and 2025 were selected based on their direct relevance to the topic, methodological quality, and citation impact. After initial screening, 35 relevant articles were chosen for final analysis.

Results: The findings indicate potential applications of artificial intelligence in nursing include clinical decision support systems, patient deterioration prediction, intelligent medication management, automated wound assessment, care robots, and simulation-based education. Key challenges identified include: professional resistance stemming from fear of replacement, digital skill deficiencies among nurses, data privacy and security concerns, ethical issues related to algorithmic decision-making, infrastructure limitations and implementation costs, and lack of appropriate regulatory frameworks. Furthermore, reviews showed that effective use of artificial

intelligence requires integrating nurses' perspectives in the design and development process, continuous education, and creating an organizational culture receptive to innovation.

Conclusion: Despite existing challenges, artificial intelligence has significant potential to transform the nursing profession and enhance quality of care. Successful implementation of these technologies requires a multifaceted approach including development of nurses' digital skills, establishment of appropriate ethical and legal standards, investment in infrastructure, and active participation of nurses in the design and evaluation of artificial intelligence systems. As artificial intelligence technologies develop, nurses' roles are expected to shift from routine tasks toward more complex and humanistic care.

Keywords: Artificial Intelligence, Nursing, Ethics, Education, Digital Healthcare

G-1754

The Impact of Artificial Intelligence and Associated Ethical Challenges on Professional Decision-Making: A Systematic Review

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Abstract:

Background and Aims: Artificial Intelligence (AI) technologies have revolutionized education and research by enabling rapid information access, personalized learning, and streamlined research processes. While AI offers significant benefits as an educational assistant for content design, feedback provision, and student assessment, concerns persist regarding diminished critical thinking skills, technological over-reliance, and misinformation. In research, AI aids data analysis and innovation but raises ethical issues including privacy violations, algorithmic biases, and citation transparency. This review examines AI's dual impact, analyzing its advantages, limitations, and ethical dilemmas while proposing strategies for responsible academic integration.

Methods: We systematically reviewed studies from Persian (SID, Civilica, Magiran) and international databases (PubMed, ISI, Web of Science, ScienceDirect, Google Scholar) using Keywords: "Artificial Intelligence", "ChatGPT", "Ethical Challenges", "Professional Decision-Making" and "nursing students" (2016-2025). Inclusion criteria prioritized peer-reviewed articles with full-text availability and direct relevance to AI's academic applications.

Results: Findings demonstrate AI's dual role in education and research. While enhancing efficiency and personalization, AI risks undermining critical thinking and fostering dependency. Comparative studies show ChatGPT improves time management but underperforms in developing clinical reasoning and ethical analysis skills. In research, AI facilitates data processing but faces reliability challenges including content inaccuracies and opaque sourcing. Newer models (e.g., GPT-4) show progress yet require human oversight. Recommended solutions include: hybrid learning models, transparent ethical guidelines, AI-content detection systems, and diversified assessment methods (practical projects and oral presentations).

Conclusion: AI presents transformative opportunities alongside significant ethical and pedagogical challenges. Successful integration requires balancing technological benefits with educational integrity through revised teaching methodologies, evaluation standards, and ethical policies. Future implementation should emphasize human-AI collaboration, with AI serving as a

complement to professional expertise rather than a replacement. Achieving this balance demands coordinated efforts among educators, policymakers, and technology developers.

Keywords: Artificial Intelligence, Ethical Challenges, Nursing Students

G-1755

AI and Older Adults Care, Opportunities and Challenges for Nursing Practice: A Systematic Review

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Abstract:

Background and Aims: Artificial Intelligence (AI) is transforming elderly care through applications like fall prediction, cognitive monitoring, and personalized care planning. While AI shows promise in enhancing clinical decision-making and operational efficiency, its integration raises ethical concerns, including privacy risks, algorithmic bias, and the potential marginalization of human-centered care. This review examines AI's role in gerontological nursing, focusing on (1) clinical applications, (2) ethical considerations, and (3) strategies to balance technology with person-centered care.

Methods: We systematically reviewed studies from Persian (SID, Civilica, Magiran) and international databases (PubMed, ISI, Web of Science, ScienceDirect, Google Scholar) using Keywords: "Artificial Intelligence", "Older Adults", "Ethical Challenges" and "Nursing Practice" (2016-2025). Inclusion criteria prioritized peer-reviewed articles with full-text availability and direct relevance to AI's academic applications.

Results: AI demonstrated significant benefits, including high-accuracy fall detection systems and personalized care recommendations that reduced assessment burdens. Elderly participants generally adapted well to monitoring technologies. However, challenges included algorithmic biases in training data, privacy concerns, and limited nursing involvement in AI development. Most algorithms lacked clinical translation, and efficiency-driven implementations occasionally compromised empathetic care. Successful integration required three conditions: validation across diverse populations, human oversight in decision-making, and AI systems designed to augment—not replace—nursing roles.

Conclusion: AI holds transformative potential for gerontological nursing but must be implemented ethically. Nurses need education to leverage AI effectively while preserving core caregiving values. Key priorities include addressing bias, ensuring transparency (e.g., labeling AI interactions), and enforcing strict data protections. Nurses must advocate for systems that enhance, not undermine the human dignity and equity. Proactive engagement by the nursing

profession is essential to shape AI's role in elderly care, ensuring technology complements rather than displaces the human touch.

Keywords: Artificial Intelligence, Older Adults, Nursing Practice

G-1756

Development of a Decision Tree-Based Artificial Intelligence Model for Enhancing Acute Appendicitis Diagnosis in Pediatric Patients

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Abstract:

Background and Aims: Diagnosing acute appendicitis in children is challenging due to overlapping clinical presentations with other abdominal conditions. Delayed diagnosis can lead to complications, while misdiagnosis may cause unnecessary surgeries. This study develops and evaluates an AI-based decision tree model to improve diagnostic accuracy for acute appendicitis in children.

Methods: Data from 780 children suspected of appendicitis were analyzed, using clinical, laboratory, and imaging parameters from the Regensburg Pediatric Appendicitis Dataset on Kaggle. 702 cases were used for training, and 78 for evaluation. The model incorporated key diagnostic features, including Alvarado Score, Pediatric Appendicitis Score, WBC, CRP, RBC, appendix diameter, appendicolith presence, and clinical symptoms. Feature importance analysis identified the most influential variables in classification decisions.

Results: The model achieved a training accuracy of 100.00% and a test accuracy of 92.31%. Precision was 0.92 for appendicitis and 0.93 for no appendicitis, with an overall weighted F1-score of 0.92. Key diagnostic contributors included appendix diameter, WBC count, neutrophil percentage, and appendicolith presence. These results indicate that the decision tree model can effectively differentiate between cases of appendicitis and non-appendicitis, reducing unnecessary surgeries and improving diagnostic precision. Comparison with traditional scoring methods demonstrated the AI model's superior accuracy.

Conclusion: This study highlights the role of decision tree algorithms in improving the diagnosis of acute appendicitis in children. AI-driven decision-support systems may enhance efficiency and accuracy in clinical settings. However, dataset biases and the need for external validation remain challenges. Future research should explore ensemble learning, hybrid AI models, and real-world

validation. Integrating this model into a clinical interface could further support physicians in emergency settings.

Keywords: AcuteAppendicitis, ArtificialIntelligence, DecisionTree, MachineLearning, ClinicalDiagnosis, PediatricPatients

G-1757

Revolutionizing Zoonotic Disease Outbreaks Detection and Prediction with AI: Based on One Health Perspective

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Abstract:

Background and Aims: Zoonotic diseases are responsible for approximately 70% of emerging infections outbreak, which require innovative and precise methods of identifying and predicting them. This study examines the role of artificial intelligence (AI) in managing these diseases through a one-health approach which integrates human, animal, and environmental health.

Methods: A comprehensive review of literature was conducted from 2020 to 2024 across PubMed, ScienceDirect, Google Scholar, and IEEE Xplore databases using key terms such "One health", "Zoonotic disease", "Disease Surveillance", "Artificial intelligence"

Results: Emerging zoonotic diseases require rigorous analysis and advanced technologies, such as artificial intelligence (AI), the Internet of Things (IoT), remote sensors, and molecular tools, in order to prevent them from spreading and resulting in epidemics or pandemics. Machine learning (ML) improved the accuracy of predicting outbreaks of leptospirosis by 13.3% to 31.26 %, while neural network models improved sensitivity by up to 35.43 %. It has been demonstrated that deep learning was employed to train a deep convolutional neural network that can accurately predict bovine tuberculosis by 70-90%, with sensitivity and specificity increasing by 1.22 and 1.45 times, respectively. In studies on COVID-19, recurrent neural networks (RNNs) and long short-term memory (LSTM) units were shown to possess high accuracy in predicting pandemic curves. A multilayer perceptron (MLP) neural network, analyzing 57 variables, accurately predicted the cumulative incidence of COVID-19 in the United States with a correlation of 65%. Furthermore, studies have demonstrated the value of machine learning in tracing the origin of emerging viruses, including COVID-19, based on genomic data and spike protein sequences.

Conclusion: Artificial intelligence has the potential to revolutionize disease diagnosis and management by analyzing immense amounts of data and identifying intricate patterns. The use of machine learning can allow for faster and more accurate diagnoses, thereby reducing antibiotic overuse and assisting with the management of antimicrobial resistance. Furthermore, AI-driven

systems can predict and prevent emerging infections. The use of artificial intelligence is ultimately a promising solution for improving health while adhering to One Health principles.

Keywords: One Health, Zoonotic Disease, Disease Surveillance

G-1758

Early detection of multiple sclerosis with artificial intelligence: an innovative approach based on deep learning

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Abstract:

Background and Aims: Multiple sclerosis is a chronic autoimmune disease of the central nervous system, often beginning with clinically isolated syndrome. Early diagnosis of this condition is crucial for timely intervention and improved patient outcomes. Traditional diagnostic methods rely on magnetic resonance imaging and cerebrospinal fluid biomarkers, which may be limited in terms of reliability and accessibility. This study aims to develop a deep learning-based model to predict the progression of clinically isolated syndrome to multiple sclerosis and enhance diagnostic accuracy through artificial intelligence.

Methods: In this study, a dataset comprising 20 different variables, including clinical, laboratory, and magnetic resonance imaging data from the Kaggle platform, was analyzed. The dataset included features such as patient demographic information, initial symptoms, evoked potentials, oligoclonal bands, and lesion distribution in magnetic resonance imaging scans. A deep neural network was trained using a five-fold cross-validation method (k=5) to increase the model's generalization ability. The model's depth was increased to 1000 layers, with three neurons used for the final decision-making process. Performance metrics, including accuracy, sensitivity, and specificity, were evaluated.

Results: The developed deep learning model demonstrated an accuracy range of 80% to 87%, with an average accuracy of 84.7%, indicating the model's high predictive capability. Increasing the network's depth and optimizing the decision-making neurons resulted in a significant improvement in model performance. These results suggest that artificial intelligence could provide a more reliable and scalable approach for early diagnosis of multiple sclerosis compared to traditional methods.

Conclusion: This study highlights the potential of deep learning in predicting the conversion of clinically isolated syndrome to multiple sclerosis with high accuracy. The application of artificial intelligence in neurology can lead to earlier diagnoses and the creation of personalized treatment plans, ultimately improving patient care. Future research will focus on expanding the dataset and validating the model in clinical environments to enhance its applicability.

Keywords: Artificial Intelligence, Multiple Sclerosis, Deep Learning

G-1760

Automatic Detection of Pulmonary Embolism from Computed Tomography Scans Using Deep Learning

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Abstract:

Background and Aims: Pulmonary embolism (PE) is a sudden blockage of an artery in the lung, typically caused by a blood clot that has traveled from a deep vein. Early detection of deep vein thrombosis (DVT) and PE is crucial to prevent life-threatening complications. This study explores the application of deep learning techniques to improve computer-aided detection (CAD) of PE, demonstrating the potential of artificial intelligence in enhancing clinical workflows. PE poses significant diagnostic challenges, particularly with the increasing reliance on computed tomography pulmonary angiography (CTPA) scans. Early and accurate detection is vital for improving patient outcomes. This research seeks to address these challenges by integrating convolutional neural networks (CNNs) into the diagnostic process, leveraging classification-guided detection approaches to enhance sensitivity and reduce false positives in automated PE detection.

Methods: A dataset of computed tomography pulmonary angiography (CTPA) images was collected from healthcare facilities in Ardabil Province, consisting of 8,125 slices from 32 anonymized patients. Ethics committee approval was obtained prior to data collection. Initial image reviews were conducted by a radiologist and a pulmonologist, while final PE region annotations were completed by a physician using semi-automated software. A convolutional neural network (CNN) was employed to identify and localize PE regions using a classification-guided detection approach, leveraging probabilistic inference for diagnostic predictions.

Results: The proposed deep learning model demonstrated satisfactory sensitivity in detecting PE on CTPA scans while maintaining an acceptable number of false positives. This indicates the model's potential for improving diagnostic accuracy and supporting clinical decision-making processes.

Conclusion: The findings highlight the feasibility of using CNN-based deep learning models for computer-aided detection of PE, offering a promising solution to current diagnostic challenges.

Further research is recommended to refine the approach and explore its application in broader clinical settings, emphasizing the potential of human-AI collaboration in enhancing healthcare outcomes.

Keywords: Deep learning, Artificial intelligence, Computed Tomography, Pulmonary Embolism, Diagnosis

G-1761

The Role and Potential of Artificial Intelligence in Geriatric Rehabilitation

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Abstract:

Background: The aging population is rapidly increasing worldwide, particularly in developed nations, creating significant challenges in elderly care and rehabilitation. Addressing these challenges requires innovative solutions, and artificial intelligence (AI) has emerged as a promising tool in geriatric rehabilitation. AI applications have the potential to enhance motor, cognitive, and social abilities among older adults, ultimately improving their recovery process and quality of life. This study examines the potential of AI in geriatric rehabilitation and its impact on the recovery process and quality of life of the elderly.

Methods: This scoping review was conducted using Arksey and O'Malley's(2005) five-step framework. A comprehensive search was performed across PubMed, Web of Science, and Scopus databases for English-language articles published between 2019 and 2023. Inclusion and exclusion criteria were defined to ensure the relevance of selected studies. Data from five eligible articles were systematically analyzed to identify trends and applications of AI in geriatric rehabilitation.

Results: The findings highlight several impactful applications of AI in elderly rehabilitation. These include the use of robotic systems to enhance motor skills, smart home technologies for continuous health monitoring, and AI-driven tools for early detection of cognitive and physical impairments. Additionally, AI enables healthcare professionals to develop more precise treatment plans and predictions by leveraging advanced health data processing techniques.

Conclusion: While AI demonstrates substantial potential in improving geriatric rehabilitation outcomes, its implementation faces challenges such as ethical concerns, privacy issues, and high costs. Nonetheless, research underscores its ability to significantly enhance the quality of life for older adults. Achieving optimal results will require interdisciplinary collaboration, further studies, and robust infrastructure development to integrate AI effectively into elderly care systems.

Keywords: Artificial Intelligence, Geriatric Rehabilitation, Elderly Care

G-1763

CCL3 as a Key Node in the Chemokine Signaling Pathway: Insights from Bulk RNA Sequencing in Psoriatic Arthritis Therapy

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Abstract:

Background and Aims: Psoriatic arthritis is a chronic inflammatory disease characterized by the interplay of genetic, immune, and environmental factors, primarily affecting the joints and skin. Central to its pathogenesis is the dysregulated chemokine signaling pathway, which orchestrates the recruitment of immune cells to sites of inflammation. Chemokines such as CXCL10 and CCL2, along with their respective receptors (e.g., CXCR3 and CCR5), drive persistent inflammation, tissue damage, and joint destruction. This pathway not only contributes to the disease's clinical manifestations but also serves as a potential target for therapeutic interventions, highlighting its importance in understanding and managing PsA.

Methods: Bulk RNA sequencing data were retrieved from the GEO repository and analyzed using the GEO2R tool. Identified differentially expressed genes were employed to construct and study a protein-protein interaction network using the STRING database and Cytoscape software. Functional enrichment analysis was conducted via the Enrichr platform to explore the biological roles of key clusters. This method provides valuable insights into the molecular differences between healthy and psoriatic arthritis-affected skin, paving the way for potential therapeutic advancements.

Results: Our analysis identified EGF, MMP9, MUC1, STAT1, CXCL8, and CXCL10 as the most central proteins among the differentially expressed genes. To uncover specific gene clusters driving distinct pathways, we utilized the Gephi application. Using its modularity algorithm, we identified five distinct functional protein clusters. Among these clusters, Cluster 2—comprising CCL3, FCGR3B, CCL4, FCGR3A, CD80, and CCR7—was identified as being associated with the chemokine signaling pathway through enrichment analysis. Within this cluster, CCL3 emerged as the most central gene based on metrics such as closeness, harmonic closeness, and eigenvector centrality. Notably, CCL3 was found to be connected with proteins such as GZMB, CD38, PLEK, CCR7, CD80, IL7R, CD28, FCGR3B, and CTLA4.

Conclusion: Our analysis highlights critical molecular differences and key signaling pathways between healthy and psoriatic arthritis-affected skin. The identification of central proteins such as CCL3 and its connections within the chemokine signaling pathway provides insights into the pathophysiology of psoriatic arthritis. These findings could inform targeted therapeutic strategies and advance our understanding of inflammatory skin disorders.

Keywords: Psoriatic Arthritis, Chemokine Signaling Pathway, RNA-sequencing

G-1764

In Silico Analysis of Gene Expression and Protein Networks in iPSCs and iPSC-Derived Cardiomyocytes for Advancing Regenerative Medicine and Tissue Engineering

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Abstract:

Background and Aims: Induced pluripotent stem cells (iPSCs) have potential in regenerative medicine due to their ability to differentiate into various cell types, including cardiomyocytes. Understanding the differences in gene expression between undifferentiated iPSCs and iPSC-derived cardiomyocytes is critical for identifying key signaling pathways involved in cardiac development and function. Such insights can be applied to optimize protocols for tissue engineering and improve therapeutic approaches for heart disease. By comparing the molecular profiles of these two cell states, we aim to uncover mechanisms that may enhance the use of stem cells in cardiac regeneration and repair.

Methods: We employed in silico methods to compare iPSCs with iPSC-derived cardiomyocytes. Microarray datasets from the GEO repository were analyzed through the GEO2R tool. Significantly differentially expressed genes were used to construct and analyze a protein-protein interaction (PPI) network utilizing the STRING and Cytoscape tools. Functional enrichment analysis was performed using the Enrichr platform to investigate the roles of key clusters. This approach, which identifies crucial nodes in the PPI network, offers valuable insights into the molecular distinctions between iPSCs and iPSC-derived cardiomyocytes, opening new avenues for therapeutic development.

Result: Our microarray analysis revealed that MYL2, TECRL, POPDC2, SLC7A3, USP44, and TDGF1 exhibited the highest fold changes among the differentially expressed genes. To visualize the protein-protein interactions of these DEGs, we employed the STRING database to construct a comprehensive interaction network. Using Cytoscape, we identified key genes driving the differentiation of iPSCs into cardiomyocytes. Notably, ACTIN2, MYH6, EGF, RYR2, TNNI3, SOX2, and CDH1 emerged as the most critical nodes in the network. Further functional enrichment analysis predicted that these central DEGs play pivotal roles in processes such as ventricular cardiac muscle tissue morphogenesis, myofibril formation, fibroblast growth factor receptor

binding, platelet alpha granule function, as well as involvement in the MAPK and Rap1 signaling pathways.

Conclusion: We identified molecular differences between iPSCs and iPSC-derived cardiomyocytes, highlighting critical genes like ACTIN2, MYH6, SOX2, and CDH1 involved in cardiac muscle morphogenesis and signaling pathways such as MAPK and Rap1. These findings offer insights into cardiomyocyte differentiation and suggest potential targets for improvement.

Keywords: iPSCs, Cardiomyocytes, Gene Expression, Protein-Interaction

G-1765

Virtual Reality-Based Therapeutic Approaches for Post-traumatic stress disorder (PTSD): A Systematic Review of Methods and Outcomes

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Abstract:

Background and Aims: PTSD is a common mental health problem worldwide. Virtual reality, as a new method in the treatment of PTSD, helps patients confront their traumatic experiences and reduce symptoms by simulating real environments. This study aims to investigate virtual reality-based therapeutic approaches and their outcomes in the treatment of PTSD.

Methods: In this study, scientific databases including PubMed, Scopus, and Embase were searched using relevant keywords between 2020 and 2025. Relevant studies on the use of virtual reality in the treatment of PTSD were screened based on inclusion and exclusion criteria. They were examined in terms of treatment methods and their outcomes. Screening and extraction of articles were carried out according to the PRISMA guidelines.

Results: In this study, 19 studies with different VR-based treatment methods were examined. Treatment methods include: VR exposure therapy (n=6), 3MDR (n=6), TF-CBT with VR (n=2), VR game (n=1), olfactory VR (n=1), VR mental health (n=1), VR Imagery Rescripting (n=1), multisensory VR nature immersion (n=1). These treatment methods addressed PTSD from the aspects of psychotherapy (anxiety, stress, depression, sleep quality, and emotional issues), cognitive therapy, and psychomotor skills. The results of 18 studies showed the effectiveness of VR in significantly reducing PTSD symptoms, emotional distress, anxiety, anger, and depression as well as improving the daily functioning of patients, such that some patients no longer had PTSD symptoms at the end of treatment. However, one study that used virtual reality imagery reenactment found no significant treatment effects on positive emotions, anxiety, and depressive symptoms in the treatment setting. Another important point of these studies was the target population, with approximately 63% of participants being military personnel and veterans, and approximately 11% being adolescents, suggesting the potential effectiveness of VR for all populations, especially younger populations, as trauma treatment for young people is often more complex.

Conclusion: Studies have shown positive results in the treatment of PTSD using virtual reality-based therapies, which have the potential to replace traditional treatments. However, more

research is needed to examine the long-term effects and their implementation in larger populations.

Keywords: Virtual Reality, PTSD, 3MDR, VERT

G-1766

Scoping Review: The Application of Medical Image Processing in the Diagnosis of Kidney Cancer

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Abstract:

Background and Aims: Kidney cancer is one of the most common urological malignancies, with early detection significantly improving patient outcomes. Medical image processing has emerged as a powerful tool for enhancing diagnostic accuracy. This scoping review explores the role of medical image processing techniques in the diagnosis of kidney cancer, focusing on their applications, advantages, and limitations.

Methods: A scoping review was conducted following the PRISMA-Scar framework. Databases such as PubMed, IEEE Explore, and Science Direct were searched for relevant studies published between 2015 and 2023. Keywords included "kidney cancer," "medical image processing," "machine learning," and "diagnosis." Studies were selected based on their relevance to imaging techniques such as CT, MRI, and ultrasound, along with computational methods like deep learning and segmentation.

Results: Recent studies highlight the integration of deep learning models with CT imaging for kidney cancer classification. For example, frameworks combining clinical metadata with CT scans have achieved high accuracy rates (85.66%) in tumor classification and surgical procedure prediction. Another approach employed fused deep features from CT images, achieving 100% detection accuracy using K-Nearest Neighbor classifiers after pre-processing. Techniques such as threshold filtering and feature fusion have significantly improved diagnostic reliability.

Conclusion: Image processing techniques have revolutionized kidney cancer diagnosis by enhancing precision and reducing manual intervention. The integration of artificial intelligence models with radiological data offers promising results, paving the way for personalized treatment strategies. Future research should focus on overcoming data imbalances and improving real-time applications in clinical settings.

Keywords: Kidney Cancer, Medical Image Processing, Computed

G-1767

Artificial Intelligence in Big Data Management and Health Technology

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Abstract:

Background and Aims: Big data refers to a set of data that is so large that it cannot be managed using conventional methods and tools for managing, processing, and analyzing data. It is recognized as an important meta-field in the information age. Big data plays a very important role in the world of artificial intelligence. Artificial intelligence is based on analyzing data and extracting patterns and useful information from it. Big data serves as the main source of information for training and feeding AI systems.

Methods: The present study is a review study that was conducted using the ISI, Pubmed, and Science Direct databases and Persian sources Iranmedex, SID, and Magiran. The search in these databases was conducted using the Keywords: Big data, Artificial Intelligence, and Health technology, Management. Among the studies published between 2010 and 2025, 40 articles were extracted, and finally 10 articles were reviewed in line with the researchers' goals.

Results: To manage big data, tools and technologies such as distributed database systems, parallel processing technologies, and advanced data analysis algorithms are used. The role of big data in AI includes: 1. Training AI models: Big data is used to train AI models, especially deep learning models. By feeding models with large amounts of data, more complex patterns and relationships can be identified and recognized. 2. Providing input to AI systems: Big data is used as input to AI systems. This data provides the information needed for the systems to perform specific tasks. AI algorithms excel at processing and analyzing large volumes of data, enabling managers to gain deeper insights into their operations. AI technology, with human-like decision-making in various situations and circumstances, has become a category that is highly regarded by managers, practitioners, and policymakers.

Conclusion: By developing and improving artificial intelligence models, big data, as a large sampling of various aspects of the problem, and with the help of modern information technologies, helps systems to achieve greater accuracy and power in recognizing patterns and predicting events. In the future, indicator-based management using artificial intelligence will replace traditional management

Keywords: Artificial Intelligence, Big Data, Health

G-1768

AI Guidelines in Healthcare: A Systematic Review of Reporting Frameworks, Quality Assessment, Clinical Implementation, Ethical Governance, and Technical Standards (2015-2024)

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Abstract:

Background and Aims: The growing use of AI in healthcare demands clear, practical guidelines to ensure safety, effectiveness, and ethics. However, existing guidelines vary widely in quality and coverage. This review evaluates AI guidelines across five key areas: reporting, quality, clinical use, ethics, and technical standards, identifying major gaps in the field.

Methods: We conducted this systematic review following PRISMA 2020 guidelines, searching PubMed, Web of Science, and IEEE Xplore (2015-2024) using a combination of AI terms ("artificial intelligence," "machine learning"), guideline types ("framework," "checklist"), and healthcare applications. Two independent reviewers screened 5,632 records, identifying 98 eligible guidelines. Data extraction captured bibliometrics, development characteristics, content attributes, implementation features, and limitations. Quality assessment used modified AGREE-II criteria, with thematic analysis performed across our five-domain framework.

Results: Current AI healthcare guidelines show strengths in reporting (CONSORT-AI/TRIPOD-AI, 82% quality) and quality assessment (QUADAS-AI/PROBAST-AI) but face critical gaps: low adoption (19% trials), missing AI-bias evaluation, scarce deployment guidance (despite DECIDE-AI's 89% score), and weak compliance (32% for FAIR-AI). Ethical frameworks (e.g., WHO) lack actionable tools. Challenges persist in applicability, reproducibility, and environmental/ethical integration. Stakeholder engagement (clinicians/patients) remains undervalued.

Conclusion: This review highlights gaps in AI guidelines, particularly in implementation tools and generative AI. Key recommendations: (1) integrated guidelines for all development stages, (2) practical toolkits, and (3) monitoring systems for compliance—essential for safe and equitable AI use in healthcare.

Keywords: Artificial Intelligence, Healthcare Guidelines, Ethical

G-1769

Machine Learning-Based Cardiovascular Disease Prediction with Social Behavior Analysis

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Abstract:

Background and Aims: Cardiovascular diseases are among the top causes of mortality worldwide, and therefore, effective predictive systems in clinical decision-making are crucial. Traditional approaches often concentrate on medical factors and overlook lifestyle or behavioral factors that have a high influence on heart health. This study aims to improve cardiovascular disease prediction by combining clinical data with behavioral variables through the use of machine learning techniques.

Methods: Two open-source datasets were utilized, with over 70,000 patient records with clinical and lifestyle variables. The data was preprocessed via standard procedures like outlier handling, normalization, and missing value replacement. Feature importance was determined with the assistance of a Random Forest algorithm. Various machine learning models were trained and tested, and comprised Random Forest, Extreme Gradient Boosting, Logistic Regression, Support Vector Machines, and K-Nearest Neighbors. The datasets used in this study were divided into training and test subsets based on an 80/20 ratio, while model performance was evaluated using accuracy, precision, recall, and F1-score.

Results: The ensemble model using Random Forest and XGBoost yielded the best results with 94.54% accuracy, outperforming all the baseline classifiers. Smoking status, blood pressure, and cholesterol levels were the most potent predictors. Physical activity exhibited a strong negative correlation with the risk of cardiovascular disease, reaffirming its role as a protective factor.

Conclusion: Integrating behavioral factors with clinical indicators not only enhances the prediction accuracy of machine learning models but also provides valuable insight into individual health profiles. This approach can assist healthcare providers in analyzing patient test results more effectively and offering personalized strategies aimed at improving overall health and preventing cardiovascular conditions. We plan to develop a software application that analyzes patients' test results by incorporating both medical records and lifestyle data, to deliver more precise health assessments and personalized preventive recommendations.

Keywords: Cardiovascular Disease, Social Behavior, Machine Learning

G-1770

Clinical Deterioration Prediction in Smart Homes: A Sensor-Based Early Warning System Using Deep Learning

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Abstract:

Background and Aims: Monitoring and predicting patient vital signs using Internet of Things technology in smart homes enables the early detection of clinical deterioration (CD). By analysing this data with artificial intelligence (AI), it is possible to prevent the consequences of CD. This study aims to develop an early warning score (EWS) system that predicts patient vital signs including heart rate (HR), blood pressure (BP), respiration rate (RR), body temperature (BT), and SpO₂ using unobtrusive sensors in smart home settings.

Methods: We develop the AI and IoMT-based EWS system in three major phases. First, chair sensors in smart homes capture the study subjects' BT and photoplethysmography (PPG) signals. In the second phase, we convert the PPG signals into vital signs, including HR, BP, RR, and SpO₂. Additionally, we develop a long short-term memory (LSTM) model to predict the five components of the EWS for the next four to six hours based on their previous five consecutive values. Finally, we create a web-based EWS system for our subjects based on their projected vital signs for four to six hours.

Results: The mean absolute errors for the extracted vital signs were as follows: HR – 2.25 beats/min, RR – 5.28 breaths/min, SpO₂ – 5.11%, systolic BP – 2.81 mmHg, and diastolic BP – 3.10 mmHg. The LSTM model's prediction results at the sixth time point almost align with the actual values for all vital signs. However, the body temperature prediction at the sixth time point shows the most significant deviation from its actual values. The calculated EWS for two participants was more accurate than for the others. The average EWS error based on the predicted vital sign values is 1.86 points.

Conclusion: Our results demonstrate the potential of using unobtrusive sensors and AI algorithms to remotely monitor discharged patients in their homes. However, there is a need to implement more advanced denoising techniques for collecting PPG signals.

Keywords: Artificial Intelligence, Clinical Deterioration, Smart Home

G-1771

Application of artificial intelligence in the prevention and early diagnosis of cognitive decline in the aged: A Systematic Review

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Abstract:

Background and Aims: Alzheimer's disease (AD), which accounts for approximately 70% of dementia cases, reduces quality of life and increases the cost of care. Early detection and intervention are crucial to slow the progression of the disease, but traditional methods such as cognitive tests and neuroimaging have limitations such as high costs and invasiveness. As a result, the need for accurate and affordable diagnostic tools has increased. Meanwhile, artificial intelligence (AI) has been proposed as a transformative technology in the diagnosis and prevention of cognitive decline. This systematically investigate the role of AI in the prevention and early diagnosis of dementia in the elderly, analyzing recent advances.

Methods: This study was conducted in accordance with the PICO criteria, in line with the research objective, and guided by the PRISMA checklist. A comprehensive search of articles from 2019 to 2025 was conducted in the databases PubMed, SCOPUS, CINAHL, Web of Science, SID, and Magiran, as well as the Google Scholar search engine. The search was conducted using the MESH keywords "artificial intelligence" "early diagnosis" "cognitive decline" "aged" and using Boolean operators. Subsequently, two researchers independently reviewed and screened the retrieved articles based on the inclusion criteria.

Results: review of the inclusion and exclusion criteria and assessment of the quality of the articles, 8 articles out of a total of 315 articles were included in the initial search. The findings indicate that artificial intelligence-based techniques, especially deep learning and machine

learning , play an important role in the analysis of neuroimaging data and language and behavioral patterns for the early diagnosis of AD. In addition, the use of multimodal AI models that analyze a combination of clinical, genetic, and imaging data has helped improve diagnostic accuracy.

Conclusion: Artificial intelligence has great potential for early detection and prevention of cognitive decline in the elderly and can help complement traditional approaches. However, challenges such as data standardization, model interpretability, and the need for extensive validation are barriers to clinical adoption.

Keywords: Artificial Intelligence, Early Diagnosis, Cognitive Decline

G-1772

Artificial Intelligence detects gastric ulcer in endoscopic images: a systematic review and meta-analysis of diagnostic test accuracy

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Abstract:

Background and Aims: Peptic ulcer disease (PUD) affects 5-10% of the global population and can lead to gastric cancer if not detected early. The use of Artificial Intelligence (AI) in gastroenterology may improve diagnostic accuracy and efficiency, but there is insufficient evidence on its specific performance for diagnosing gastric ulcers. This study aims to evaluate image-based machine learning and deep learning techniques for diagnosing gastric ulcers, with the goal of guiding clinical decision-making and future research.

Methods: We performed a systematic search in PubMed, Embase, Scopus, and Web of Science until September 11, 2024. QUADAS-2 was selected to judge the risk of bias in the included articles. Independent reviewers screened studies and assessed eligibility, certainty of evidence, and risk of bias. A univariate meta-analysis was conducted to calculate the sensitivity, specificity, and, subsequently, diagnostic odds ratio (DOR), positive likelihood ratio (LR+), and negative likelihood ratio (LR-), along with the bivariate Reitsma method to compute SROC using R version 4.4.2. The study protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) database [CRD42024611583].

Results: Twenty-three studies were eligible for qualitative analysis, of which sixteen were included in quantitative meta-analysis. The pooled DOR, sensitivity, and specificity of classification of gastric ulcer against other lesions or normal tissue were 80.80 [95% CI: 37.89 – 172.31], 0.854 [95% CI: 0.829 – 0.875], and 0.929 [95% CI: 0.906 – 0.947], respectively. The studies analyzing only CNN showed a DOR of 76.78 [95% CI: 32.53 – 181.22], while studies utilizing machine learning and feature fusion, in addition to the convolutional neural network, exhibited a DOR of 87.93 [95% CI: 61.74 – 125.23]. The SROC curve analysis reveals a diagnostic test with a high AUC of 0.934 [95% CI], indicating excellent overall accuracy and reliability for clinical application.

Conclusion: Machine learning and Deep learning models demonstrate promising potential in detecting gastric ulcers in classification tasks against other pathologies. Further prospective multicenter studies, with standardized reporting of algorithms and modality parameters, are needed to validate these findings.

Keywords: Gastric Ulcer, Endoscopy, Artificial Intelligence

G-1773

Application of Virtual Reality in Motor Retraining of Stroke Patients: A Narrative Review with Emphasis on Neuroimaging Findings

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Abstract:

Background and Aims: Virtual reality (VR) has attracted much attention in clinical research as a new method for motor retraining in stroke patients. Given the importance of restoring motor and brain function in these patients, this review study evaluated the effect of virtual reality-based exercises on improving motor function and neurological changes in stroke patients.

Methods: This study was conducted as a narrative review in 2024, involving searches in valid databases such as PubMed, Web of Science, Scopus, and the Google Scholar search engine. Keywords including "Virtual Reality," "Stroke," "Neuroimaging," and "Motor Rehabilitation" were examined in studies without time restrictions. In the initial search, 29 articles were found, and after screening, 14 articles were selected for further analysis.

Results: Virtual reality (VR)-based motor exercises have a positive effect on motor retraining and improving motor function in stroke patients, especially in the acute and chronic phases. Neuroimaging data show that VR can increase brain activity in motor and sensory areas of the brain, including the primary motor cortex (M1) and the frontal lobe. Using fMRI and EEG, it was shown that the exercises increased neural connectivity in motor networks and improved muscle coordination. In addition, the results showed a decrease in activation of unnecessary brain areas and improved efficiency of motor performance. Long-term effects of these exercises, including stabilization of neural changes, have also been reported.

Conclusion: Virtual reality exercises can effectively help stroke patients improve movement and motor function. This method is not only useful in relearning movement, but also helps rebuild neural networks in the brain that have been damaged by stroke. However, more research is needed to more accurately prove and improve this method. We need to investigate how the long-term effects of virtual reality can affect patients' rehabilitation and what the neural changes will look like over time. It seems that integrating virtual reality exercises with other treatment methods could lead to the creation of a comprehensive treatment protocol to help stroke patients.

Keywords: Virtual Reality, Stroke, Neuroimaging, Motor Rehabilitation, Neural Networks

G-1774

Prediction of Hospitalization Duration for Colorectal Cancer Surgery Patients Using Artificial Neural Networks

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Abstract:

Background and Aims: The duration of hospitalization after colorectal cancer surgery is a key factor influencing healthcare costs, resource management, and patient outcomes. Accurate prediction of hospital stay length allows for better surgical planning, improved hospital efficiency, and enhanced patient care. Machine learning techniques, particularly artificial neural networks, provide advanced methods for analyzing complex clinical data and making precise predictions. This study aims to develop and validate a predictive model using artificial neural networks to estimate the length of hospitalization in patients undergoing colorectal cancer surgery.

Methods: A predictive artificial neural network model was developed and trained using clinical data from 621 patients who underwent colorectal cancer surgery (496 for training and 125 for testing). The model's input features included tumor location, cancer stage, presence of metastasis, lymph node involvement, and type of surgery performed. The dataset was obtained from <https://doi.org/10.6084/m9.figshare.4747246.v1>.

Results: The artificial neural network model achieved an accuracy of 76%, demonstrating superior performance compared to similar predictive models. This improved accuracy makes the model a valuable tool for clinical decision-making, enabling better patient management and hospital workflow optimization.

Conclusion: The use of artificial neural networks for predicting hospitalization duration can significantly enhance hospital efficiency, reduce unnecessary bed occupancy, and optimize surgical planning. Implementing such models in healthcare systems supports data-driven decision-making, ultimately improving patient outcomes. Further validation with larger datasets is recommended to enhance model reliability and generalizability.

Keywords: Colorectal Cancer Surgery, Artificial Neural Networks, Hospitalization Duration Prediction

G-1775

A Short Review on Technological Advances in Tuberculosis Diagnosis

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Abstract:

Background and Aims: Tuberculosis remains a critical global health challenge, particularly with the increasing prevalence of drug-resistant strains that undermine conventional treatment protocols. Traditional diagnostic approaches suffer from limitations in sensitivity, speed, and accessibility, especially in resource-constrained regions. This review aims to evaluate how computational intelligence technologies, particularly machine learning and deep learning methodologies, can revolutionize tuberculosis detection and management protocols to improve patient outcomes globally.

Methods: This review examines recent progress in computational intelligence for tuberculosis diagnosis, emphasizing machine learning and deep learning. Key techniques include convolutional neural networks (CNNs) like VGG16, ResNet50, EfficientNetB3, and Vision Transformers for chest X-ray analysis, and U-Net for detecting pulmonary issues. It also discusses machine learning methods such as Support Vector Machines (SVMs), Naive Bayes, and Decision Trees for imaging and non-imaging data. Validation often uses dataset splitting and cross-dataset testing with public datasets like Shenzhen (662 CXRs) and Montgomery County (138 CXRs) for generalizability. Innovative methods like cough audio analysis with Capsule Networks and Fully Convolutional Neural Networks (FCNNs) are highlighted for resource-limited environments.

Results: The reviewed studies show significant improvements in tuberculosis detection using deep learning, with accuracies from 93.59% to 99.1% and sensitivity up to 98%. A CNN-based CAD system achieved 98.46% accuracy on the Shenzhen dataset, while EfficientNetB3 with U-Net segmentation reached 99.1% accuracy and 99.9% AUC-ROC. Image segmentation improved diagnostic precision by isolating pulmonary abnormalities. Cough audio analysis, a non-invasive method, attained 97% accuracy, 98% sensitivity, and 96% specificity. Challenges include data quality issues, high computational demands, and integration into healthcare systems.

Conclusion: Computational intelligence approaches offer transformative potential for tuberculosis management through enhanced early detection capabilities, personalized treatment regimens, and improved resource allocation. However, successful implementation requires addressing significant barriers, including the development of representative datasets, ethical considerations regarding algorithmic bias, and accessibility concerns for underserved populations. Future research should focus on creating lightweight models suitable for

deployment in resource-limited settings and establishing standardized evaluation frameworks to facilitate clinical adoption.

Keywords: Tuberculosis, Tuberculosis Diagnosis, Computer-Aided Diagnosis, Medical Imaging, Deep Learning, Machine Learning

G-1776

The Role of Biomarkers and Artificial Intelligence in Lung Cancer Diagnosis: A Systematic Review

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Abstract:

Lung cancer remains the leading cause of cancer-related mortality worldwide, emphasizing the urgent need for earlier and more accurate diagnostic strategies. While traditional screening approaches offer utility, they are often hindered by limited sensitivity, subjective interpretation, and delays in detection—especially in asymptomatic individuals. This systematic review explores the transformative convergence of biomarkers and artificial intelligence (AI) in redefining the landscape of lung cancer diagnosis and precision care.

Biomarkers such as circulating tumor DNA (ctDNA), microRNAs, and serum proteins like CEA and CYFRA21-1 have become indispensable tools for early detection, prognostication, and guiding therapy. Their integration into clinical workflows enables non-invasive, real-time monitoring of tumor dynamics, improving both diagnostic precision and treatment response evaluation.

Beyond image analysis and decision support, AI is increasingly contributing to the discovery of novel lung cancer biomarkers. Advanced machine learning and deep learning models can analyze vast and complex multi-omics datasets—including genomic, transcriptomic, and proteomic data—to identify previously unknown molecular patterns associated with tumor presence and progression. These algorithms uncover hidden correlations, enabling the identification of predictive and prognostic biomarkers that might remain elusive through conventional statistical methods. Moreover, AI facilitates the stratification of biomarkers for different lung cancer subtypes, supporting the development of more personalized and targeted therapeutic approaches.

In conclusion, the fusion of AI and biomarker science marks a paradigm shift in lung cancer diagnostics. This interdisciplinary frontier promises earlier detection, individualized treatment

pathways, and a new standard for patient-centered care. Continued collaboration among clinicians, researchers, and technologists is essential to overcoming current limitations and realizing the full potential of these innovations in real-world oncology.

Keywords: Lung Cancer, Biomarker, AI

G-1777

Using Machine Learning Algorithms for the Classification of Breast Tumors

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Abstract:

Background and Aims: Breast cancer is considered as a general life-threatening state which considerably engages females all around the world. In 2020, breast cancer caused 685,000 deaths in the world and it has a significant role in cancer deaths. The detection of cancer cells in the early-stage of the disease can effectively decrease death rates and leads to a better prognosis. Many approaches exist for the diagnosis of breast cancer, but the problem is that these approaches possess many limitations.

Artificial intelligence is shown to have the ability to analyze breast images for the detection of breast cancer. Our principal goal was to utilize artificial intelligence techniques to provide solutions for this problem. Therefore, we proposed using machine learning algorithms as an appropriate way to detect breast cancer.

Methods: We aimed to classify tumors into benign and malignant groups. We used the Breast Cancer Wisconsin Diagnostic Dataset. The dataset was obtained from Kaggle and contains 569 tumor samples and 30 numerical features, including radius, smoothness, and perimeter of tumor and etc. These features are based on digital images of fine needle aspirate biopsy slides. We trained and fine-tuned 9 machine learning algorithms. The models were assessed using metrics like accuracy, F1-score, and the area under the receiver operating characteristic curve.

Results: The Support Vector Machine achieved the accuracy of 98.98%, which was the highest one, considering that Logistic Regression gained similar accuracy but Support Vector Machine gained higher area under the receiver operating characteristic curve. Gradient Boosting with the accuracy of 97.97% ranked next. Neural Network and K-Nearest Neighbors achieved 96.96%, Extreme Gradient Boosting and Random Forest gained 95.95%, Naïve Bayes achieved 93.93%, and Decision Tree with the accuracy of 86.86% ranked last.

Conclusion: Machine learning algorithms could achieve high accuracy in classifying breast masses. Findings can help physicians in the early detection of breast cancer. Future studies can achieve better results by using larger sample size and more features.

Keywords: Breast Cancer Diagnosis, Machine Learning, Early Detection, Classification

G-1778

Early Detection of Parkinson's Disease Using Machine Learning

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Abstract:

Background and Aims: Parkinson's disease is the second most common neurodegenerative disorder and is more prevalent in men than in women. It affects 1-2% of individuals over 60 and typically arises between 55 and 65. Late diagnosis of parkinson's disease can lead to severe signs and symptoms; therefore, early diagnosis can help to slow the progression of the disease and might lead to a better life condition for patients. Recently, using machine learning techniques for disease diagnosis has shown great results. This article presents machine learning algorithms to predict Parkinson's disease at an early stage based on patient characteristics.

Methods: This paper used a dataset from Kaggle, which contains 2105 cases with features such as age, gender, medical history, blood pressure, and biomarkers (low-density lipoprotein and cholesterol levels). We trained nine Machine learning models like: Gradient Boosting and XG Boost, for the prediction of Parkinson's disease at an early stage. The models were assessed using metrics like accuracy, F1-score, and area under the receiver operating characteristic curve.

Results: The Gradient Boosting achieved the accuracy of 93.59%, an F1-score of 94.86%, and an area under the receiver operating characteristic curve of 96.88%, which was the highest one. Gradient Boosting with an accuracy of 93.11% ranked next. While K-Nearest Neighbors and Naïve Bayes demonstrated lower predictive power.

Conclusion: This study could achieve high accuracy in diagnosing Parkinson's disease using Machine learning techniques, which is a significant help for physicians. Future studies can achieve better results by using Deep Learning techniques and larger datasets.

Keywords: Parkinson's Disease Diagnosis, MachineLearning, GradientBoosting, DeepLearning

G-1779

Artificial Intelligence in Robotic Assisted Surgery: Advancements in Clinical Practice and Future Perspectives

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Abstract:

Background and Aims: The integration of artificial intelligence into robotic assisted surgery is redefining the future of operative care. Artificial intelligence technologies now play an active role in enhancing intraoperative decision making, improving anatomical recognition, and enabling semi-autonomous task execution. These advancements are designed to increase surgical accuracy, reduce variability, and support better outcomes across a range of clinical specialties. As these technologies evolve, a clear understanding of their current clinical applications and implementation barriers is essential to guide future development.

Methods: This systematic review was conducted in accordance with PRISMA guidelines. A comprehensive search of PubMed, Scopus, and Google Scholar was performed for English-language studies published from January 2015 to April 2024. Search terms included “artificial intelligence,” “robotic surgery,” “machine learning,” “computer vision,” and “autonomy.” Studies were included if they described artificial intelligence driven applications in robotic surgical platforms, including intraoperative decision support tools or automation technologies. A total of 94 articles met the inclusion criteria and were reviewed.

Results: Artificial intelligence has been successfully incorporated into robotic surgery in four main domains. First, computer vision systems allow realtime anatomical segmentation and structure identification, improving surgical navigation. Second, machine learning and reinforcement learning algorithms optimize robotic tool movement and automate tasks such as suturing and tissue dissection. Third, sensor-based haptic feedback systems help restore tactile sensation, addressing a major limitation of robotic platforms. Fourth, predictive models enable dynamic intraoperative risk assessment and adaptive surgical strategies. Notable technologies include the Smart Tissue Autonomous Robot (STAR) and TSolution One, which demonstrate advanced artificial intelligence guided precision. Additionally, artificial intelligence is being applied in surgical training through simulators that offer automated performance metrics and personalized feedback.

Conclusion: Artificial intelligence enhanced robotic surgery holds transformative potential for improving precision, efficiency, and outcomes. Widespread adoption will require validation through clinical trials, regulatory alignment, and collaboration between surgeons, engineers, and health systems.

Keywords: Artificial Intelligence, Medicine, Robotic Surgery

G-1780

Binary classification of drug molecules using machine learning as a drug repurposing tool for finding new COX-2 inhibitors

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Abstract:

Background and Aims: To accelerate the drug discovery process, virtual screening methods are currently employed as a high-throughput strategy for drug repurposing. The therapeutic target investigated in this study for drug repurposing is the enzyme Cyclooxygenase-2 (COX-2). This enzyme is crucial in converting arachidonic acid to prostaglandins, which are involved in inflammatory processes. Beyond its role in inflammation, COX-2 is frequently overexpressed in cancers (e.g., cervical cancer) and is associated with inhibiting apoptosis and promoting angiogenesis. Consequently, compounds that inhibit this enzyme are commonly used as anti-inflammatory agents.

Methods: In this study, molecules tested in vitro against the COX-2 enzyme were extracted from the ChEMBL database. Subsequently, several machine learning models—including K-Nearest Neighbors (KNN), Support Vector Machines (SVM), XGBoost, CatBoost, LightGBM, Random Forest (RF), and Artificial Neural Networks (ANN)—were trained for binary classification of the molecules based on their inhibitory or non-inhibitory activity against COX-2. To optimize model performance, multiple feature sets, such as MACCS keys, topological torsion, atom pairs, and RDKit descriptors, were evaluated. Finally, the trained model was applied to screen FDA-approved, experimental, and investigational drugs to identify potential COX-2 inhibitors.

Results: Among FDA-approved and investigational drugs Lipoic Acid, MK-886, and Pemirolast can be used for further investigation as the candidates for drug repurposing against COX-2. The model's predictions can be further validated through molecular docking as an in silico validation step. The proposed candidates can subsequently undergo in vitro testing for experimental validation.

Conclusion: The process of discovering new drugs is time-consuming and costly. Therefore, utilizing virtual screening methods assisted by machine learning can significantly contribute to shortening this process by repurposing existing drugs (either FDA-approved or in experimental stages) for new therapeutic purposes.

Keywords: Drug repurposing, Machine learning, Cyclooxygenase-2

G-1781

A Dual-Path Deep Learning Approach for Robust Classification of Colon Histopathology Images Using Attention Mechanisms: A Multicenter Study

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Abstract:

Background and Aims: Colorectal cancer is among the most prevalent and lethal malignancies globally. Histopathological image analysis is essential for accurate diagnosis, yet limited resources and inter-observer variability often challenge it. Existing deep learning models are typically trained on homogeneous public datasets that lack the staining, scanning, and demographic diversity encountered in everyday clinical settings, particularly in low-resource environments. These limitations reduce their generalizability and clinical relevance. In this study, we aimed to develop a robust and generalizable deep learning model for binary classification of H&E-stained colon tissue images into adenocarcinoma and normal categories. We combined ensemble learning with a diverse multicenter dataset to enhance real-world applicability.

Methods: We curated a private dataset of over 2,000 H&E-stained colon tissue images from three independent pathology laboratories, capturing variation in staining protocols, microscope cameras, and patient demographics. Expert pathologists annotated all images. We separately trained three pre-trained convolutional neural networks—DenseNet121, InceptionV3, and VGG19—on a publicly available dataset to capture generalizable features. We then fine-tuned each model on our multicenter dataset. To improve performance, we integrated the three networks using a Squeeze-and-Excitation block to enhance feature attention. The merged outputs

from each path were passed through fully connected layers for final binary classification. Preprocessing steps included tile extraction, normalization, and data augmentation. We evaluated model performance using accuracy, precision, recall, and F1-score.

Results: The proposed model achieves superior performance compared to individual models (VGG19, InceptionV3, DenseNet121). On the test set, it reached an accuracy of 0.9912 and F1-score of 0.9921, outperforming VGG19 (acc: 0.9694, F1: 0.9726), InceptionV3 (acc: 0.9475, F1: 0.9502), and DenseNet121 (acc: 0.9825, F1: 0.9843). In training, the proposed model achieved 0.9941 accuracy and 0.9943 F1-score, while VGG19 scored 0.9767 (acc) and 0.9767 (F1), InceptionV3 0.9577 (acc) and 0.9582 (F1), and DenseNet121 0.9912 (acc) and 0.9914 (F1).

Conclusion: Our study highlights that combining transfer learning and multicenter data within a dual-path framework leads to more accurate and clinically viable diagnostic tools for colorectal cancer detection. The proposed dual path method effectively addresses the limitations of traditional models, making it particularly valuable in underrepresented clinical environments.

Keywords: Histopathology, Conon Cancer, Deep Learning

G-1782

Lung Cancer Prediction Using Machine Learning and Deep Learning Models

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Abstract:

Background and Aims: Lung cancer remains a leading cause of cancer-related mortality globally, emphasizing the urgent need for early detection and accurate predictive tools. Current diagnostic methods often lack sufficient precision for timely intervention, underscoring the demand for more effective predictive approaches. This study aims to improve predictive accuracy in lung cancer diagnosis by exploring the application of artificial intelligence techniques, hypothesizing that machine learning models can significantly outperform other methods in terms of accuracy and reliability.

Methods: We analyzed a dataset of 3,000 clinical samples with 16 features, including demographic and diagnostic variables, sourced from Kaggle. Various machine learning models, including Random Forest, K-Nearest Neighbors, Decision Tree, Gradient Boosting, Adaptive Boosting, and Extreme Gradient Boosting, along with a deep neural network with multiple hidden layers, were developed for lung cancer prediction. Dropout mechanisms were implemented in the deep neural network to mitigate overfitting. Model performance was evaluated using metrics such as accuracy, precision, recall, F1-score, and area under the curve.

Results: The results showed that Extreme Gradient Boosting achieved the highest performance with an area under the curve of 97%. The deep neural network also performed well, reaching an area under the curve of 93%, along with 92% accuracy, 0.88 precision, 0.96 recall, and 0.92 F1-score. Other models, including Random Forest, Decision Tree, and Gradient Boosting each achieved 96% area under the curve and 96% accuracy, while K-Nearest Neighbors reached 94% for both metrics. Adaptive Boosting showed comparatively lower performance with 93% area under the curve and 94% accuracy.

Conclusion: This study demonstrates that artificial intelligence holds significant promise in revolutionizing lung cancer diagnosis and facilitating personalized treatment strategies. Future

research should validate these models across diverse populations and develop methods for integrating them into clinical practice.

Keywords: Artificial Intelligence, Lung Cancer, Machine Learning, Extreme Gradient Boosting, Deep Neural Network

G-1783

Image-Based Prediction of Microsatellite Instability in Colorectal Cancer Using H&E-Stained Histopathology: A Dual-Path Deep Learning Approach

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Abstract:

Background and Aims: Microsatellite instability (MSI) is a key molecular biomarker in colorectal cancer, critical for identifying patients eligible for immunotherapy and screening hereditary cancer syndromes such as Lynch syndrome. Current gold-standard MSI detection methods—immunohistochemistry (IHC) and PCR—are accurate but often time-consuming, resource-intensive, and inaccessible in low-resource settings due to their dependence on specialized laboratory infrastructure and expertise. These constraints hinder routine MSI screening in many clinical environments. Recently, deep learning has emerged as a promising non-invasive alternative, with growing evidence supporting the feasibility of predicting MSI status from routine hematoxylin and eosin (H&E) stained slides. However, the lack of publicly available datasets with matched MSI labels and the homogeneity of prior studies limit model generalizability. This study aims to develop and validate a dual-path deep learning model for MSI prediction using a novel, diverse dataset of H&E-stained colorectal cancer images, offering a scalable, low-cost adjunct to molecular testing.

Methods: Our proposed dual-path deep learning method integrates features from two pre-trained convolutional neural networks—DenseNet121 and InceptionV3—fine-tuned on a private dataset comprising over 500 digitized H&E-stained colon cancer images with confirmed MSI status. We collected data from a referral pathology laboratory with diverse staining protocols and patient demographics. To enhance feature representation, we applied a Convolutional Block Attention Module (CBAM) to the outputs of each path. The attention-weighted features from both paths were globally pooled, concatenated, and passed through fully connected layers for

final binary classification. Model performance was evaluated using cross-validation metrics such as accuracy, F1-score, and AUC.

Results: The final model achieved a training accuracy of 98.4% and an F1-score of 98.3%. Validation accuracy and F1-score reached 95.1% and 94.9%, respectively. On the test set, the model maintained robust performance, achieving 96.3% accuracy and 96.9% F1-score, confirming its generalizability across heterogeneous data.

Conclusion: While this approach is not intended to replace IHC, it can act as an early triage tool, buying time for patients while awaiting confirmatory IHC results, easing pathologists' workload, and prioritizing resources. It offers a promising, equitable step toward accessible precision oncology, especially in resource-limited settings.

Keywords: Microsatellite Instability, Colorectal Cancer, Deep Learning

G-1784

Evaluating the Performance of Artificial Intelligence Chatbots in Medical Examinations: A Scoping Review

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Abstract:

Background and Aims: Advancements in large language models (LLMs), such as ChatGPT, have opened new avenues for medical education. Medical examinations, as standard measures of physicians' knowledge and competence, provide an ideal context for evaluating the capabilities of these chatbots. This study aims to investigate the performance of AI chatbots in medical examinations.

Methods: This scoping review was conducted on March 5, 2025, with searches in Scopus (263 records), Web of Science (196 records), and PubMed (195 records). From an initial pool of 654 records, 334 duplicates were removed, leaving 319 records for screening. Exclusion criteria included non-research documents, irrelevant titles, abstracts, or full texts. Data from eligible studies were extracted and descriptively analyzed, categorized into national, specialty, and preclinical examinations.

Results: Advanced models like GPT-4 frequently surpassed passing thresholds in national examinations (e.g., USMLE: 89.9%, JMLE: 81.5%) and specialty examinations (e.g., ophthalmology: 91%, orthopedics: 73.9%). However, weaknesses were evident in image-based questions (accuracy: 45%-78%), complex clinical reasoning, and local contexts. GPT-4 consistently outperformed older models (e.g., GPT-3.5, Bard).

Conclusion: AI chatbots demonstrate significant potential as educational tools in medicine, but limitations in multimodal processing and cultural adaptation persist. Future research should focus on improving these aspects and integrating chatbots into medical education frameworks.

Keywords: AI Chatbots, LLMS, Medical Examinations, ChatGPT

G-1785

Artificial Intelligence in Medical Image Interpretation for Lung Cancer: A New Era of Precision in Data-Driven Prognosis

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Abstract:

Background and Aims: Lung cancer remains a major global health challenge and is the leading cause of cancer-related mortality. Accurate interpretation of medical imaging is critical for diagnosis, staging, treatment planning, and response evaluation—especially in non-small cell lung cancer (NSCLC). This study aims to review and synthesize recent advances in artificial intelligence (AI)-driven image analysis techniques, with a focus on segmentation, radiomics, and predictive modeling in NSCLC management.

Methods: A narrative review was conducted of current literature on AI applications in thoracic imaging. We examined studies utilizing deep learning architectures (e.g., U-Net, BCDU-Net) for automated segmentation of lung nodules, and the extraction of radiomic features from CT and PET scans. We also reviewed predictive models integrating imaging, clinical, and molecular data to forecast treatment responses and patient outcomes.

Results: AI-based segmentation methods have significantly reduced inter-observer variability and improved the efficiency of tumor delineation. Radiomic features derived from segmented lesions offer insight into tumor heterogeneity and phenotype, enabling non-invasive virtual biopsies. Predictive models combining imaging and clinical data have shown strong performance in stratifying patients by recurrence risk, predicting responses to immunotherapy and targeted therapies, and guiding adjuvant therapy decisions. However, challenges such as model generalizability, interpretability, and data standardization remain.

Conclusion: AI is revolutionizing medical image interpretation in lung cancer by transforming static radiologic data into dynamic tools for clinical decision-making. Its ability to integrate multimodal data and predict patient-specific outcomes marks a significant advancement toward personalized medicine in thoracic oncology. Continued collaboration between clinicians, data scientists, and regulatory bodies is essential to ensure the safe, ethical, and effective deployment of these technologies in routine practice.

Keywords: Artificial Intelligence, Lung Cancer, Medical Imaging

G-1786

Artificial Intelligence in Drug Discovery and Design: A Paradigm Shift Toward Faster, Smarter, and Targeted Therapeutics

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Abstract:

Background and Aims: Drug discovery is traditionally a high-cost, time-intensive endeavor with a high failure rate. The recent integration of artificial intelligence (AI)—particularly machine learning (ML), deep learning (DL), and natural language processing (NLP)—has transformed this paradigm, enabling faster, data-driven, and more predictive workflows. This paper aims to comprehensively review AI's impact across the entire drug development continuum, from target identification to clinical translation.

Methods: We conducted a structured literature review of recent advances in AI-enhanced drug discovery platforms. Key focus areas include structure-based virtual screening, generative AI for de novo molecule design, synthesis prediction, and drug repurposing strategies. The study also evaluated real-world case studies and emerging commercial platforms applying AI in both early and late-stage pharmaceutical research.

Results: AI-driven platforms such as RosettaVS have revolutionized structure-based drug discovery by enabling rapid, flexible receptor modeling and accurate binding affinity prediction. These systems successfully identified potent compounds from multi-billion entry libraries within days—validated through crystallographic analysis. Concurrently, generative AI models have shown promise in designing novel chemical entities with optimized pharmacokinetic and pharmacodynamic profiles, bypassing traditional compound libraries. Additionally, AI is facilitating downstream processes such as synthetic route planning, combinatorial drug design, and clinical trial optimization. Early clinical assets developed through AI-collaborative pipelines are emerging, reflecting real-world impact. However, challenges such as data standardization, explainability, and regulatory compliance remain central to successful integration.

Conclusion: AI is fundamentally reshaping the future of drug discovery and design by streamlining workflows, accelerating timelines, and enhancing precision. The integration of AI with multi-omics data and real-time patient stratification models positions it as a cornerstone of next-generation pharmaceutical innovation. Future progress depends on continued interdisciplinary

collaboration, ethical data practices, and the development of transparent, explainable AI systems aligned with regulatory standards.

Keywords: Artificial Intelligence, Drug Discovery, Drug Design

G-1790

The most effective machine learning algorithms in predicting gestational diabetes: A systematic review

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Abstract:

Background and Aims: Gestational diabetes mellitus (GDM) is a condition in which the body is unable to effectively utilize insulin, leading to insulin resistance and glucose intolerance. Timely prediction of this disorder can aid in better management of the health of both mother and baby. The purpose of this study is to systematically review published papers on gestational diabetes prediction using machine learning (ML) algorithms and to introduce and compare the most efficient of these algorithms.

Methods: A total of 1062 publications were found, of which 34 studies were considered in this review. The authors conducted a systematic search in databases including PubMed, Scopus, and Embase using the keywords "Artificial Intelligence," "Predictive Modeling," "Machine Learning," and "gestational diabetes" from 2020 to March 2025. The screening, extraction and analysis of the identified articles were performed by following the PRISMA guidelines.

Results: A total of thirty-four articles met the inclusion criteria. Parameters for selecting the most efficient machine learning algorithm include accuracy, sensitivity, specificity, and precision criteria. Among them, the Xgboost algorithm was identified as the best and most efficient machine learning algorithm for predicting gestational diabetes in 30% of the articles (n = 10). Other algorithms recognized as the best and most effective methods in these papers included Random Forest (n = 8), K-Nearest Neighbors (n = 4), Logistic Regression (n = 3), Artificial Neural Networks (n = 3), Gradient Boosting Machine (n = 4), and Bayesian Classifier (n = 2). Analysis of variables also showed that age, body mass index, and family history of diabetes are the main influential factors in predicting this disease.

Conclusion: Machine learning algorithms are recognized as effective tools in predicting GDM. The findings of this study can serve as a basis for future research aimed at improving GDM prediction and management, contributing to optimal decision-making in pregnancy health.

Keywords: Gestational Diabetes, Artificial Intelligence, Machine Learning

G-1791

Artificial intelligence applications in dentistry: A scoping review

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Abstract:

Background and Aims: This review aims to provide a scoped overview of the applications of artificial intelligence (AI) and machine learning (ML) in the field of dentistry, offering the professional community an in-depth understanding of the advancements enabled by these technologies. Particular emphasis is placed on their contributions to esthetic dentistry and color science.

Methods: The scoping review was conducted through Cochrane, PubMed, Web of Science, and Scopus databases, for eligible articles published in the last 5 years.

Results: From a total of 3,871 eligible articles, 120 were selected for final evaluation. The methodologies employed across these studies included deep learning (DL; n = 76), fuzzy logic (FL; n = 12), and other ML techniques (n = 32). These approaches were primarily utilized for disease identification, image segmentation, image enhancement, and biomimetic color analysis and modeling.

Conclusion: The findings presented in this study highlight significant advancements in the development of high-performance decision support systems across the aforementioned domains. The future of digital dentistry lies in the creation of integrated approaches that enable personalized patient care. Moreover, esthetic dentistry stands to benefit substantially from these innovations through the development of advanced models for comprehensive tooth color characterization, thereby improving the precision of dental restorations.

Clinical Significance: The integration of AI and ML is exerting a growing influence on the dental profession, complementing the advancement of digital technologies and tools. These innovations are being widely applied in treatment planning as well as in various esthetic dentistry procedures.

Keywords: Artificial Intelligence, Deep Learning, Dentistry, Machine

G-1792

Improving operating room efficiency through process control and digital transformation

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Abstract:

Background and Aims: The operating room is often considered the heart of a hospital, playing a critical role in generating revenue and delivering high-quality patient care. Given its operational complexity and substantial costs, improving efficiency and ensuring patient safety are essential. This study investigates methods and outcomes for enhancing operating room efficiency through the dual approaches of process control and digital transformation.

Methods: To improve operating room efficiency, various time metrics were analyzed, including waiting times after admission, entering the operating room, anesthesia induction, completion of preoperative preparations, surgery start and end times, and transfer to the recovery room. The study involved a comprehensive review of existing literature on digital transformation aimed at improving operating room efficiency. Key search terms included "operating room," "digital transformation," "hospital," and "AI." The literature review encompassed studies published in English until 2024, utilizing databases such as PubMed, EMBASE, CINAHL, Scopus, ISI Web of Science, and Global Index Medicus.

Results: A total of 4931 studies were screened, with 12 meeting the inclusion criteria. The reviewed articles highlighted several key points regarding the use of digital transformation and advanced technologies to improve operating room efficiency: Artificial Intelligence (AI) and Machine Learning: The integration of these technologies enhances surgical efficiency and precision by analyzing historical data to identify risk factors and develop personalized treatment plans. Robotic Surgery: Robotic systems not only augment surgeons' capabilities but also enhance patients' surgical experiences by enabling minimally invasive procedures with high precision and reduced complications. Real-Time Data Analysis: This allows hospital managers to monitor

operating room performance comprehensively, enabling the identification of issues before they impact patient care. Automated Supply Chain Management: These systems ensure the timely availability of tools and consumables, preventing delays due to inventory shortages. Equipment Tracking with IoT: IoT technology facilitates the real-time tracking of critical equipment, ensuring optimal operational performance.

Conclusion: The study demonstrates that smart surgical management, which integrates patient safety and digital transformation, can significantly improve operating room performance while reducing the workload of nursing staff, reflecting the increasing role of information technology in enhancing community health.

Keywords: Telemedicine, Digital Transformation, E-Health

G-1793

The Necessity of Focusing on Training AI Prompters in Policy-Making, Legislation, and Health Management

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) into healthcare systems is revolutionizing medical practice by enhancing diagnostics, treatment planning, and patient care. However, AI's effectiveness hinges on human-AI interaction, particularly through AI prompters—specialists trained to craft precise, context-specific prompts. This study aims to underscore the urgent need to prioritize AI prompter training within policy-making, legislation, and health management frameworks to maximize AI's potential, mitigate inefficiencies, and ensure ethical and equitable healthcare delivery.

Methods: A mixed-method approach was utilized, combining a systematic literature review with stakeholder analysis. We analyzed 30 peer-reviewed studies from 2020–2025, sourced from Scopus and PubMed, focusing on AI applications in healthcare and the role of human prompting. Additionally, semi-structured interviews were conducted with 12 stakeholders, including healthcare policymakers, legal experts, and clinicians, to evaluate current training gaps and propose solutions. Data were synthesized using thematic analysis to identify challenges and training needs.

Results: Results reveal that untrained AI prompters contribute to inefficiencies, such as AI misinterpretations, leading to clinical errors, resource waste, and disparities in care. For example, poorly designed prompts resulted in a 25% rate of inaccurate diagnostic outputs in reviewed studies. Evidence shows structured training improves AI accuracy by up to 40% in diagnostics. Stakeholders emphasized that integrating AI prompter training into health policy and legislation can address ethical concerns like privacy and bias, while enhancing health management workflows and patient outcomes.

Conclusion: Training AI prompters is critical to unlocking AI's transformative potential in healthcare safely and equitably. Policymakers, legal bodies, and healthcare leaders must collaborate to establish robust training ecosystems, supported by funding and legislation. This ensures AI systems are ethically sound, efficient, and aligned with patient-centered goals, building a future-ready healthcare infrastructure.

Keywords: Artificial Intelligence, AI Prompters, Healthcare Policy

G-1794

The ethics of artificial intelligence in health care :A Systematic Review

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Abstract:

Background: AI is no longer a technological marvel today but also a force that can bring immense value to healthcare provision in many ways. From enhancing patient care to enabling better diagnosis and prognosis, the power of AI is revolutionizing the provision of healthcare.

Methods: This study was conducted in accordance with the PICO criteria, in line with the research objective, and guided by the PRISMA checklist. A comprehensive search of articles from 2019 to 2025 was conducted in the databases PubMed, SCOPUS, CINAHL, Web of Science, SID, and Magiran, as well as the Google Scholar search engine. The search was conducted using the MESH keywords "artificial intelligence" " ethics " " health care " and using Boolean operators. Subsequently, two researchers independently reviewed and screened the retrieved articles based on the inclusion criteria.

Results: Ethical issues are privacy, trust, accountability, and bias, with significant gaps in the discussion for low- and middle-income countries (LMICs). The most pressing concerns regarding privacy and security are at 40.7%, pointing to the need to protect patient data in the context of increasing digital health records. Health inequity issues constitute 24.8%, which is an indicator of the risk AI poses in exacerbating access inequities. Patient harm risk, at 16.6%, points to the need for stringent validation and regulation of AI use cases. Accountability concerns constitute 13.1%, and this reflects the need for well-defined responsibility structures in case AI systems go wrong. Lastly, data ownership issues, at 7.6%, raise the issue of who belongs to health data generated by AI technologies.

Conclusion: Artificial intelligence (AI) application in healthcare has vast potential for enhanced patient care but also serious ethical concerns. Key among them is patient privacy, algorithmic bias, accountability, and ensuring patient autonomy. Algorithmic bias must be overcome to ensure equal access to care. Ethical guidelines must govern the interaction of healthcare professionals with AI, and adaptive regulations can guide the complex legal landscape. At the end

of the day, ethical guidelines must prioritize human well-being as the healthcare system is transformed by AI.

Keywords: Artificial Intelligence, Ethics

G-1795

perspectives and challenges of using artificial intelligence sensors in telemedicine:A Systematic Review

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Abstract:

Background and Aims: Fueled by the Internet and IT, telemedicine is now a popular model, providing high-quality, accessible healthcare. AI promises further gains, aiding physicians in decision-making, automating tasks, and improving care delivery. However, AI adoption faces hurdles: tech limitations, system costs, constant updates, and the potential for reduced innovation. This review examines the benefits and challenges of AI integration in telemedicine.

Methods: This study was conducted in accordance with the PICO criteria, in line with the research objective, and guided by the PRISMA checklist. A comprehensive search of articles from 2019 to 2025 was conducted in the databases PubMed, SCOPUS, CINAHL, Web of Science, SID, and Magiran, as well as the Google Scholar search engine. The search was conducted using the MESH keywords "artificial intelligence" "Telemedicine" "Digital Health" and using Boolean operators. Subsequently, two researchers independently reviewed and screened the retrieved articles based on the inclusion criteria.

Results: After careful review of the inclusion and exclusion criteria and assessment of the quality of the articles, 11 articles out of a total of 315 articles were included in the initial search.

Integrating artificial intelligence (AI) into telemedicine revolutionizes healthcare delivery, yielding significant improvements in patient outcomes and provider efficiency. Analysis across multiple studies reveals compelling quantitative evidence of AI's positive impact. Remote patient monitoring (RPM) systems incorporating AI-powered devices have demonstrated a remarkable 25% reduction in hospital readmission rates (p0.05), indicating a statistically significant improvement in patient management and a reduction in healthcare costs associated with readmissions. This is complemented by a 15% increase in diagnostic accuracy (p0.01) achieved through AI-driven tools, exceeding the capabilities of traditional methods and leading to more accurate and timely diagnoses.

Conclusion: The integration of AI and telemedicine holds transformative potential for healthcare by 2050, improving access, diagnosis, and efficiency. However, addressing legal, ethical, technological, and regulatory challenges, including data privacy, biases, and infrastructure needs,

is crucial. Realizing AI's full potential requires physician-led implementation, adherence to clinical practices, and robust evaluation frameworks, ensuring a more inclusive, efficient, and high-quality healthcare system, especially in remote areas.

Keywords: Artificial Intelligence, Telemedicine, Digital Health

G-1796

Alzheimer's Disease Detection: A Comparison Between Machine Learning And Deep Learning Approaches

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Abstract:

Alzheimer's disease is a neurodegenerative disorder that significantly impacts cognitive functions. Early and accurate diagnosis is crucial for effective intervention and patient care.

Background and Aims: This study evaluates and compares the performance of various machine learning and deep learning models on the Kaggle dataset to identify the most accurate AI-based approach for AD detection and validate the effectiveness of each method.

Methods: The study utilized a publicly available Kaggle dataset containing health information for 2,149 patients, uniquely identified by IDs ranging from 4751 to 6900. This dataset included demographic details, lifestyle factors, medical history, clinical measurements, cognitive assessments, and Alzheimer's disease diagnosis. Initially, the dataset was normalized using Python to enhance model compatibility and then split into training and testing subsets, with 80% allocated for training and 20% for testing. Subsequently, various machine learning algorithms (KNN, LR, SVM, RF, DT) and deep learning models (CNN, LSTM) were applied to the normalized dataset. Ultimately, model performance was evaluated using accuracy, precision, and recall scores calculated on the test data.

Results: Among the machine learning algorithms, Decision Tree (DT) and Random Forest (RF) demonstrated strong performance, achieving accuracy, precision, and recall scores of (95, 96), (93, 96), and (93, 91), respectively. However, deep learning models (CNN, LSTM), achieving accuracy, precision, and recall scores of (89, 91), (88, 90), and (88, 90), respectively.

Conclusion: The comparative study indicated that traditional machine learning algorithms, particularly Decision Tree (DT) and Random Forest (RF), outperformed deep learning models (CNN, LSTM) in the context of Alzheimer's disease classification. DT and RF achieved the highest accuracy, precision, and recall scores—up to 96%—highlighting their effectiveness in structured tabular data scenarios. In contrast, while deep learning models demonstrated competitive performance with scores reaching 91%, they slightly lagged behind classical models. This suggests that for this specific dataset, tree-based models may offer a more efficient and interpretable solution compared to complex deep architectures.

Keywords: Alzheimer's Disease, Machine Learning, Deep Learning

G-1797

AI development in prenatal care: key weaknesses and challenges

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Abstract:

Background and Aims: Artificial intelligence is transforming healthcare by analyzing big data and offering novel insights. In pregnancy, AI can effectively monitor maternal and fetal health, potentially preventing complications and enhancing care quality. However, careful consideration of existing limitations is crucial when deploying this technology in such a sensitive context. Despite the promising outlook, the integration of AI in pregnancy care raises ethical, legal, and social implications.

Methods: This review study analyzed articles published between 2015 and 2025 on artificial intelligence in pregnancy care, sourced from Google Scholar, PubMed, and Science Direct.

Results: Technical Weaknesses and Challenges:

Data quality and availability are limited in the pregnancy domain due to privacy concerns, incomplete datasets, and lack of population diversity, hindering model development. This can lead to poor generalizability across diverse populations and clinical settings.

Ethical and Legal Challenges:

- Informed Consent: Obtaining explicit and transparent consent is crucial when using pregnant women's medical data.

- Privacy: Due to the sensitive nature of pregnancy information, its disclosure poses significant privacy risks.

Liability: The legal responsibility for AI errors or misdiagnoses remains undefined.

Clinical and Cultural Hurdles:

- Physician Hesitancy: Obstetricians and gynecologists often lack confidence in AI's reliability.
- Absent Clinical Standards: Standardized guidelines for AI integration in prenatal care are needed.
- Varying Societal Acceptance: Cultural perspectives on pregnancy influence the adoption of new technologies.

Conclusion: Overcoming challenges through comprehensive data, interpretable models, ethical frameworks, and healthcare professional training is crucial for effectively leveraging AI in prenatal care. Addressing these barriers will unlock AI's potential to significantly improve maternal and fetal health.

Keywords: Artificial Intelligence, Pregnancy, Prenatal Care, Challenges

G-1798

Impact of IoT-based Wearable Devices in Continuous Monitoring of Chronic Diseases

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Abstract:

Background and Aims: As the IoT technology is progressing, wearable devices prove to be essential in chronic disease management. Real-time monitoring through these devices allows patients to monitor their health status outside the hospital environment. The aim of this study is to evaluate how such devices are effective for improving treatment outcomes and quality of life of patients suffering from chronic diseases. The hypothesis of the study is stating that such IoT based wearables might lower the occurrence of complications of the disease and improve symptoms control.

Methods: This study was conducted as a review in 2025 and included searches in reputable databases such as PubMed, Web of Science, Scopus, and Google Scholar search engine. Keywords including "Internet of Things", "wearable devices", "chronic disease management", "health monitoring", and "remote monitoring" were reviewed in studies without time limits. In the initial search, 102 articles were found and after screening, 45 articles were selected for further analysis.

Results: The present study claims that IoT-based wearable devices significantly improve the management of chronic diseases. If these devices allow for real-time monitoring of patients' health status, then they could afford dramatic cost savings and prevention of disease exacerbation as well as facilitate treatment. Such wearable devices provide valuable clinical information such as blood sugar levels, blood pressure, physical activity levels, and heart rate such

that doctors can prescribe better treatment modalities. These technologies may also prevent hospitalizations and complications associated with chronic diseases. The use of such devices does not only help improve the management of diseases but also increases patient satisfaction and the quality of life.

Conclusion: Advancement in wearable technologies and IoT enable continuous monitoring of patients' health status. These can prevent disease exacerbation, reduce costs, and improve the quality of life of the patient. Privacy and data security issues must be given attention. Future research should focus on developing predictive models and studying long-term effects of these technologies on disease management.

Keywords: Internet of Things, Wearable Devices, Chronic Disease, Smart Healthcare, Mobile Health

G-1799

Artificial Intelligence in the Service of Accurate Lung Cancer Diagnosis: A Systematic Scoping Review

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Abstract:

Background and Aims: Lung cancer is one of the most common and deadliest cancers globally, primarily due to delayed or inaccurate diagnosis. Recent advancements in artificial intelligence (AI) have introduced new opportunities to improve diagnostic precision using imaging, biomarkers, and clinical data. The aim of this scoping review is to explore current evidence on how AI contributes to the early and accurate diagnosis of lung cancer.

Methods: This scoping review was conducted in 1403. A comprehensive search was performed in PubMed, Scopus, and Google Scholar using MeSH terms such as "artificial intelligence," "lung cancer," "diagnosis," and "machine learning." After initial screening of 105 articles published between 2020 and 2025, 15 studies met the inclusion criteria and were selected for thematic analysis.

Results: The reviewed studies indicated that AI supports lung cancer diagnosis in three primary domains:

A-Imaging-based diagnostics – AI models, especially deep learning and convolutional neural networks (CNNs), have been used to analyze CT scans and pathology images with high accuracy in detecting early-stage lung cancer.

B-Biomarker analysis – AI systems have been applied to genomic, proteomic, and liquid biopsy data to identify diagnostic biomarkers, enhancing non-invasive diagnostic capabilities.

C-Clinical decision support – AI has been employed in integrated models that combine imaging, biomarkers, and clinical records to assist in subtype classification and treatment planning, especially in distinguishing between different types of lung cancer.

Conclusion: Artificial intelligence has proven valuable in improving the accuracy, speed, and non-invasiveness of lung cancer diagnosis. By leveraging imaging data, molecular biomarkers, and machine learning techniques, AI tools support clinical decision-making and enable earlier interventions. However, standardization, interpretability, and clinical integration remain essential future directions for maximizing AI's impact.

Keywords: Artificial-Intelligence, Lung-Cancer, Medical-Diagnosis, Bio-Markers

G-1800

Harnessing Multi-Omics and Deep Learning to Predict Immunotherapy Response in Lung Cancer: A Step Toward Precision Oncology

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Abstract:

Background and Aims: Lung cancer patients have accessed better therapy options through immunotherapy treatments although patient responses continue to vary. The current biomarkers which include PD-L1 expression prove to have poor predictive capabilities. This study creates a deep learning prediction model that combines genomic and transcriptomic and proteomic data approaches to determine lung cancer patient response to immunotherapy.

Methods: Our research initiated by obtaining 200 lung cancer patients receiving anti-PD-1/PD-L1 therapy. The researchers performed WES together with RNA-seq and mass spectrometry-based proteomics testing on their 200 lung cancer patients undergoing anti-PD-1/PD-L1 therapy. The patient cohort was divided into responders and non-responders following the evaluation under RECIST v1.1 criteria. A deep learning model utilized multiple networks which processed individual omics data to combine their outputs through a fusion layer that performed response predictions. A model training process used both cross-validation with hyperparameter adjustment.

Results: Using this model resulted in 85% accuracy alongside a measure of 0.90 AUC value. The SHAP values analysis revealed important features that comprised specific gene mutations together with immune-related gene expressions and protein abundance measurements.

Conclusion: The deep learning model illustrates the effectiveness of multi-omic data combination for lung cancer immunotherapy prediction which establishes procedures for individualized therapy approaches. Nonetheless, this model necessitates further research and clinical trials to accurately assess its efficacy. Additionally, it is imperative to evaluate this proposed model across various types of cancer.

Keywords: Deep Learning, Immunotherapy, Lung Cancer, Multi-Omics

G-1801

Pilot Study of AI-Powered Clinical Decision Support System to Predict Flares in Psoriasis

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Abstract:

Background and Aims: Psoriasis is a chronic, immune-mediated skin disease characterized by unpredictable flare-ups. Timely prediction of flares can facilitate early interventions and reduce disease burden. This pilot study aimed to develop and evaluate an artificial intelligence (AI)-powered clinical decision support system (CDSS) to predict impending psoriasis flares using routinely collected clinical and patient-reported data.

Methods: A retrospective dataset of 1,200 patients with moderate-to-severe plaque psoriasis was extracted from the dermatology clinics of three academic hospitals (2018–2023). Variables included demographics, Psoriasis Area and Severity Index (PASI) scores, comorbidities, treatment regimens, adherence rates, and longitudinal patient-reported outcomes (PROs). Data preprocessing involved imputation of missing values, normalization, and feature engineering, including time-series transformation and lag feature creation.

An ensemble AI model combining long short-term memory (LSTM) networks and gradient-boosted decision trees (XGBoost) was trained to classify the likelihood of a flare occurring within the next 30 days. Model performance was assessed using stratified 5-fold cross-validation. Metrics included accuracy, sensitivity, specificity, F1-score, and area under the receiver operating characteristic curve (AUC-ROC).

Results: The hybrid AI model achieved an AUC-ROC of 0.87, with sensitivity and specificity of 82.4% and 79.1%, respectively. The CDSS interface successfully generated real-time alerts for high-risk patients in a simulated deployment, showing a 20% reduction in predicted flare-related hospital visits during internal validation.

Conclusion: This pilot study demonstrates the feasibility and clinical promise of AI-based flare prediction in psoriasis management.

Keywords: Psoriasis, Artificial Intelligence, Decision Support Systems

G-1804

Deep Learning for the Detection and Classification of Sleep Disorders Using EEG Signals: A Systematic Review

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Abstract:

Background and Aims: Sleep disorders are widespread and significantly affect overall health and quality of life. Early detection is crucial for effective treatment and management. Recent advancements in deep learning and artificial intelligence offer promising approaches for analyzing EEG signals, enabling improved detection and classification of sleep disorders. This systematic review evaluates these innovative methodologies and their applications.

Methods: This study is a review of the application of machine learning and deep learning in biomarker discovery and cancer diagnosis. Research findings from 2010 to 2025 were gathered from the Google Scholar, Web of Science, Scopus, and PubMed databases. Both English and Persian searches were conducted using the following **Keywords:** Deep Learning, EEG, and sleep disorders. A total of 125 articles were initially identified. After screening, 62 articles were excluded due to duplication, 31 articles were removed due to unavailability, and 14 articles were deemed irrelevant to the topic. Ultimately, 18 related articles were selected for a comprehensive review.

Results: The review identified three key trends in the application of deep learning for the detection and classification of sleep disorders using EEG signals. First, advanced deep learning architectures, particularly Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), significantly improved the accuracy of sleep disorder classification compared to traditional methods. Second, feature extraction techniques utilizing deep learning demonstrated enhanced sensitivity in recognizing complex patterns associated with various sleep disorders, leading to more reliable diagnoses. Third, the integration of hybrid models and transfer learning facilitated the adaptation of pre-trained networks for EEG data, resulting in improved performance and the discovery of novel biomarkers not previously identified. These findings underscore the potential of deep learning methodologies to transform the diagnosis and management of sleep disorders.

Conclusion: This study underscores the transformative capabilities of deep learning in detecting and classifying sleep disorders through EEG signals. Future research should focus on integrating deep learning techniques, utilizing extensive and diverse datasets, and enhancing model interpretability for clinical implementation. These advancements have the potential to improve diagnostic accuracy and personalize treatment strategies, ultimately enhancing patient outcomes and quality of life.

Keywords: Deep Learning, EEG, Sleep Disorders

G-1805

Artificial Intelligence in Precision Oncology: A Revolution in Cancer Diagnosis and Treatment

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Abstract:

Background and Aims: The process of treatment selection in oncology medicine involves reviewing distinct patient information along with results from genomic and molecular laboratory examinations. Medical disease databases now require advanced computational approaches and artificial intelligence stands out as an effective technology to discover significant outcomes within these vast datasets. The development of precision oncology requires artificial intelligence because it enables efficient examination of intricate dataset information. This article examines current AI applications to identify and provide personalized treatment for cancer patients alongside their primary achievements and necessary study directions.

Methods: The research included systematic database queries of PubMed and Scopus and Web of Science for peer-reviewed papers from 2018 to 2025. The search incorporated artificial intelligence, machine learning, deep learning, precision oncology, cancer detection, and cancer treatment among the keyword group. Studies from Q1 journals served as the research criteria because they provided a standard of high-quality evidence.

Results: Cancer detection experienced major progress because deep learning models excel at determining malignant cases through advanced image analysis of radiological images and pathological samples. AI convolutional neural networks derived from deep learning technology detect breast cancer and lung cancer effectively in mammograms and CT scans resulting in AUC values reaching 0.99 and higher levels of excellence. The combination of actionable mutations analysis in next-generation sequencing data helps predict treatment possibilities through machine learning integration with multi-omics data to create patient stratification models. AI-based tools speed up treatment development processes through their capability to find and repurpose drugs at a faster rate.

Conclusion: Precision oncology shows strong potential after adding AI because research shows AI tools achieve excellent results at determining diagnoses and prognoses and selecting appropriate treatments. The ability of AI to decode challenging multi-omics data systems enables medical professionals to deliver individualized care to patients. Current AI applications face ongoing barriers regarding the quality of their data sources together with unclear model explanations and clinical procedures. Future research needs to focus on resolving existing challenges while performing clinical trials for AI instrument validation to confirm their performance and security in medical settings.

Keywords: Artificial Intelligence, Oncology, Machine Learning, Cancer

G-1806

Investigation on the Prediction of Student Depression for Early Detection based on Artificial Intelligence

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Abstract:

Background and Aims: Depression is one of the most important global challenges in the field of psychological disorders. However, timely diagnosis of depression requires relatively comprehensive data information from the target population and often delays timely intervention. Advances in artificial intelligence (AI) provide developers with tools to identify impairments through patterns and objective data. In this article, the effectiveness of artificial intelligence models in predicting depression in the student population, with the aim of improving early diagnosis, has been investigated.

Methods: This study proposes developing a depression detection model using advanced machine learning methods. The research utilized "Student Depression Dataset" from Kaggle. Data preprocessing was led to handle missing values, encode categorical variables, and normalize the data. Feature selection was carefully performed to enhance model performance. This study provided powerful ensemble-based classification algorithms, containing Random Forest and eXtreme Gradient Boosting (XGBoost), alongside RBF SVM and K-Nearest Neighbors (KNN), to create and estimate prediction models for depression detection.

Results: In this research, among the applied models, the random forest algorithm attained good performance in predicting depression. It achieved an accuracy of 84.96%, a precision of 85.79%, a recall of 89.07%, and an F1-score of 87.40%, demonstrating its robustness and reliability. Additionally, the Random Forest model attained a high ROC AUC score of 0.9203, indicating excellent discriminatory ability in depression detection compared to other models.

Conclusion: Machine learning shows significant potential in predicting depression among student populations and provides a basis for early intervention. Further research in this area by combining

a variety of models and using these models in a variety of human populations will give us more accurate results in the early detection of mental disorders.

Keywords: Artificial Intelligence, Depression Prediction, Machine

G-1807

From Lab to AI: The Impact of ERMP1 Knockdown on Pancreatic Cancer with Continuous Health Monitoring

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Abstract:

Background and Aims: Pancreatic cancer emerges as a dangerous form of malignancy while offering very few available treatment possibilities. The cancer progression relationship exists between pancreatic tumors and the Endoplasmic Reticulum Metalloproteinase 1 gene. We evaluated MIA PaCa-2 cell autophagy and unfolded protein response (UPR) using shRNA against ERMP1 to observe the effects. On the other hand a mobile health application was created to track genetic and biological data consistently which helped predict the development or recurrence of cancer according to individual needs.

Methods: Specific shRNA enabled long-term ERMP1 expression reduction in MIA PaCa-2 cells which was confirmed by measuring gene expression level through RT-qPCR. Cancer-related markers were analyzed. An app for mobile health allowed users to enter their dietary habits and lifestyle data including exercise and eating habits and sleep cycles by connecting to sensors that measured biomarkers from blood testers. The mobile application uses biomarker trend analysis to review dietary modification relationships and provides individualized suggestions through this data correlation.

Results: Knocking down ERMP1 expression levels resulted in major reductions of cancer-related genes according to laboratory analysis and proved it could be a therapeutic target. Biomarkers under the application's system get monitored effectively while real-time feedback arrives through visual dashboard displays. The application alerts users while providing custom life advice through which users can modify their diet based on how their selected nutritional modifications affect designated biomarkers.

Conclusion: By combining lab research findings with advanced mobile health (mHealth) tech, including AI-powered diagnostic tools and IoT monitoring systems that offer personalized diet and

lifestyle advice, we can improve how we spot cancer, tailor treatments to each patient, and manage cancer care. This marks a big change in patient care focusing on individual health needs and using tech to boost health results. These systems give complete suggestions based on each patient's unique situation. This new approach puts a high value on the details of each person's health profile and uses technology to help achieve better outcomes.

Keywords: Pancreatic cancer, ERMP1, Gene knockdown, Ai

G-1808

Revolutionizing Prosthetics: The Intersection of Artificial Intelligence and 3D Printing—A Comprehensive Systematic Review

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Abstract:

Background and Aims: The combination of Artificial Intelligence (AI) and 3D printing has transformed the development of prosthetic limbs, delivering unmatched levels of customization, efficiency, and functionality. Conventional prosthetic manufacturing tends to be expensive, slow, and inflexible in meeting individual user requirements. By leveraging AI-powered methods and cutting-edge additive manufacturing, these challenges have been overcome through automated design refinement, real-time adjustments, and enhanced material choices.

Methods: A structured literature review was carried out by searching databases like PubMed, Scopus, and Web of Science, concentrating on studies published from 2022 to 2025, examining 50 peer-reviewed studies, 15 industry reports, and 10 clinical case studies. Key areas of focus include AI-enhanced design optimization, advancements in 3D printing efficiency, and progress in user-specific customization. The methodology employs a systematic literature review, meta-analysis of clinical trials testing AI-integrated prosthetic solutions, and interviews with leading researchers and manufacturers. Inclusion criteria prioritized studies investigating AI applications in prosthetic design, manufacturing efficiency, material innovation, and user adaptability. Statistical analyses were performed to evaluate the impact of AI-driven methods on prosthetic fit, durability, and production costs.

Results: The results reveal that AI substantially advances prosthetic development by facilitating highly tailored designs, cutting production timelines, and boosting durability and functionality. Machine learning algorithms are pivotal in analyzing patient-specific data to refine fit and comfort, while AI-enhanced 3D printing increases precision and affordability. Additionally, AI-enabled real-time monitoring and adaptive control systems dynamically fine-tune prosthetic performance, significantly enhancing user experience and mobility.

Conclusion: The collaboration between AI and 3D printing is set to revolutionize prosthetic technology, tackling major hurdles in design, production, and accessibility. Future efforts should aim to improve AI algorithms, incorporate advanced biosensors, and extend these innovations to underserved communities. As AI progresses, its integration with 3D printing promises to

significantly improve the quality of life for amputees globally, offering prosthetics that are more affordable, functional, and customized to meet individual requirements.

Keywords: Artificial Intelligence, Prosthetics Limbs, 3D Printing

G-1809

The Future of Vaccination: AI and Metaverse Synergy in Developing Multi-Epitope Vaccine Against HIV

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Abstract:

Background and Aims: The viral disease Human immunodeficiency (HIV) kills many people despite the fact that no available vaccine exists. Traditional vaccine development faces three major challenges in terms of poor effectiveness combined with safety-related fears and high manufacturing costs. A vaccine design strategy based on epitopes combined with AI technologies and metaverse innovations creates better security features by pinpointing exact viral-cell response pathways.

Methods: Using AI-enhanced immunoinformatics methods we predicted epitopes of B cells and T cells originating from the HIV. The vaccine components came together through the combination of epitopes with adjuvants and linkers in a specific design. Analysis employing AI together with metaverse-integrated three-dimensional modeling systems led to optimized vaccine structure development and enhanced interactions between the vaccine and human leukocyte antigen (HLA) molecules. Simulations with docking functions assessed the stability together with effectiveness of the constructed complex. A predictive framework based on AI simulated both cloning and solubility experiments for human models following vaccine administration.

Results: The vaccine product contains 488 amino acids with high HLA binding capacity that covers 99.44% of the worldwide population. A simulation testing performed by using AI technology and metaverse methods demonstrated TLR receptor stability which indicates strong immunological activation. The vaccine production benefited from its superior physicochemical properties. The laboratory modeling experiments performed using mouse models showed both enhanced protein expression and better solution quality which proved that mass-production was feasible.

Conclusion: The authors present a groundbreaking formulation approach using AI technology enabling better collaboration between immunoinformatics and metaverse technologies. Prospective medical applications demonstrate major potential in the multi-epitope vaccine. The epitope-based vaccine development strategy resolves efficiency and production cost problems encountered by traditional vaccines. The combination of AI and metaverse technologies creates new vaccine development opportunities while solving worldwide health challenges although more research is required to confirm the method's effectiveness.

Keywords: Vaccine Design, HIV, Immunoinformatics, Multi-Epitope Vaccine

G-1810

Revolutionizing Surgery and Healthcare: The Role of AI-Driven Robotics—A Systematic Review

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Abstract:

Background and Aims: Artificial Intelligence (AI) is reshaping the role of robotics in surgery and healthcare, driving improvements in precision, operational efficiency, and patient care. Through the integration of AI into robotic systems, medical professionals can enhance procedural accuracy, minimize surgical complications, and tailor treatments to individual patient needs. This review delves into the latest innovations, advantages, and obstacles of AI-powered robotics in surgical applications, examining its influence across diverse medical fields and its transformative potential in healthcare services.

Methods: This review explores recent advancements in AI-driven robotics in surgery and healthcare. A structured literature review was carried out by searching databases like PubMed, Scopus, and Web of Science, concentrating on studies published from 2023 to 2025, analyzing 60 studies, 20 industry reports, and 12 clinical trials. It focuses on AI-supported surgery, autonomous systems, diagnostics, and rehabilitation technologies. The methodology includes a literature review, meta-analysis of clinical trial data, and expert interviews. Studies assess AI's impact on surgical precision, recovery, diagnostics, and healthcare efficiency, with statistical analyses quantifying improvements in patient safety, outcomes, and cost-effectiveness.

Results: The findings demonstrate that incorporating AI into robotic systems markedly enhances surgical accuracy, cutting error rates by as much as 25% during intricate procedures. AI algorithms facilitate instant decision-making, support preoperative preparations, and adjust to unique patient anatomies, resulting in shorter operation durations (by up to 30%) and quicker recovery times. Additionally, AI-powered robotic systems improve postoperative care by offering customized rehabilitation programs and predictive insights to anticipate complications. These advancements lead to better patient outcomes, with a 20% decrease in postoperative issues across multiple surgical fields.

Conclusion: In summary, AI-driven robotics is revolutionizing healthcare by enabling precise, efficient, and personalized surgical procedures. These advancements enhance decision-making, reduce errors, and improve recovery. However, challenges like high costs, regulatory hurdles, and

limited access require further research. Future efforts should focus on refining AI algorithms, enhancing system compatibility, and expanding availability, especially in underserved regions. With ongoing progress, AI-integrated robotic surgery promises to elevate care quality, patient outcomes, and healthcare systems globally.

Keywords: Artificial Intelligence, Healthcare, Robotics, Surgery

G-1811

Revolutionizing Diabetes Management: The Role of Mobile Health Innovations

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Abstract:

Background and Aims: Type 2 diabetes mellitus (T2D) is a metabolic condition distinct from others because it manifests with elevated glucose levels combined with insulin resistance. The development of T2D heavily relies on genetic factors because several genetic polymorphisms take part in disease initiation. The comprehension of this condition proves essential to create new methods that help detect and treat diabetes. mHealth technologies demonstrate excellent potentials to minimize T2D risks and create tailor-made disease management plans for patients at high risk.

Methods: The research evaluates the vital role which mobile health technology plays in Type 2 Diabetes management. A wide-ranging research encompassed both PubMed and Scopus databases and the Google Scholar search engine to identify relevant studies between 2015 and 2024 through keywords such as “T2D,” “mHealth,” “monitoring,” and “Personalized Management.” The evaluation was performed by two authorized analysts who studied 233 articles independently. We selected 10 research studies that studied mHealth applications for T2D treatment and included quantitative results and peer-reviewed publication.

Results: Type 2 Diabetes (T2D) receives personalized care through mobile health (mHealth) technologies which provide continuous glucose monitoring functions. The devices supply immediate feedback together with graphical data views which enable patients to base knowledgeable decisions and adjust their behavior patterns respectively. mHealth strategies work to minimize blood glucose levels and improve glycosylated hemoglobin measurements at the same time. Through their implementation these systems help patients improve their self-regulatory abilities and cut down on unexpected health visits while enhancing their lifestyle patterns and resulting clinical measurements.

Conclusion: The analysis shows that mobile health (mHealth) stands as an essential tool for Type 2 Diabetes (T2D) supervision and management because it rapidly provides glucose data and reveals trends and additionally helps people adopt better behavior patterns and self-manage their healthcare effectively. The delivery of mHealth interventions through genetic individualization can achieve substantially better results in T2D treatment.

Keywords: Type 2 Diabetes, mHealth, Monitoring, Genetics

G-1812

Artificial Intelligence for Enhanced Survival Prediction in Liver Cirrhosis: A Stacking Ensemble Approach

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Abstract:

Background and Aims: Liver cirrhosis is a significant global health concern, causing high mortality rates due to irreversible liver damage and severe complications, including liver failure and hepatocellular carcinoma. Early and accurate survival prediction is essential for identifying high-risk individuals and facilitating timely interventions. Traditional prognostic methods often lack precision, highlighting the necessity for advanced analytical approaches. Recent advancements in artificial intelligence and machine learning present promising solutions by effectively analyzing complex patient data.

Methods: This study employs a stacking ensemble learning approach that integrates multiple base models—Multilayer Perceptron, Random Forest, K-Nearest Neighbors, and Support Vector Machine—with Extreme Gradient Boosting serving as the meta-learner to enhance survival prediction accuracy. We utilized the Liver Cirrhosis Stage Classification dataset from Kaggle, derived from a Mayo Clinic study on primary biliary cirrhosis (1974-1984). This dataset originally encompassed 19 clinical and demographic features and 418 samples. To improve the robustness and generalizability of the model, the dataset was manually cleaned and augmented with synthetic data, resulting in a final synthetic sample size of 25,000.

Results: The stacking ensemble model outperformed individual algorithms, achieving an accuracy of 99.0%, precision of 99.0%, recall of 98.5%, F1-score of 98.8%, Matthews correlation coefficient of 98.1%, and area under the receiver operating characteristic curve of 99.8%. These results highlight the model's superior ability to identify complex patterns and improve survival prediction in cirrhosis patients. The ensemble approach demonstrated robustness, reduced overfitting, and effectively balanced bias and variance, making it a reliable tool for clinical applications.

Conclusion: The stacking ensemble approach markedly improves prediction accuracy, serving as a reliable tool for clinical decision-making in liver cirrhosis management. By leveraging the strengths of diverse algorithms and utilizing a high-quality dataset, this method offers a comprehensive framework for survival prediction, potentially enhancing patient outcomes and reducing mortality rates. Future research could explore the application of this technique in broader clinical settings and its integration with real-time patient monitoring systems.

Keywords: Livercirrhosis, SurvivalPrediction, ArtificialIntelligence, MachineLearning, StackingEnsembleLearning

G-1813

The Role of Artificial Intelligence in Promoting Mental Health in the Elderly: A Systematic Review

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Abstract:

Background and Aims: Artificial intelligence (AI), a branch of computer science, simulates human cognitive processes such as thinking, reasoning, and learning. Its primary aim is to solve complex problems traditionally addressed by specialists. Artificial intelligence also has the potential to increase the overall quality of services provided in the healthcare industry. Meanwhile, the global rise in the elderly population has posed significant challenges to healthcare systems, particularly in ensuring their mental well-being. Adopting innovative approaches like AI may offer promising solutions in geriatric mental health care. This study aimed to review existing literature on the application of AI in supporting mental health among older adults.

Methods: A systematic search was conducted in both English and Persian languages across databases including Google Scholar, SID, and PubMed using keywords such as “artificial intelligence,” “elderly mental health,” and “geriatric care.” A total of 30 relevant articles were selected and analyzed using content analysis methodology.

Results: The findings revealed that AI can play a significant role in improving mental health services for the elderly, contributing to enhanced psychological and healthcare outcomes in this population.

Conclusion: Given the demonstrated potential of AI in elderly mental health care, it is recommended that healthcare providers prioritize the integration and training of AI technologies in geriatric care strategies.

Keywords: Artificial Intelligence, Mental Health, Geriatric Care

G-1814

AI Challenges in Article Writing: From Idea to Publication

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Abstract:

Background and Aims: Scientific research drives knowledge and technology, making scientific writing crucial for documenting, sharing, and assessing its findings. Artificial intelligence, particularly deep learning and language models, offers researchers opportunities to streamline article production. However, this advancement raises concerns about maintaining research originality, credibility, and ethical standards.

Methods: This study employs a narrative review methodology to explore the key technical, ethical, and cultural challenges associated with the application of artificial intelligence (AI) in scientific writing. Relevant literature was collected through a comprehensive search of databases such as PubMed, Scopus, and Google Scholar using keywords including "AI in scientific writing," "GPT challenges," "ethical implications of AI," and "AI-generated content." Publications from 2019 to 2024 were considered to ensure the inclusion of the most recent developments. Articles were selected based on their relevance, credibility, and focus on issues related to AI-generated academic content. The findings were synthesized and categorized thematically to present a structured discussion on the multi-dimensional challenges of using AI tools in the process of writing academic manuscripts.

Results: Using AI in scientific writing presents challenges on three levels. Technically, language models can generate inaccuracies, lack specialized understanding, and fabricate sources. Ethically and legally, concerns arise regarding intellectual property ambiguity, increased fraud risk, and unclear AI usage guidelines. Culturally and in research, over-dependence on AI may erode skills, diminish digital literacy, and foster unrealistic expectations about AI's role in science.

Conclusion: Artificial intelligence has the potential to serve as a powerful tool in scientific writing, provided it is used with proper understanding, ethical awareness, and adherence to research principles. It is recommended that: Formal education on the ethical use of AI be incorporated into academic and publishing institutions. Ethical and research guidelines be developed specifically for the application of AI in scientific writing. AI should be regarded solely as a supportive tool, not as a replacement for the creativity and critical thinking of the researcher.

Keywords: Artificial Intelligence, Essay Writing, Scientific Writing

G-1815

Machine Learning for Personalized Content Delivery: Adapting to Learning Styles and Knowledge Gaps

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Abstract:

Background and Aims: Personalized learning environments aim to improve educational outcomes by tailoring content to individual learners. This systematic review examines how machine learning techniques detect learner preferences and optimize content delivery in digital education platforms. The objective is to evaluate the accuracy, adaptability, and pedagogical impact of these AI-driven systems.

Methods: A systematic literature search was conducted across PubMed, Embase, Scopus, and Web of Science using MeSH-compliant and relevant terms such as “Machine Learning,” “Individualized Instruction,” “User-Computer Interface,” “Cognition,” “Knowledge Bases,” and “Learning.” Out of 178 initially identified studies, 69 met the inclusion criteria based on eight screening parameters. Selected studies were reviewed and analyzed for five core dimensions: machine learning approach, learning style framework used, data sources, adaptation method, and measured learning outcomes.

Results: Among the 69 studies, a variety of learning style models were employed, including Felder–Silverman (used in 17 studies), VARK, MBTI, and several proprietary or hybrid approaches. Machine learning techniques ranged from Support Vector Machines (SVMs), decision trees, ensemble methods, neural networks, and Bayesian models, to deep learning architectures. Reported accuracy in learning style detection varied from 72% to 98.2%, with the highest results achieved using ensemble models combining random forests, SVMs, logistic regression, and convolutional neural networks (CNNs). Adaptive strategies included rule-based sequencing, semantic content personalization, adaptive link structuring, and real-time navigation support. Most systems were integrated into web-based platforms or Learning Management Systems (LMS), dynamically collecting and analyzing behavioral data, quiz performance, and interaction patterns to inform content delivery. Over half of the studies reported statistically significant improvements in learning efficiency, engagement, and retention when adaptive mechanisms were applied.

Conclusion: Machine learning is a promising enabler of adaptive learning systems, capable of identifying user learning styles and knowledge gaps with increasing precision. By leveraging behavioral and interaction data, these systems can personalize educational content in real-time, leading to enhanced user engagement and improved learning outcomes. Future research should focus on improving model generalizability, integrating affective computing, and evaluating long-term educational impact through large-scale field

Keywords: Machine Learning, Cognition, Knowledge Bases, Learning

G-1819

The Role of Artificial Intelligence in the Development of Smart and Targeted Drug Nanocarriers

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Abstract:

Background and Aims: Background and Objectives: In recent years, artificial intelligence and nanotechnology have dramatically changed the path of drug design and targeted therapies. The combination of these two technologies has helped develop nanocarriers that deliver drugs precisely to the desired site in the body, thereby both increasing the effectiveness of treatment and reducing side effects. This study examines the role of artificial intelligence in the development of smart drug nanocarriers.

Methods: This review was conducted systematically. A search was conducted in the reputable databases PubMed, Scopus, and Google Scholar in the period 2020-2025 with the keywords Artificial Intelligence, Nano drug carriers, Smart drug delivery, Targeted drug delivery, Machine learning in drug design, and Nanotechnology in pharmaceutical sciences. Finally, 30 relevant articles that met the defined inclusion criteria (articles published in English, full-text access, and focused on AI applications in drug nanocarriers) were selected for content analysis.

Results: The review findings specify that most of the AI algorithms particularly machine learning models such as Random Forest, SVM, and Convolutional Neural Networks (CNN) have a vital role in the drug nanocarrier design specifications. These studies assessed biological and chemical data to give a more accurate prediction of toxicity, pharmacokinetics, and therapeutic efficacy of nanoparticles. Artificial intelligence also facilitates the design of nanostructures more responsive

to pH, enzyme activity, and cellular receptors through molecular dynamics simulations and optimization of targeted drug release. It is true that AI technologies have increased the speed of design, but they also improve the likelihood of clinical success and effectiveness of nanoformulations.

Conclusion: The application of artificial intelligence to design smart, targeted drug nanocarriers can even go further and might revolutionize targeted drug therapies. Modern progress made in both machine learning and nanotechnology holds great promises toward the improvement of precision and effectiveness in treatment. As these technologies grow so rapidly, it would be imperative that policymakers and researchers develop this field much more seriously for the full capabilities of artificial intelligence to be exploited in optimizing treatments.

Keywords: Artificial Intelligence, Nanocarriers, Drug Delivery, Machine Learning, Nanotechnology

G-1821

Mortality patterns by time series simulation in ten causes of heart disease in Mazandaran province, 2011-2023

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Abstract:

Background and Aims: Heart Failure (HF) is one of the leading causes of mortality and healthcare costs, with its prevalence on the rise. Large-scale contemporary population-based studies on the incidence of heart failure are essential for resource planning and prioritizing necessary research.

Methods: In this population-based study, data from the Health Department of Mazandaran Province, classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Edition (ICD-10) by WHO for 2019 were used. We estimated age-standardized rates using European age standard rates as well as the census population of Mazandaran Province. Our aim was to assess temporal trends in the incidence and prevalence of heart failure in a large general population group from Mazandaran Province, focusing on both genders and ten cardiovascular disease classifications between 2011 and 2023, which we analyzed using time series modeling with the Python programming language and stata software.

Results: Utilizing health department data, a total of 73,434 deaths due to cardiovascular diseases were observed. From 2011 to 2023, the age- and sex-standardized incidence of heart failure showed a slight decrease for both men and women (from 173.7 to 167.2 per 100,000 individuals). However, since 2019, there has been an increase in cardiovascular disease mortality, peaking in 2021 at 178.5 ASR, followed by a slight decline, potentially due to the COVID-19 pandemic and increased mortality in the population. The highest mortality rates from cardiovascular diseases were associated with diseases of arteries, arterioles, and capillaries in both genders. Predictions indicate an increase in mortality cases for this category in the coming years, although overall mortality rates for various cardiovascular diseases have decreased, as simulated through time series modeling in Python.

Conclusion: Despite a moderate decline in standardized mortality from cardiovascular diseases, the burden of heart failure is increasing and currently ranks among the leading causes of mortality. Socioeconomic inequalities also highlight the preventable nature of this disease, which still needs to be addressed.

Keywords: Artificial Intelligence, Time series, Heart Failure, Mortality

G-1822

Beyond Medication: The Role of Virtual Reality in Enhancing the Psychological and Physical Well-being of Children with Cancer

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Abstract:

Background: Cancer treatment in children is often accompanied by invasive and long-term medical interventions, which lead to experiences of pain, anxiety, depression, and reduced quality of life. Virtual Reality (VR), as an innovative non-pharmacological tool, has demonstrated potential in alleviating these psychological and physiological symptoms. This Umbrella review explores the effectiveness of virtual reality interventions in improving psychological and physical outcomes in children.

Methods: A systematic review of review studies was conducted by searching keywords (Virtual Reality (VR), Neoplasm, children, anxiety, pain, non-pharmacological intervention) in titles and abstracts within the scientific databases Embase, Web of Science, Scopus, and PubMed in April 2025. This study followed the PRISMA guidelines for systematic reviews. Reviews that examined the applications of virtual reality in cancer patients and had full texts available in English were included without time limitations.

Results: After the final assessment, 14 review studies were included in the analysis. Results showed that VR reduced pain in 9 studies, decreased anxiety in 7, and improved mood and reduced depression in 4 studies. Additionally, fatigue reduction was reported in 6 studies, improved quality of life in 3, and regulation of vital signs such as heart rate and blood pressure in 4 studies. Only one study confirmed a reduction in children's fear. This evidence suggests that virtual reality can serve as an effective complement to traditional treatments and significantly enhance the therapeutic experience of pediatric cancer patients.

Conclusion: Virtual reality, as a safe, accessible, and cost-effective method, holds great potential in improving the psychological experience of children with cancer. Given the positive results, it is recommended that virtual reality be integrated into the supportive care and psychotherapy protocols for this patient group.

Keywords: Virtual Reality, Non, Pharmacological Intervention, Neoplasm

G-1824

AI-Driven Improvements in Diagnostic Accuracy for Medical Imaging Systems

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Abstract:

Background: The integration of Artificial Intelligence (AI) into medical image processing has significantly enhanced diagnostic accuracy. AI-powered Diagnostic Aid Systems (DAS) are transforming radiology, pathology, and other image-dependent specialties by automating detection, classification, and segmentation tasks. With increasing volumes of imaging data and a global shortage of expert radiologists, AI offers a scalable and efficient solution for improving diagnostic precision and supporting clinical decision-making.

Methods: This study systematically reviewed peer-reviewed literature published between 2021 and 2025 on the application of AI in enhancing diagnosis accuracy in DAS for medical imaging. Various AI techniques, including convolutional neural networks (CNNs), deep learning, and transformer-based architectures, were evaluated. Comparative performance metrics (sensitivity, specificity, accuracy, and AUC) of AI models versus human experts and traditional rule-based systems were analyzed across modalities such as X-ray, MRI, CT, and digital pathology.

Results: AI-enhanced DAS demonstrated superior accuracy compared to conventional systems across all studied modalities. For instance, deep learning models achieved a pooled sensitivity of 96.3% and specificity of 93.3% in digital pathology applications . In brain metastases detection using MRI, AI algorithms showed a detectability rate of 89% . Furthermore, AI tools in diagnostic imaging have been shown to reduce errors and accelerate diagnostic processes, leading to quicker patient diagnosis and reduced healthcare costs .arXiv

Discussion: The results affirm AI's potential in enhancing diagnostic accuracy, particularly in settings with limited medical resources or high workloads. However, challenges such as data bias, model interpretability, and clinical integration persist. Standardizing model evaluation and

promoting transparent AI systems are essential to gaining clinician trust and ensuring ethical deployment.

Conclusion: AI-driven Diagnostic Aid Systems significantly improve diagnostic accuracy in medical image processing and hold promise for global healthcare enhancement. Future research should focus on real-world deployment, interoperability, and regulatory frameworks to fully harness AI's potential in clinical practice.

Keywords: AI, Diagnostic Aid Systems, Medical Medical Image, Deep Learning

G-1825

Applications of Artificial Intelligence in Diabetes Prediction, Diagnosis, and Management: Challenges and Opportunities - A Review of Meta-Analyses and Systematic review

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Abstract:

Background and Aims: Diabetes, as one of the most prevalent chronic diseases, requires innovative approaches for early diagnosis and effective management. Traditional systems face limitations such as high costs and lack of personalization. Artificial intelligence, by analyzing complex data (clinical, genetic, and behavioral), has created new opportunities for more accurate prediction, targeted treatment, and real-time monitoring.

Methods: By searching databases such as PubMed and Google Scholar, 11 articles were selected from 174 studies (2018-2025) based on relevance to the topic and methodological quality. The studies included quantitative and qualitative research focusing on machine learning, deep learning, and hybrid systems.

Results: Artificial intelligence, particularly machine learning and deep learning models, has demonstrated high accuracy in early diabetes diagnosis. For example, a combination of artificial neural networks and decision trees achieved 92.5% accuracy and an area under the curve (AUC) of 0.94 in predicting diabetes. In the field of personalized management, hybrid algorithms such as reinforcement learning and convolutional neural networks, by analyzing lifestyle and blood glucose data, led to a 1.5% reduction in HbA1c and a 25% improvement in treatment adherence. Additionally, systems based on deep learning and clustering algorithms in wearable devices reduced the occurrence of hypoglycemia and hyperglycemia by 40% and predicted critical events with 89-91% accuracy. However, challenges such as algorithmic bias (a 30% reduction in accuracy when combining machine learning and recurrent neural networks), the need for large datasets, and privacy concerns were identified as major obstacles.

Conclusion: Artificial intelligence, as a new paradigm in diabetes care, has significant potential to reduce costs, improve clinical outcomes, and alleviate the burden on healthcare systems. However, its success depends on addressing key challenges such as model transparency, mitigating data bias, and developing ethical standards. To maximize its impact, it is recommended to develop multidisciplinary platforms for integrating artificial intelligence into clinics, generate diverse datasets, and design regulatory frameworks to ensure patient security and privacy. By

fulfilling these requirements, artificial intelligence can serve as an intelligent companion, playing an unparalleled role in combating the global diabetes epidemic

Keywords: Artificial Intelligence, Diabetes, Management, Machine Learning

G-1826

Policymaking, Legislation, and Health Management of Artificial Intelligence in Healthcare 4.0

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Abstract:

Background and Aims: The global healthcare system has evolved from diagnosing and treating patients to providing personalized care. This shift highlights technology's role as a competitive factor. Healthcare 4.0 has emerged from digitalization, transforming the industry with artificial intelligence, data analysis, and real-time medical care. Artificial Intelligence can extract valuable information from medical records and clinical reports. This technology is vital in Healthcare 4.0, but its application requires new infrastructure and guidelines within the healthcare sector. Preparing for the widespread adoption of this technology necessitates careful planning, implementation, and continuous monitoring. Developing reliable training courses and guidelines for utilizing artificial intelligence in medical sciences demands collaboration among all stakeholders. Given the expansion of AI applications in healthcare and the challenges and potential barriers, policymaking and regulation of this emerging technology have received heightened attention in recent years. Despite significant advancements in artificial intelligence, the healthcare industry in Iran still holds many opportunities for digital solutions.

Methods: The initial phase involves a systematic review to examine the current AI regulations in healthcare across ten prominent organizations and countries. Articles from 2007 to 2025 were reviewed for research variable relationships, along with current guidelines. Due to the topic's novelty, 23 relevant articles were found. No prior research explored these connections in Healthcare 4.0. The guiding principles of Iran's National Document on Artificial Intelligence were also examined. The study's second phase will analyze artificial intelligence policy in healthcare using the health policy triangle framework, which emphasizes content, process, context, and actors.

Results: Based on policy analysis and stakeholder insights, this research will recommend guiding principles for AI policy actions in the Iranian healthcare industry. It will also suggest challenges and strategies for integrating AI in health management across planning, implementation, and continuity in the Strategic Plan Implementation model.

Conclusion: Generative AI faces misconceptions and misuse. Clear healthcare regulations are crucial. An organization's readiness affects its technical and regulatory preparedness in AI integration. Establishing clinical criteria and selecting appropriate methodologies are key for

optimal outcomes. Trust is essential to avoid inequities. Future articles may further explore these issues.

Keywords: Artificial Intelligence, Policymaking, Legislation, Health Management

G-1827

Artificial Intelligence in Clinical Decision Support Systems: Enhancing Laboratory-Clinician Collaboration

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Abstract:

Background and Aims: Artificial Intelligence (AI) has emerged as a transformative force in healthcare, particularly within Clinical Decision Support Systems (CDSSs). By integrating AI into clinical and laboratory settings, healthcare providers can leverage data-driven insights to enhance diagnostic accuracy, optimize treatment selection, and reduce medical errors. This study aims to evaluate the role of AI in CDSSs and its impact on clinician-laboratory collaboration.

Methods: We reviewed studies published from 2015 to 2025, sourced from PubMed, Scopus, and Web of Science. Inclusion criteria encompassed peer-reviewed articles focusing on AI integration in CDSSs for laboratory medicine and clinical applications. Exclusion criteria included studies without sufficient data, non-peer-reviewed articles, and non-English publications.

Results: AI-driven CDSSs demonstrated significant improvements in diagnostic accuracy and decision-making efficiency. Machine learning models, particularly convolutional neural networks (CNNs) and data mining algorithms, were effective in identifying disease patterns from large datasets. These systems reduced false alerts and missed diagnoses compared to traditional rule-based models. Additionally, AI applications in perioperative risk prediction and disease management streamlined clinician workflows, enhancing patient outcomes. AI also enabled real-time data analysis, promoting personalized treatment approaches and collaborative decision-making in laboratory settings.

Conclusion: AI-based CDSSs present a paradigm shift in healthcare by fostering collaboration between clinicians and laboratories. Their capacity to process vast datasets, generate evidence-based recommendations, and improve diagnostic accuracy highlights their transformative potential. Future research should focus on addressing data privacy concerns, reducing algorithmic biases, and ensuring seamless integration into existing healthcare systems.

Keywords: Artificial Intelligence, Machine Learning, Diagnosis

G-1828

The Application of Edge AI in Optimizing Digital Patient Monitoring: A Fast and Secure Revolution

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Abstract:

Background and Aims: Artificial intelligence (AI) and deep learning have brought about significant transformations in healthcare. One area that is gaining attention in the utilization of these technologies is edge computing. This method utilizes edge computing as an infrastructure to enable smart and real-time data analysis at the source, leading to faster and more accurate clinical decision-making. Accordingly, this study aims to explore the application of Edge AI in optimizing digital patient monitoring systems and reducing related challenges.

Methods: This review study was conducted through a comprehensive search of reputable databases, including Google Scholar and PubMed, using the keywords edge computing and digital monitoring for the period between 2020 and 2025. The initial search yielded 38 articles, of which 8 met the inclusion criteria. The study design was guided by the PICO framework (Population, Intervention, Comparison, and Outcome).

Results: Processing the vast volume of data generated by Internet of Medical Things (IoMT) devices through traditional cloud-based data centers is associated with several challenges, including unacceptable response delays in critical medical conditions, high data transmission costs, and privacy concerns over sensitive patient information. Edge AI presents an innovative solution to these limitations. Rather than transmitting all data to the cloud, AI models are deployed directly at the network edge, close to the data source or patient. This enables smart and immediate processing of sensor data. Furthermore, this technology can instantly detect complex patterns in physiological data and accurately assess potential risks, such as the likelihood of acute medical conditions.

Conclusion: The integration of AI with edge computing significantly reduces latency in vital analyses, enhances data security and privacy through local processing, and facilitates the delivery of more precise and personalized healthcare services. However, this technology requires the development of specialized algorithms, data management and security policies, and the promotion of interdisciplinary collaboration to build a smart and ethically responsible future in healthcare.

Keywords: Edge AI, Digital Patient Monitoring

G-1829

Artificial Intelligence as a Pedagogical Tool in Medical Education: A Descriptive-Analytical Study of Iranian Faculty Attitudes

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Abstract:

Background:

The rapid evolution of artificial intelligence (AI) has positioned it as a disruptive innovation with transformative potential across various disciplines, including medical education. While AI-driven tools are increasingly integrated into pedagogical frameworks globally, their adoption and perceived efficacy within specific regional contexts, such as Iran, remain underexplored. This study sought to systematically evaluate the attitudes and perceptions of faculty members in Iranian medical universities regarding the applications, benefits, and challenges of AI in medical education.

Methods: A descriptive-analytical cross-sectional study was conducted in 2024, employing a stratified sampling technique to recruit 120 faculty members from five prominent medical universities in Iran. Data collection was achieved through a validated, researcher-administered questionnaire designed to assess three core dimensions: (1) perceived utility of AI in educational methodologies, (2) potential advantages for student engagement and learning outcomes, and (3) identified barriers to implementation. Quantitative analysis was performed using SPSS software (version 26), incorporating both descriptive statistics (means, frequencies) and inferential tests (chi-square, ANOVA) to examine associations between demographic variables and AI perceptions.

Results: The findings revealed a generally positive disposition toward AI adoption, with 82% of participants acknowledging its efficacy in enhancing didactic approaches. A significant majority (65%) concurred that AI could facilitate deeper cognitive engagement and personalized learning experiences for students. However, nearly half of the respondents (48%) cited critical impediments, including insufficient technological literacy among educators, infrastructural deficits, and unresolved ethical dilemmas pertaining to data privacy and algorithmic bias.

Conclusion: This study underscores the considerable promise of AI as a catalyst for innovation in medical education, contingent upon the resolution of systemic and human-resource challenges. Strategic recommendations include the institutionalization of faculty development programs, investment in technological infrastructure, and the formulation of evidence-based policies to govern ethical AI deployment. Future research should explore longitudinal outcomes of AI integration and comparative analyses across diverse socio-cultural contexts.

Keywords: Artificial Intelligence, Medical Education, Faculty Perceptions

G-1830

Artificial Intelligence as an Educational Assistant: Experience in Designing Academic Achievement Tests

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Abstract:

Background and Aims: The use of artificial intelligence technologies in medical education is an emerging and rapidly growing topic. This study aimed to investigate the psychometric indices of multiple-choice questions designed by artificial intelligence tools in the field of urology for nursing students.

Methods: First, the content of the urology sessions of the adult nursing course 2 for undergraduate nursing students was developed according to the curriculum and based on the principles of Gagnier's instructional design. Then, with the help of artificial intelligence tools, 20 to 30 multiple-choice questions were designed for each session according to the volume of content. The questions were evaluated for face validity using the Millman checklist. Content validity was also evaluated according to the test specification table developed by the instructor. Two tests were used to evaluate the students' formative performance, and their difficulty coefficient and discrimination coefficient were calculated.

Results: The results showed that the designed questions were relatively successful in content and face validity. Of the 130 questions designed for 5 sessions, 104 questions (80%) had adequate content validity and 91 questions (70%) were acceptable in terms of form using the Millman checklist. The average difficulty coefficient of the 40 questions used in formative evaluation was 0.4 and the average discrimination coefficient was 0.32. Also, the answer options had a good variety in terms of placement, but the deviant options of about 60% of the questions were not designed in a way that would attract the attention of less informed learners.

Conclusion: The results show that the use of artificial intelligence tools in designing multiple-choice questions in the subject of urology can be considered as an efficient strategy and as a facilitating tool in the evaluation process of nursing students. Issues such as improving deviant options to improve the difficulty and discrimination indices of the test, face validity and content validity need to be improved. These tools can be used to serve teachers and facilitate processes, but they will not replace human activities in any way. It is worth considering the need to improve the ability of professors to use these tools in a correct manner.

Keywords: Artificial Intelligence, Nursing, Urology, Evaluation

G-1831

Interpretable Sepsis Infection Prediction Based On Kolmogorov-Arnold Neural Network

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Abstract:

Background and Aims: Sepsis is a type of illness that occurs as a result of the body's incorrect response to infection, characterized by organ weakness and sometimes shock, which can result in death for patients. Some reports indicate that this disease has a higher mortality rate compared to breast and prostate cancer worldwide. Any efforts aimed at the early diagnosis of infection and treatment can increase the chances of survival for patients. Given the emergence of computer-based decision support systems powered by artificial intelligence in healthcare facilities and hospitals in recent years, the objective of this study is to evaluate the Kolmogorov-Arnold neural network method in predicting sepsis infection.

Methods: This study utilized clinical and laboratory data from 65,321 patients who visited a hospital in Shanghai, China, between the years 2016 and 2021. After preprocessing which includes managing missing data, balancing using under sampling Technique, identifying and removing outlier and normalizing the data, the implementation of the Kolmogorov-Arnold neural network was carried out in the Google Colab environment using the Python programming language.

Results: After training the model and using the Adam optimizer to update the model parameters, To assess the effectiveness of this model, the accuracy metric has been used. The accuracy of this model with learnable activation functions along edges, has been reported to be 91.5 %. This takes 2.58 minutes to train.

Conclusion: The results of this study indicate that this method has a higher accuracy in diagnosing sepsis infections compared to conventional deep learning methods such as convolutional neural networks and long short-term memory networks. This method enhances physicians' understanding of the reasoning behind predictions, thereby improving clinical decision-making, by providing a transparent model with an interpretable architecture.

Keywords: Kolmogorov-Arnold Neural Network, Interpretability

G-1833

The Role of Artificial Intelligence in Enhancing Educational Planning: Evaluating Its Impact on the Quality and Efficiency of University Instruction

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Abstract:

Background: In the digital age, effective educational planning has emerged as a critical challenge for university faculty. While the integration of artificial intelligence (AI) in education has been widely studied, there remains a significant research gap regarding its direct impact on lesson plan design and the improvement of instructional quality. This study aims to evaluate the effectiveness of AI tools in enhancing lesson plan quality and improving the efficiency of academic instruction in higher education settings.

Methods: A mixed-methods approach was adopted, combining quantitative and qualitative data collection. In the quantitative phase, a quasi-experimental design employing pre- and post-tests was implemented with 160 faculty members (85 men and 75 women) from 12 universities nationwide. Over the course of eight weeks, participants utilized AI tools to develop their lesson plans. Data were collected through a researcher-designed questionnaire, which demonstrated high reliability (Cronbach's alpha = 0.87) and content validity confirmed by ten subject matter experts. In the qualitative phase, semi-structured interviews were conducted with 25 selected participants. Additionally, three instructional design experts assessed the quality of the AI-generated lesson plans.

Results: The results revealed that 80% of participants were satisfied with the AI-assisted lesson plans. A statistically significant difference in satisfaction was noted between male (82.4%) and female (75.1%) faculty members ($p = 0.05$). Furthermore, 78% reported that AI usage reduced their average lesson planning time from 4.2 to 1.8 hours per session. The qualitative analysis identified three major themes: increased creativity in designing instructional activities, diversification of educational resources and assessment strategies, and challenges related to cultural relevance and contextual adaptation. Instructional design experts rated the structural quality of the lesson plans

highly (mean score of 4.2 out of 5), while the alignment with higher-order learning objectives received a moderate evaluation (mean score of 3.4 out of 5).

Conclusion: The study highlights the promising role of AI in optimizing lesson planning processes and enhancing instructional effectiveness in higher education. However, AI should be regarded not as a substitute for the educator's creativity, but as a supportive and enabling tool.

Keywords: Artificial Intelligence, Educational Planning

G-1834

A ViT-Based Approach for Breast Cancer Histopathology Images Classification

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Abstract:

Background and Aims: Previously, Convolutional Neural Networks (CNNs) have gained remarkable attention and also achieved an effective performance in histopathology image classification, which face two major challenges: Image variations due to tissue heterogeneity and a large training dataset required. Recent advancements in Vision Transformers (ViTs) offer a powerful alternative to CNNs. Despite their potential, the performance of ViT on medical image classification tasks has not been extensively studied. This paper aims to provide a comprehensive evaluation of ViT-based models for breast cancer histopathology image classification.

Methods: The BreakHis dataset comprises 7,909 breast cancer histopathological images across multiple magnification levels. To enhance robustness and compatibility with the ViT architecture, images underwent a series of preprocessing transformations. A pre-trained Vision Transformer model (vit_b_16) initialized with ImageNet1K_V1 weights served as the base architecture. To address class imbalance, class weights were assigned based on the inverse frequency of each class. The dataset was split such that 10% was reserved for testing, with the remaining data divided into training and validation subsets. A three-fold cross-validation strategy was employed for training and validation, ensuring balanced representation across folds. The model was trained for ten epochs per fold using the Adam optimizer with differential learning rates, optimizing convergence and generalization.

Results: On the separate 10% test set, the model achieved an accuracy of 94.81%, with precision, recall, and F1-score of 0.9587, 0.9510, and 0.9497, respectively.

Conclusion: This study presents a novel approach to breast cancer histopathological image classification by leveraging the ViT architecture. The proposed model utilizes all magnification levels, as well as eight distinct types of breast tumors. The training and validation were conducted, with a separate test set reserved. The experimental results demonstrated the effectiveness of this approach in achieving high classification performance, highlighting the potential of ViT in automated breast cancer diagnosis.

Keywords: Breast Cancer, Histopathology, ViT, Classification

G-1836

AI Utilization and Self-Efficacy: A Correlational Study of Medical Students at Babol University of Medical Science

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Abstract:

Background and Aims: The rise of artificial intelligence (AI) has a significant impact on education, particularly in medical training, where the expertise of future healthcare professionals is crucial to public health. Integrating AI into medical education necessitates assessing self-efficacy regarding its adoption and use. Beliefs about one's ability and confidence are fundamental to medical education and career development. While understanding the interplay between students' interactions with AI and their self-efficacy is important, research is limited. Considering the impact of AI in personalizing medical education, this study aimed to determine the relationship between the use of artificial intelligence and academic self-efficacy in students of Babol University of Medical Sciences.

Methods: This descriptive-analytical study was conducted on medical students at Babol University of Medical Sciences. Data was collected via an online questionnaire. Students were categorized as AI users or non-users based on the question of whether they use AI or not. Academic self-efficacy, which was measured using a standard questionnaire (CASES), was compared between the two groups. Also, the level of artificial intelligence use was measured on a 5-point Likert scale. After collecting data, statistical analysis was performed using SPSS software.

Results: This study involved 330 medical students, comprising 230 females (69.7%) and 100 males (30.3%), with a mean age of 21.55 ± 1.71 years. Our findings showed that students who actively utilized AI tools reported a significantly higher academic self-efficacy score, averaging 111.15 ± 70.48 , compared to their counterparts who did not use AI, whose average score was 91.66 ± 22.15 ($P = 0.006$). Moreover, a positive correlation was identified between the frequency of AI usage and self-efficacy levels, with a correlation coefficient of $r = 0.531$ ($P = 0.006$).

Conclusion: Integrating AI into education, particularly medical sciences, can boost students' self-efficacy, foster deeper learning, and ultimately improve academic performance. Enhanced self-efficacy translates to increased confidence and a stronger belief in one's ability to achieve medical goals, benefiting both individual learning and the broader medical system.

Keywords: Artificial Intelligence, Self-Efficacy, Medical Student

G-1837

Artificial Intelligence in Pharmaceuticals: Can Drug Repurposing Replace the Discovery of New Drugs? A Scoping Review

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Abstract:

Background and Aims: Drug repurposing (also known as drug repositioning) has emerged as a promising strategy to accelerate drug development by identifying new therapeutic applications for existing drugs. With the exponential growth of biomedical data and advancements in artificial intelligence (AI), computational methods such as machine learning (ML) and deep learning (DL) are revolutionizing the drug repurposing process.

Methods: This study systematically analyzed 320 studies, excluding review articles, papers with an impact factor (IF) below 3, and those involving animal testing. The analysis ultimately focused on 279 repurposed drugs. The objective was to evaluate the role of various AI algorithms in predicting new drug applications, compare success rates, clinical trial phases, and therapeutic areas. We conducted a comprehensive review of the 279 repurposed drugs and analyzed the AI/ML/DL algorithms used (e.g., SVM, Random Forest, CNN, Bayesian Networks), clinical trial phases (Phase 2 to Phase 4), success rates, and the impact factors (IF) of related publications. Data were extracted from reviewed studies, clinical trial databases (e.g., ClinicalTrials.gov), and biomedical repositories (e.g., PubMed).

Results: Statistical analyses and trend evaluations were performed to assess algorithm performance and therapeutic applications. Key findings include:

-Algorithm Distribution: ML (45%, primarily Random Forest and SVM), DL (35%, primarily CNN and GNN), and classical AI (20%, Bayesian Networks).

-Clinical Trial Phases: 40% in Phase 2, 35% in Phase 3, and 25% in Phase 4.

-Success Rates: DL models achieved the highest success rate (75%), followed by ML (72%) and classical AI (70%).

-Therapeutic Areas: Inflammatory/autoimmune diseases (25%), cancers (20%), and neuropsychiatric disorders (18%) were the primary targets.

-Publication Impact: Studies published in high-impact journals (IF ≥ 8) reported an 80% success rate, compared to 65% for lower-impact journals (IF ≤ 6).

Conclusion: Drug repurposing using AI demonstrates significant potential to reduce timelines and costs in drug development, with DL models showing higher predictive accuracy. While most repurposed drugs are in mid-stage clinical trials (Phases 2–3), AI is not yet a replacement for de novo drug discovery but serves as a powerful complementary tool in the pharmaceutical supply chain.

Keywords: Drug Repurposing, Artificial Intelligence, Clinical Trials

G-1838

Unsupervised Neural Manifolds Stabilization for Movement Decoding for Brain-Computer Interface Applications

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Abstract:

Background and Aims: Brain-computer interfaces (BCIs) aim to convert brain signals into commands to control external devices for assisting individuals with spinal cord injuries (SCIs). However, a challenge in real-world BCI applications is the changes in neural activity over time, which is needed for day-to-day calibration. One solution to overcome the need for calibration is projecting neural data onto low-dimensional manifolds and aligning them across sessions using alignment methods such as canonical correlation analysis (CCA). However, CCA requires the actual trajectory of subject movements, such as target labels, which is often not feasible for real-world applications.

Methods: In this study, an automatic algorithm named unsupervised neural manifold alignment decoding (UnMAD) is proposed to decode movement parameters from neural activity using aligned manifolds without the need for actual target labels. UnMAD integrates three main stages: (1) Dimensionality Reduction for extracting manifolds, (2) Discrete Trajectory Decoding for predicting target labels, and (3) Continuous Movement Decoding for aligning and decoding. The primary goal is to decode 2D velocity from the neural activity of the primary motor cortex of two monkeys (Monkey C and Monkey M) during a reach center-out task.

Results: Results show that UnMAD compensated the variation between manifolds across two different recording sessions in two monkeys, improving the average correlation from $R=0.47$ before UnMAD to $R=0.97$ after UnMAD. The decoding performance results demonstrated that UnMAD outperformed the unsupervised distribution alignment decoding (DAD) approach. Also, UnMAD achieved 84% of the decoding performance compared to the CCA supervised method, with an average R-squared of 0.65 for UnMAD and 0.77 for CCA.

Conclusion: This study suggests UnMAD, an unsupervised manifold stabilization method for decoding movement parameters. Unlike other alignment methods, UnMAD does not need true target labels, making it suitable for clinical applications such as subjects with SCIs.

Keywords: Brain-Computer Interfaces, Neural Manifold, Movement Decoding

G-1839

2D Lung Segmentation from all Three Views of Thoracic CT Images Using Deep Learning-Based Methods and 3D Volume Reconstruction

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Abstract:

Background and Aims: Lung diseases significantly impact global health, with mortality affecting over 1.5 billion people, necessitating early detection for improved outcomes. CT imaging is an essential tool for diagnosis. Precise lung segmentation from CT images is crucial for enhancing diagnostic accuracy, evaluating abnormalities, and facilitating advanced procedures like Electromagnetic Navigation Bronchoscopy (ENB). Traditional manual segmentation is time-consuming and prone to errors, making deep learning-based methods a promising solution for

achieving fast, precise, and automated lung segmentation. This study proposes a deep-learning approach to improve efficiency in lung segmentation.

Methods: We used the EMPIRE10 dataset, containing 60 annotated thoracic CT images, split into 80% for training, 10% for validation, and 10% for testing.

We developed a 2D U-Net model, which is more computationally efficient and easier to deploy than the 3D version. To optimize performance, we reduced the parameter count to about 7 million while retaining all network layers and added dropout in some layers to prevent overfitting. We employed a hybrid loss function that combines Tversky loss and binary cross-entropy (BCE) to enhance segmentation accuracy. This approach effectively balances false positives and false negatives, thereby improving the overall model performance. Furthermore, we fed the input images to the network for better generality in all three axial, sagittal, and coronal views.

Result:

Our deep learning model, developed using PyTorch, was evaluated with the Dice Similarity Coefficient (DSC) for segmentation accuracy. The U-Net achieved DSC scores of 98.46%, 96.2%, and 98.1% for train, validation, and test, respectively.

After segmentation, 2D slices were reconstructed into a 3D volume for visualization using the ITK-SNAP application. Post-processing techniques were applied to refine the segmentation results and enhance the clarity of the 3D lung volume.

Conclusion: Our study shows that the 2D U-Net architecture is highly effective for lung segmentation, reaching almost good accuracy with low computational costs without any restrictions for input view to aid radiologists in real-time clinical decision-making. Future work will focus on expanding our dataset to include diverse cases and implementing more post-processing techniques and advanced loss functions for improved accuracy and reliability.

Keywords: Artificial intelligence, Deep learning, Lung segmentation

G-1840

Artificial intelligence in pharmacology research and drug discovery

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Abstract:

Background: In recent years artificial intelligence (AI), and especially machine learning (ML), has rapidly considered for pharmacology is a field of its' application where AI and ML approaches are particularly useful to analyze data according to different aspects as chemical structure to clinical informations from genomic to disease stages. For several days, AI has being applied in drug discovery and identification of drug targets. Moreover, AI models which help to describe an drug response of individuals are shown, which occupy from drug discovery to personalized medicine. In this review we explained some of these.

Methods: By exploring some research data motors as Pubmed, Medline, Elsevier, Google Scholar, Ovids, we have assayed some AI practices and applications in Pharmacology

Results: More than 20 articles which describing use of AI in pharmacology learning and 15 articles in chemicals. Accordingly in field of pharmacology, AI and ML approaches would be useful to analyze data from many sources, ranging from the chemical structure of a drug to clinical aspects and from genomic informations to disease characteristics. Increasing AI applications in pharmacology is also evident in some studies published on the topic. AI is also useful to predict which chemical structures might bind to a target site. Also, the chemical structure of potent drugs or endogenic factors which used to elucidate the structure of a potential target. Finally, in vivo characteristics of a new compound also can be predicted by understanding drugs pharmacokinetics (PKs), and pharmacodynamics.

Later, the toxicity profile of a novel compound could be assessed by AI and ML. which requires substantial datasets with in vivo data provided through clinical studies. Especially chemical structure plays an important role in the occurrence of toxicity, the same approaches as in drug discovery could be applied. Two important toxicities that are assessed during drug development are cardiotoxicity and hepatotoxicity.

Conclusion: AI approaches are widely used in all aspects of pharmacology, from drug discovery to real-world evidence and personalized medicine. In recent years, AI is rapidly becoming a standard analytical tool in drug development.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Pharmacology

G-1841

Decoding Parkinson's Diagnosis: An OCT-Based Explainable AI with SHAP/LIME Transparency from the Persian Cohort Study

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Abstract:

Background: Parkinson's disease (PD) diagnosis remains challenging due to subjective clinical assessments and late-stage symptom manifestation. Retinal optical coherence tomography (OCT) biomarkers reflect neurodegenerative changes and provide a non-invasive diagnostic tool. This study integrates retinal OCT with explainable artificial intelligence (XAI) to improve PD diagnosis.

Methods: Using data from the Persian Cohort Study (204 patients with PD, 972 controls), we developed a 6-layer deep neural network (DNN) combining OCT biomarkers (foveal thickness and volume) and clinical variables (motor scores and olfactory dysfunction). Synthetic Minority Oversampling (SMOTE) mitigated class imbalance (PD:Healthy $\approx$ 1:5). Model interpretability was ensured via SHAP (global feature importance) and LIME (local explanations).

Results: An explainable AI framework integrating retinal OCT biomarkers and clinical data diagnosed with PD with 95.3% accuracy and 0.98 AUC-ROC. The model identified SUPERIOR4 thickness reduction and foveal volume expansion as key biomarkers, alongside motor/olfactory deficits. SHAP/LIME revealed interpretable thresholds (e.g., SUPERIOR4 120 μ m = high risk), while SMOTE reduced false negatives by 12% while maintaining specificity (94.8%).

Conclusion: This study pioneered a transparent, OCT-based AI framework for PD diagnosis, emphasizing early detection through retinal neurodegeneration patterns. The integration of multimodal data, explainability, and imbalance robustness makes it a scalable tool for resource-limited settings. Future studies should validate biomarkers across diverse populations and standardize OCT protocols.

Keywords: Parkinson's Disease, Retinal Biomarkers, Explainable AI

G-1842

Retinal Imaging and Artificial Intelligence: A Systematic Review and Meta-Analysis of Diagnostic Techniques for Neurodegenerative Diseases

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Abstract:

Background: Neurodegenerative diseases (NDs) like Alzheimer's, Parkinson's, and multiple sclerosis are challenging to diagnose early due to their progressive nature and lack of cures. Current diagnostic methods are often invasive, costly, and imprecise. Retinal imaging, paired with artificial intelligence (AI), offers a non-invasive and potentially cost-effective alternative. This review assesses the diagnostic accuracy of AI-enhanced retinal imaging for ND detection, leveraging the retina's link to the central nervous system.

Methods: We conducted a comprehensive search of six databases for studies published between 2010 and 2024. Included studies utilized retinal imaging (OCT, fundus photography, OCTA) with AI (machine learning/deep learning) for ND diagnosis. The quality of studies was assessed. A meta-analysis estimated the pooled area under the curve (AUC), and subgroup analyses examined disease type, AI model, and imaging modality.

Results: Ten studies, with 41 AI models, were included. The pooled AUC was 0.726 (95% CI: 0.700-0.753), indicating moderate accuracy. Significant heterogeneity was present. Subgroup analysis showed similar AUCs for Alzheimer's (0.716) and Parkinson's (0.700). No significant differences were found across AI models or imaging methods. OCT showed the highest accuracy (0.762), followed by fundus photography (0.694) and OCTA (0.712).

Conclusion: AI-enhanced retinal imaging shows promise for non-invasive, early ND detection with moderate accuracy, with OCT as the most effective modality. However, substantial heterogeneity necessitates standardized imaging protocols and improved AI model development. Future

research should validate these findings in diverse populations and explore multimodal approaches to enhance diagnostic performance and clinical utility.

Keywords: Retinal Imaging, Artificial Intelligence, Neurodegenerative Diseases

G-1843

The Association Between Neural Biomarkers and Olfactory Dysfunction in the Prodromal Stage of Parkinson's Disease: A Systematic Review

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Abstract:

Background: Parkinson's disease (PD) is preceded by a prolonged prodromal phase marked by non-motor symptoms such as olfactory dysfunction (OD). Early identification of at-risk individuals remains challenging due to the lack of validated biomarkers. This systematic review evaluates the association between neural biomarkers and OD in prodromal PD, focusing on diagnostic accuracy and clinical utility.

Methods: Following PRISMA guidelines, we searched PubMed, Scopus, Web of Science, and Embase (2000–2025) for studies assessing neural biomarkers (neuroimaging, molecular, genetic) and OD in prodromal PD. Risk of bias was evaluated using the Newcastle-Ottawa Scale.

Results: Twenty-four studies (n=3721) met inclusion criteria. Analysis of DAT-SPECT imaging revealed significant deficits in striatal dopamine transporter binding in individuals with OD who later developed PD [Hazard Ratio (HR) 7.3, 95% CI 4.1–12.9, p0.001]. Reduced striatal binding correlated with OD severity (r=-0.53, p=0.002). Skin and CSF α -synuclein aggregates, measured by RT-QuIC, showed high specificity (89%, 95% CI: 82–94%) for prodromal PD. Genetic analyses indicated that LRRK2 G2019S carriers had higher OD prevalence (55% vs. 36%, p=0.0003) and significant DAT deficits. Combining DAT-SPECT and olfactory testing substantially improved diagnostic accuracy [Area Under the Curve (AUC)=0.88].

Conclusion: Olfactory dysfunction in prodromal PD is strongly linked to nigrostriatal degeneration, α -synuclein pathology, and genetic susceptibility. Multimodal biomarker panels, particularly combining DAT imaging and olfactory testing, enhance early diagnosis and risk stratification. Standardization of protocols and longitudinal validation are critical for clinical translation.

Keywords: Parkinson's Disease, Olfactory Dysfunction, Neural Biomarkers

G-1844

Assessing Babol University of Medical Sciences students' attitudes, opinions, and interest in AI curriculum integration.

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Abstract:

Background and Aims: Artificial intelligence has emerged as a pivotal force across scientific and industrial sectors, particularly in medicine, where it enhances disease diagnosis, treatment, and management. Consequently, integrating AI-related topics into university curricula is crucial, requiring universities to adapt their programs to equip students with the knowledge to navigate the challenges and opportunities presented by this technology. Therefore, this study investigated Babol University of Medical Sciences students' attitudes towards integrating artificial intelligence into the curriculum and their interest in specific AI topics.

Methods: This descriptive-analytical study was conducted on 310 students of Babol University of Medical Sciences in 2024-2025. Data were collected through a researcher-made questionnaire. The reliability of the questionnaire was measured and approved by the researchers (Cronbach's alpha = 0.92). The questionnaire was sent to the students via an online link. After collecting the data, statistical analysis was performed using SPSS26 software.

Results: The results showed that 42 percent of the students were male and 68 percent were female. The majority of students agreed with the addition of AI topics. The most interest was observed in the topics of economics and AI (241 people), robotics (238 people), ethics in AI (228 people), machine learning (193 people), natural language processing (148 people), and machine vision (142 people). Also, there was no significant difference between the responses of male and female students. However, radiology students were more inclined to add the topic of robotics, while medical and dental students were more interested in the topics of earning money and AI.

Conclusion: This study reveals student willingness to integrate AI into curricula, likely driven by awareness of AI's impact on healthcare. Radiology students showed particular interest in robotics, highlighting the demand for practical training. Medical and dental students prioritized AI topics related to career advancement and financial gain, underscoring the need for curricula that address professional and economic aspirations. These findings emphasize the importance of tailoring AI education to meet contemporary needs, student interests, and ultimately, enhance the quality of medical university education.

Keywords: Artificial Intelligence, Educational Topics, Medical Students

G-1845

A Case Study on Bone Fracture Detection Using YOLOv8–YOLOv12 Models

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Abstract:

Background and Aims: Bone fracture diagnosis and localization are crucial steps in the treatment process. Specialists rely on medical imaging to assess the affected area and determine the type of fracture. However, human limitations such as fatigue, inattention, and time constraints can compromise diagnostic accuracy, leading to potential misdiagnoses and incorrect treatment decisions. To address these challenges, this study explores the use of deep learning-based object detection models, particularly YOLO architectures, for automated bone fracture detection and localization.

Methods: This study evaluates several YOLO-based models from version 8 to 12 on the FracAtlas dataset, a specialized dataset for bone fracture detection. To enhance model generalization, data augmentation techniques are applied. The models' performance is assessed using precision, recall, and mean Average Precision at IoU 0.50 (mAP@50). Furthermore, the best-performing model is tested in an end-to-end detection and localization setting to evaluate its real-world applicability.

Results: Experimental results indicate that YOLOv8-S with augmentation achieves the best balance between precision (0.8197), recall (0.6716), and mAP@50 (0.7837), making it the most effective model for fracture localization. However, when applied in an end-to-end detection and localization scenario, performance declines, with precision, recall, and mAP@50 dropping to 0.8910, 0.4179, and 0.6338, respectively. This reduction is attributed to the increased complexity of distinguishing subtle fracture patterns from the non-fractured regions.

Conclusion: The findings highlight the effectiveness of YOLO-based architectures in fracture detection while underscoring the challenges posed by real-world medical imaging conditions. Future work should focus on expanding dataset diversity, improving augmentation strategies, and optimizing model architectures to enhance detection accuracy, particularly for subtle fractures.

Keywords: Artificial_Intelligence, Medical_Imaging, Bone_fracture_detection, Augmentation, YOLOV8-S

G-1846

The role of virtual reality in pain relief in emergency interventions, a review study

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Abstract:

Background and Aims: The application of virtual reality (VR) in medical settings has gained substantial attention, particularly for its potential in managing pain during emergency interventions. The aim of this study, explores the role of VR in alleviating pain during emergency procedures.

Methods: A systematic review was conducted, focusing on studies published between 2010 and 2024, assessing the use of VR for pain relief in emergency interventions. Sources were identified through databases like PubMed, Scopus, and Google Scholar using keywords like “virtual reality,” “pain management,” “emergency interventions,” and “acute pain.” Selected articles were critically appraised for study design, sample size, VR interventions used, and the outcomes measured. A synthesis of quantitative and qualitative data was performed to draw comprehensive conclusions.

Results: A total of 1252 records were identified from databases. Among them, 38 records underwent eligibility screening. After applying inclusion and exclusion criteria, 12 studies were deemed eligible and included in this review. Results shown that The use of virtual reality (VR) has been shown to effectively reduce pain intensity in emergency situations, particularly in burn care and dressing changes. VR works by diverting attention, reducing stress and anxiety, and promoting relaxation, which leads to a decrease in pain perception. It has demonstrated significant benefits in both adults and children in terms of reducing pain and anxiety. Among various VR applications, interactive experiences and guided games have been more effective in pain reduction compared to passive VR experiences.

Conclusion: Virtual reality has emerged as a promising tool for managing pain in emergency interventions. Its ability to provide effective pain relief without the side effects of pharmacological treatments makes it an appealing option in clinical practice. However, further research is needed to optimize VR protocols and fully understand its mechanisms.

Keywords: Virtual Reality, Pain Management, Emergency Interventions

G-1847

Machine Learning and Wearable Devices, Benefits and Challenges

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Abstract:

Background and Aims: Machine learning (ML) and wearable devices have become critical components of modern healthcare, offering innovative solutions for monitoring, diagnosing, and treating various health conditions. This review explores the integration of ML with wearable devices, focusing on the benefits they bring to healthcare, alongside the challenges faced in their implementation and use.

Methods: A review was conducted by searching the keywords (Machine learning, wearable devices) in the title abstract in Web of Science, Scopus, and PubMed scientific databases on April 1, 2025. In this study, the Guidelines and Preferred Items of Systematic Review Studies (PRISMA) were followed. The quality of the studies was assessed using the JBI checklist. Studies with a score higher than 7 were analyzed. addressed the application of wearable technologies in health monitoring, predictive analytics using ML, and the benefits and challenges of such integrations. Both primary research articles and meta-analyses were included to ensure a broad perspective.

Results: A total of 986 records were identified from databases. Among them, 42 records underwent eligibility screening. After applying inclusion and exclusion criteria, 13 studies were deemed eligible and included in this review. Results shown that The Wearable devices, in conjunction with machine learning algorithms, provide continuous monitoring of vital health data, allowing for 24/7 health tracking and early detection of potential health issues. The combination of wearable devices and machine learning has been particularly beneficial in managing chronic diseases such as diabetes, hypertension, and heart disease. However, there are challenges to overcome. Privacy and security concerns remain significant, as the sensitive health data collected by wearable devices must be protected. Additionally, the accuracy of the data can be affected by various factors such as the user's physical state and environmental conditions, which can lead to issues with data interpretation. Finally, system integration and the need for global standards to ensure compatibility with existing healthcare systems are key challenges for optimizing the use of wearable technologies and machine learning in healthcare.

Conclusion: Machine learning, combined with wearable devices, offers significant potential for transforming healthcare through continuous monitoring and personalized treatment.

Keywords: Machine Learning, Wearable Devices, Healthcare Technology

G-1848

The Role of Artificial Intelligence in Promoting Occupational Health and Safety among Municipality Cleaners

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Abstract:

Background: Waste collection and management workers are exposed to numerous hazards that can negatively affect their physical and psychological health. With the rapid evolution of artificial intelligence (AI), innovative solutions are being developed to enhance occupational safety and health in this sector. This study aims to present evidence on how AI supports occupational health and safety in waste collection and management.

Methods: This study was a literature review conducted in 2025. Three databases including ISI web of science, PubMed, Scopus, were searched from last 5 years. The search strategy was based on relevant keywords and Boolean operators "AND" and "OR". A total of 20 studies that met the inclusion criteria were selected and reviewed.

Results: The findings showed that AI technologies, such as predictive analytics, robotics, and wearable sensors, are increasingly used to enhance safety and health in municipality cleaners. Predictive models identify potential risks, while robotics automate hazardous tasks, reducing human exposure. Wearable devices monitor workers' health in real-time, alerting them to risks like fatigue or toxic exposure, leading to safer and more efficient working conditions.

Conclusion: Artificial intelligence has substantial potential to improve occupational health and safety practices in the waste management sector. The integration of AI-based systems could significantly lower occupational hazards and improve the overall health of waste management professionals.

Keywords: Artificial Intelligence, Occupational Health and Safety

G-1849

Automatic 3D Analysis of Bronchial Tree Dilatation Using Deep Learning Algorithms in Chest CT images

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Abstract:

Background and Aims: Precise segmentation of the bronchial airway tree in chest CT images is vital for early diagnosis, treatment planning, and image-guided procedures in pulmonary diseases such as COPD and lung cancer. However, due to the low contrast, thin walls, and complex branching patterns of peripheral airways, existing techniques often struggle with accuracy. This study proposes a novel deep learning framework designed to enhance segmentation performance, particularly in detecting fine airway structures.

Methods: We introduce 3D AIR-Net (Airway-Informed Refinement Network), a novel 3D CNN architecture integrating multi-scale feature extraction and a Boundary Enhancement Module (BEM). This design allows for the preservation of thin airway walls and accurate delineation of complex branches. The model was trained and validated on two publicly available datasets—ATM'22 and EXACT'09—after preprocessing steps such as HU normalization, volume resampling, and patch extraction with 50% overlap. A combination of Dice and Tversky loss was used to address class imbalance and improve the detection of peripheral airways.

Results: 3D AIR-Net achieved a Dice Similarity Coefficient of 0.882, a precision of 0.861, and a Tree Length Detected Rate (TD) of 0.845, outperforming various state-of-the-art models. Visual assessments confirmed the model's effectiveness in preserving airway continuity, enhancing boundary sharpness, and minimizing false positives, especially in peripheral regions.

Conclusion: The 3D AIR-Net framework demonstrates high accuracy in 3D airway segmentation and holds strong potential for clinical applications such as bronchoscopy navigation and pre-

operative planning. Its capacity to detect fine, complex airway structures makes it a valuable tool for improving diagnostic and interventional outcomes. Further studies will focus on its performance in diverse imaging conditions and pathological scenarios.

Keywords: Airway Segmentation, Deep Learning, Chest CT, 3D CNN, Pulmonary Imaging, Artificial Intelligence

G-1850

Artificial intelligence decision support system for the management of diabetes: A Review study

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Abstract:

Background and Aims: Diabetes mellitus is one of the most prevalent chronic diseases globally, requiring constant monitoring and complex decision-making for effective management. Artificial Intelligence (AI)-based decision support systems (DSS) have emerged as promising tools to enhance diabetes care by analyzing large datasets, predicting risks, and supporting clinical decisions. The aim of this study the role of artificial intelligence decision support system for diabetes management.

Methods: This review study was conducted using a systematic search of databases including PubMed, Scopus, and PubMed, and Google scholar, on April 10, 2025. Search terms included “artificial intelligence,” “decision support system,” and “diabetes management.” Inclusion criteria encompassed original research articles, clinical trials, and review papers that examined AI-driven DSS in diagnosing, monitoring, or treating diabetes. Selected studies were reviewed for AI techniques used (e.g., machine learning, deep learning), system functionalities, clinical integration, and patient outcomes.

Results: A total of 524 records were identified from databases. Among them, 56 records underwent eligibility screening. After applying inclusion and exclusion criteria, 10 studies were deemed eligible and included in review. Results shown that The AI-based DSS have demonstrated significant potential in improving the management of both Type 1 and Type 2 diabetes. These systems can analyze real-time data from glucose monitors, wearable sensors, and electronic health records to provide personalized recommendations regarding insulin dosage, diet, physical activity, and medication adherence. Machine learning algorithms, especially neural networks and support vector machines, have shown high accuracy in predicting blood glucose trends and potential hypoglycemic events. Clinical studies report improved glycemic control, reduced episodes of hypo/hyperglycemia, and better patient engagement when AI-DSS is integrated into routine care. Some systems also incorporate natural language processing to interpret unstructured clinical notes, enhancing diagnostic accuracy. However, challenges remain, including

data privacy concerns, need for continuous training of models, and integration with existing healthcare infrastructure.

Conclusion: AI-based decision support systems hold great promise in enhancing diabetes management by offering personalized, timely, and accurate clinical insights. While current evidence supports their effectiveness, further validation in diverse populations and long-term clinical trials is needed to ensure broad implementation and safety.

Keywords: Diabetes Mellitus, Artificial Intelligence, Decision Support

G-1851

Automated TEM/SEM Image Analysis for Drug-Loaded Nanoparticles Using Machine Learning

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Abstract:

Background and Aims: The precise characterization of drug-loaded nanoparticles is essential for evaluating their efficacy in drug delivery applications. Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM) are standard techniques for nanoparticle imaging, yet manual analysis remains labor-intensive and subject to variability. This study proposes a machine learning-driven approach to automate TEM/SEM image analysis, enabling accurate and efficient identification of drug-loaded nanoparticles.

Methods: A comprehensive dataset was curated from two primary sources: (1) publicly available repositories such as NanoMine and Material Data Facility (MDF), which provide high-resolution TEM/SEM images of nanoparticles, and (2) peer-reviewed scientific literature featuring relevant microscopy images of drug-loaded nanoparticles. Image preprocessing techniques, including noise reduction, contrast enhancement, and feature extraction, were employed to optimize input quality. A Convolutional Neural Network (CNN) model was developed alongside conventional machine learning classifiers such as Support Vector Machine (SVM) and Random Forest to categorize nanoparticles based on morphology, drug-loading efficiency, and surface characteristics. Performance was evaluated using key metrics including accuracy, precision, recall, and F1-score.

Results: The CNN-based model exhibited superior classification performance, achieving an accuracy of 94.2%. It effectively distinguished between loaded and unloaded nanoparticles with high specificity and sensitivity, demonstrating its potential as a reliable alternative to manual assessment.

Conclusion: Leveraging machine learning for TEM/SEM image analysis significantly enhances the efficiency and consistency of nanoparticle characterization in drug delivery research. By reducing reliance on manual interpretation, this approach minimizes human bias and accelerates analytical workflows. Future efforts will focus on expanding the dataset and incorporating advanced AI methodologies, such as transfer learning, to further refine model accuracy and generalizability.

Keywords: Artificial Intelligence, Nanoparticles, Machine Learning, TEM/SEM

G-1852

The Role of Artificial Intelligence(AI) in Reducing Nursing Errors

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Abstract:

Background: Artificial intelligence has become one of the major developments in the world of medicine. This technology, with its unique capabilities in analyzing data and predicting patient conditions, has significantly increased the efficiency of care systems. Using artificial intelligence, nurses can respond quickly to critical situations and make more accurate decisions. Artificial intelligence helps reduce human errors and improves treatment processes. These changes have improved the quality of nursing services and improved patient experience.

Methods: Scoping Review and York University stages By searching for the keywords Artificial Intelligence(AI), Nursing, Nursing Error in the Latin databases Proquest, PubMed, Science Direct and Persian Magiran, SID, Iranmedex in the period 2014-2024, out of 17 articles, the findings of 9 related articles were included in the study and compiled in 2025.

Results: With the advent of artificial intelligence, nursing will be transformed in the future. This technology is able to continuously analyze medical information and patient conditions in real time. Nurses can make better decisions and even predict which potential problems a patient is at risk of. These advances improve the quality of care and allow nurses to have more time for human interaction and more personalized care. One of the biggest benefits of artificial intelligence in nursing is the reduction of nursing errors. These systems can help nurses identify errors in medication prescriptions, monitor treatments, and diagnose critical conditions in a timely manner. This technology can automatically store and update patients' medical records with high accuracy, which reduces errors caused by misunderstandings and incomplete information. From analyzing patient data to predict critical situations to automating routine processes, AI in nursing is enabling faster and more accurate decisions and helping nurses identify errors in nursing care, which also increases patient safety and reduces stress for nurses.

Conclusion: Artificial intelligence is changing traditional methods and transforming nursing. It is taking care services to a higher level by increasing accuracy and speed and helping nurses; using

more accurate data, provide more personalized care and by reducing nursing errors, improve the quality of life of patients and reduce the workload of nurses. Therefore, it is essential to pay attention to the applications of artificial intelligence in nursing.

Keywords: Artificial Intelligence(AI), Nursing, Nursing Error

G-1853

The Role of AI in Preventing Diagnostic Failures in Dental Radiology

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Abstract:

Background and Aims: Diagnostic failures in dental radiology, such as missed or delayed identification of pathologies, can result in suboptimal treatment and adverse patient outcomes. Artificial intelligence (AI), with its capabilities in image analysis and pattern recognition, offers promising solutions to enhance diagnostic accuracy, sensitivity, and efficiency in dental radiology. This study investigates the role of AI in reducing diagnostic errors and improving clinical decision-making in dental imaging. To evaluate the effectiveness of AI, particularly deep learning and machine learning models, in mitigating diagnostic failures in dental radiology by improving accuracy, consistency, and early detection of dental pathologies.

Methods: A systematic review was conducted from 2015 to 2024 on AI applications in dental radiology. PubMed, Scopus, and IEEE Xplore were searched for studies involving AI-based tools, such as convolutional neural networks (CNNs) and other machine learning algorithms, applied to dental imaging modalities (e.g., panoramic radiographs, intraoral radiographs, and CBCTs). Studies were included if they compared AI performance to human clinicians or traditional diagnostic methods in detecting pathologies like caries, periodontitis, periapical lesions, and other dental abnormalities. Data on diagnostic accuracy, sensitivity, specificity, observer variability, and clinical workflow efficiency were extracted and synthesized.

Results: AI-powered algorithms, particularly deep learning models like CNNs, consistently outperformed traditional radiographic interpretation across multiple dental pathologies. AI systems achieved diagnostic accuracy rates ranging from 85% to 98% for detecting caries, periodontitis, and periapical lesions, surpassing average clinician performance (70%–90%). Sensitivity and specificity were significantly improved, with AI models reducing false negatives by up to 30% compared to human observers. AI also minimized inter-observer variability, achieving near-perfect consistency (kappa values 0.9) in diagnostic outcomes. Early detection of subtle or complex pathologies, such as early-stage caries or root fractures, was enhanced, enabling timely interventions. Additionally, AI integration reduced diagnostic time by 20%–40%, improving clinical workflow efficiency without compromising accuracy.

Conclusion: The integration of AI in dental radiology significantly reduces diagnostic failures by enhancing accuracy, consistency, and early disease detection while minimizing errors and observer variability. By augmenting clinician expertise, AI facilitates more reliable clinical decision-making and improves patient outcomes.

Keywords: Artificial Intelligence, Dental Radiology, Machine Learning

G-1855

Development and Evaluation of a Mobile Health Application for Ovarian Cancer Diagnosis Using Bioinformatics and Deep Learning Methods

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Abstract:

Background and Aims: Ovarian cancer is one of the most lethal types of cancer among women, and early diagnosis plays a crucial role in improving patient outcomes. In this study, a mobile health application has been developed to assist in the diagnosis of ovarian cancer by utilizing bioinformatics methods and deep learning to evaluate the likelihood of the disease. The goal of this research is to design and evaluate a mobile health app that helps with early detection of ovarian cancer using biological data processing techniques and deep learning models.

Methods: The application consists of four main modules. The first is data collection, in which data is gathered from reputable bioinformatics databases and patient medical records. The second is data preprocessing and analysis, where the data is normalized and key features are extracted to improve model accuracy. The third module includes several deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), which are used to analyze bioinformatics data and identify patterns related to ovarian cancer. The fourth module is the developed application itself, which features a simple and user-friendly interface allowing users to input basic information and receive a risk assessment for ovarian cancer. The application also supports communication with physicians and the sending of analytical reports.

Results: To evaluate the performance of the application, the developed deep learning models were tested on validated datasets. Evaluation metrics included accuracy, sensitivity, specificity, false positive rate, and false negative rate. The system achieved an accuracy of over 87% in detecting ovarian cancer, indicating the high potential of this method for early diagnosis. Additionally, the application was reviewed by medical professionals, who confirmed its high usability.

Conclusion and Future Recommendations: This study demonstrated that using advanced mobile health applications can be an effective tool for the early detection of ovarian cancer and can support physicians in decision-making alongside traditional diagnostic methods. It is recommended that in the future, larger datasets and more advanced learning models be used to

enhance system accuracy. Adding features like a medical chatbot and wearable device integration can enhance system performance.

Keywords: Ovarian Neoplasms, Telemedicine, Deep Learning

G-1856

Smart Implants: AI-Driven Predictive Monitoring in Implant Dentistry

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Abstract:

Background and Aims: The integration of AI-driven smart implants into implant dentistry offers innovative solutions for real-time monitoring, early detection of complications, and predictive maintenance. These advancements aim to improve the longevity of dental implants and reduce the costs associated with failures. This study systematically reviews the efficacy of smart implants equipped with sensors (e.g., for strain, temperature, or pH) and AI models (e.g., machine learning, deep learning, or predictive analytics) in enhancing treatment outcomes.

Methods: A comprehensive systematic review was conducted, analyzing peer-reviewed studies published from 2017 to 2025. Data were collected from PubMed, Web of Science, and Engineering Village, focusing on studies that investigated AI-integrated smart implants. The inclusion criteria covered research involving sensors and AI models for dental implant monitoring. Key metrics analyzed included the detection accuracy of complications (e.g., peri-implantitis, mechanical loosening, bone loss), predictive maintenance capabilities, implant survival rates, and patient-specific risk profiling. The performance of AI models (accuracy, sensitivity, specificity), sensor reliability, and clinical integration were synthesized and compared against conventional monitoring methods.

Results: AI-driven smart implants significantly outperformed traditional methods in monitoring and predicting implant health. Sensor-equipped implants, when combined with machine learning models, demonstrated detection accuracies ranging from 90% to 97% for early-stage complications like peri-implantitis or screw loosening, in contrast to 65%–80% achieved through clinician-based assessments. Predictive maintenance algorithms identified implant failure risks 6–12 months in advance, with sensitivities and specificities exceeding 92%. Real-time monitoring of biomechanical (e.g., occlusal load) and biological (e.g., pH variations indicating inflammation) parameters enabled personalized interventions, reducing failure rates by 25%–40% in high-risk cases. Furthermore, AI-assisted risk stratification improved treatment planning, while maintenance costs decreased by 15%–30% due to timely interventions. Implant survival rates improved by 10%–20% over 5-year follow-ups. Challenges to adoption included sensor durability, data privacy concerns, and the lack of standardized clinical protocols.

Conclusion: AI-driven smart implants represent a transformative innovation in implant dentistry. These systems excel in real-time monitoring, early detection of complications, and predictive

maintenance, leading to improved implant survival rates and accuracy, personalized care, and cost efficiency.

Keywords: AI, Smart Implants, Machine Learning, Peri-Implantitis

G-1858

The Challenges of Using Large Language Models in Healthcare

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Abstract:

Background and Aims: Large Language Models (LLMs) play a significant role in generating AI-driven content. However, without proper oversight and responsible design, they can become tools for disseminating misinformation. This study examines the challenges of LLMs in healthcare and proposes strategies for their responsible use.

Methods: This review study was done in 2025, by searching databases such as ScienceDirect, PubMed, and Google Scholar with the keywords "LLMs", "Ethics", "Healthcare" and "ChatGPT" with a time limit of three years. Sources were reviewed to ensure comprehensive search results, the title and abstract of the articles were reviewed, and the articles that met the inclusion criteria were included in the study.

Results: Review of Studies shows that AI challenges in healthcare can be categorized into ethical, technical, and social area. Ethical concerns include accountability, ambiguity in responsibility allocation, preserving human dignity, bias, privacy protection, intellectual property rights, and issues like generating texts without proper citations or incorrect references. Technical limitations involve dependence on training data, lack of linguistic understanding, inability to automatically evaluate generated content, producing convincing yet incorrect responses (hallucinations), and reliance on probabilistic algorithms. Social concerns encompass reduced human oversight, altered physician-patient relationships, and diminished transparency. To address these challenges, proposed solutions include implementing response validation processes, leveraging blockchain technology, ensuring data privacy and security, obtaining informed consent, using more diverse and representative datasets, fostering interdisciplinary research, maintaining continuous human oversight, integrating AI-related topics into educational programs, and enhancing user experience through personalization and feedback mechanisms.

Conclusion: The use of large language models in healthcare can improve service delivery and enhance the quality of information. However, their challenges must be carefully managed.

Implementing the strategies suggested in this study will help optimize LLM performance and ensure compliance with ethical principles.

Keywords: Large Language Models, Ethics, ChatGPT, Healthcare

G-1859

Analysis of Vascular Features and Vocal Cord Edges Using Histogram of Oriented Gradients and Convolutional Neural Networks

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Abstract:

Background and Aims: The vocal cords play a crucial role in sound production. Vocal cord lesions can lead to voice disorders. The blood vessels in the vocal cords help maintain the health and flexibility of the tissue by supplying blood and nutrients. Accurate identification of vascular features and the edges of the vocal cords is challenging using traditional methods. The aim of this study is to employ advanced image processing and deep learning techniques to improve diagnostic accuracy using Histogram of Oriented Gradients (HOG) and Convolutional Neural Networks (CNN).

Methods: This study was conducted by searching the PubMed database and the Google Scholar search engine using the keywords "stroboscope", "artificial intelligence", "laryngeal lesions" and "effectiveness." Among the relevant articles, 13 studies published between 2011 and 2025 were reviewed.

Results: Traditional methods, such as manual image inspection by specialists, have always faced challenges like human errors and time consumption. Therefore, the use of artificial intelligence algorithms and image processing techniques like HOG and CNN has emerged as novel solutions to improve both diagnostic accuracy and speed.

Conclusion: The use of HOG was able to accurately identify the edges of the vocal cords. This method is particularly effective for diagnosis through image processing. The use of CNN demonstrated superior performance in classifying vascular features. Combining both HOG and CNN methods resulted in improved diagnostic accuracy for vascular features and vocal cord edges, achieving higher accuracy compared to specialists with 10 to 20 years of experience.

Keywords: Vocal Cords, Image Processing, Deep Learning

G-1860

Design and Evaluation of an Artificial Intelligence-Based Cybernetic System for Establishing Bidirectional Communication Between the Brain and Robotic Prosthesis

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Abstract:

Background and Aims: Prosthetic Technologies Have Been Developed for Many Years to Overcome the Limitations of Amputees and Physically Disabled Individuals. However, the Lack of Intuitive and Bidirectional Communication Between the Human Nervous System and Robotic Prostheses Remains a Critical Challenge. This Study Aims to Design and Evaluate a Simplified Cybernetic System Capable of Establishing Non-Invasive, Two-Way Interaction Between the Brain and a Robotic Prosthesis Using Artificial Intelligence and Sensory Feedback Pulses. This Work Is Conducted as Part of Validating the Functionality of a Patented Invention (Patent No. 96795, Registered in Iran) Titled "Design and Development of an Intelligent Robotic Cybernetic Prosthesis Capable of Bidirectional Brain–Robot Communication via Artificial Intelligence and Artificial Sensory Stimuli."

Methods: Due to the Complexity, High Cost, and Potential Risks of Real-World Testing on Amputees, a Simplified Version of the Original System Was Constructed for Proof-of-Concept Experimentation. The System Employed an EMG Sensor to Acquire Muscle Signals and a TENS Module to Deliver Electrical Pulses to Sensory Nerves. Data Processing and Control Were Handled by Raspberry Pi and ESP32 Microcontrollers. Features Such as Mean Absolute Value, Signal Energy, Variance, and RMS Amplitude Were Extracted and Analyzed Using Lightweight AI Algorithms, Including K-Nearest Neighbors (KNN) and Simplified Decision Trees. A Servo Motor With Angular Feedback Was Used to Simulate Prosthetic Movement.

Results: The Experiment Was Conducted in Two Stages: Training and Blind Validation. During Training, the User Gradually Achieved Better Control of the Servo Motor. In the Validation Stage, the Participant Attempted to Reach Angular Targets Without Visual Feedback. After a Few Sessions, the System Achieved an Average Accuracy of Approximately 70%, Demonstrating Its Capacity for Motion Recognition and Adaptive Sensory Feedback Using Simple Reinforcement Learning Techniques.

Conclusion: The Findings Confirm the Feasibility of the Proposed System and Its Potential as a Foundational Platform for Advanced, Non-Invasive Brain–Prosthesis Interfaces. With Further Improvements in Hardware and the Integration of More Sophisticated Algorithms, the System Could Evolve Into a Practical Tool for Real-World Prosthetic Applications.

Keywords: Prosthesis, Cybernetic, Artificial Intelligence, Feedback

G-1862

Application of Artificial Intelligence in the Diagnosis, Treatment, and Management of Stuttering

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Abstract:

Background and Aims: Stuttering is a complex and common speech disorder, and effective treatment requires accurate diagnosis. This disorder can manifest as repetition of sounds, prolonged speech, word repetitions, or blocks, and is influenced by genetic, psychological, and environmental factors. With advancements in technology, artificial intelligence has emerged as a powerful tool in the diagnosis and treatment of stuttering. Therefore, we aimed to explore the applications of artificial intelligence in this field in this study.

Methods: This narrative review aimed to identify studies on the application of artificial intelligence (AI) in stuttering diagnosis and treatment. Searches were conducted in PubMed, Scopus, and Google Scholar using combinations of Keywords: “stuttering,” “artificial intelligence,” “machine learning,” “speech therapy,” and “AI in speech disorders.” Inclusion criteria were English-language, peer-reviewed original articles or systematic reviews published between January 2022 and January 2025, focusing on AI-based assessment or intervention in stuttering. After removing duplicates and screening 42 records, 9 articles met all criteria and were included in the final review.

Results: The reviewed studies revealed several key applications of AI in stuttering. Classification models (e.g., Random Forest, CNNs) accurately identified stuttering types with 85–93% accuracy. Voice analysis using AI achieved over 90% sensitivity in detecting dysfluencies. AI tools, including ChatGPT-4, supported clinicians with documentation and treatment planning. AI-based teletherapy platforms improved accessibility and satisfaction, particularly in underserved areas. Additionally, one study used neural and facial EMG data to predict speech patterns with 78% accuracy.

Conclusion: The results of the studies show that artificial intelligence has brought significant transformations in the field of stuttering, including more accurate diagnosis, personalized treatments, and classification systems. However, to fully benefit from this technology, existing

challenges must be addressed. We expect further developments in this area in the future, which could improve the quality of life for individuals with stuttering.

Keywords: Artificial Intelligence, Stuttering, Machine Learning

G-1863

AI-Optimized PBMT Protocols: Personalizing Dental Tissue Regeneration and Healing

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Abstract:

Background: Photobiomodulation Therapy (PBMT) enhances dental tissue regeneration, wound healing, and pain relief by stimulating cellular processes with low-level light. However, variability in patient responses and optimal parameters (e.g., wavelength, energy density) limits its efficacy. Artificial Intelligence (AI) offers potential to personalize PBMT protocols by analyzing patient-specific data, optimizing treatment outcomes in dental applications such as periodontal regeneration, post-surgical healing, and implant osseointegration. To evaluate the efficacy of AI-optimized PBMT protocols in personalizing dental tissue regeneration and healing, focusing on improved healing rates, reduced complications, and patient-specific treatment precision.

Methods: A systematic review was conducted between 2018 and 2025, using PubMed, Scopus, and Web of Science. Inclusion criteria encompassed studies on PBMT (wavelengths 600–1000 nm, energy densities 1–10 J/cm²) in dental applications (e.g., periodontal therapy, implantology, oral surgery) and AI applications (e.g., machine learning, deep learning) for treatment personalization. Studies were evaluated for outcomes including tissue regeneration rates (e.g., collagen formation, bone density), healing time, pain reduction, and complication rates. AI model performance (accuracy, sensitivity, specificity) in predicting optimal PBMT parameters (e.g., dosage, session frequency) was assessed, with comparisons to standard PBMT protocols.

Results: AI-optimized PBMT protocols significantly improved dental tissue regeneration and healing outcomes compared to non-personalized approaches. Machine learning models, trained on patient-specific data (e.g., salivary biomarkers, imaging, medical history), achieved 88%–95% accuracy in predicting optimal PBMT parameters, reducing healing times by 20%–35% in periodontal and post-surgical cases. PBMT at 810–850 nm, personalized via AI, increased collagen synthesis by 30% and bone regeneration by 25% in implant osseointegration, compared to 15% and 10% with standard protocols. Pain reduction was enhanced by 40% in oral mucositis and post-extraction cases, with AI tailoring energy densities to patient pain thresholds. Complication rates (e.g., delayed healing, infection) dropped by 15%–25% with AI-driven protocols. Challenges included limited dataset sizes for AI training and the need for standardized PBMT devices.

Conclusion: AI-optimized PBMT protocols revolutionize personalized dentistry by enhancing tissue regeneration, accelerating healing, and reducing complications through patient-specific

treatment plans. AI's ability to predict optimal PBMT parameters outperforms conventional approaches, offering precision and efficiency in dental care.

Keywords: AI, PBMT, Personalized Dentistry, Tissue Regeneration

G-1864

Application of Artificial Intelligence in Stroboscopic Image Analysis and Laryngeal Lesion Detection: A Review Study

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Abstract:

Background and Aims: Laryngeal disorders such as laryngitis, vocal fold nodules, and vocal fold polyps can cause hoarseness, breathing difficulties, and swallowing problems due to impaired vocal fold function. Early and accurate diagnosis of laryngeal lesions plays a crucial role in the treatment and recovery process. Diagnosing these lesions is challenging due to their diverse appearance, the need for specialized image interpretation, and the similarity of some lesions to each other, sometimes making diagnosis difficult even for experts. Given the application and importance of this issue, this study investigates the benefits of using Artificial Intelligence (AI) in laryngeal image analysis and laryngeal lesion detection.

Methods: This study was conducted by searching the PubMed database and Google Scholar search engine using the keywords "Stroboscope," "artificial intelligence," "laryngeal lesions," and "effectiveness." Among the relevant articles, 13 articles published between 2021 and 2025 were reviewed.

Results: Studies have shown that the use of AI in laryngeal image analysis can play an effective role in early diagnosis of disorders. Additionally, this technology is beneficial in laryngeal examination and screening, especially in areas with limited resources and specialists, and can be used to train students and novice specialists.

Conclusion: In general, AI has high potential and accuracy in diagnosing and interpreting laryngeal images, assisting specialists. In some studies, its accuracy has been reported to be higher than human accuracy. With the advancement and improvement of AI, its use by specialists will increase.

Keywords: Voice Disorders, Image Processing, Laryngoscopy

G-1866

A Review of Integrating Digital Pathology and Microbiome Ecology Using Artificial Intelligence for Disease Diagnosis and Prognosis

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Abstract:

Background and Aims: Combining digital pathology with microbiome research is changing the way we understand and treat diseases. Advanced imaging and artificial intelligence (AI) methods in digital pathology reveal detailed tissue structures, while microbiome studies explore how microbes affect health. This review gathers recent progress, obstacles, and future prospects in linking tissue imaging with microbiome data using AI. It suggests that this approach could greatly improve both diagnosis and prognosis.

Methods: A detailed literature search was performed using keywords such as "digital pathology AND microbiome", "AI in pathology AND microbial ecology," and "multimodal AI AND microbiome" across databases, focusing on work that combines digital pathology with microbiome analysis via AI.

Results: Significant improvements have been noted in digital pathology, with AI models, especially neural networks, achieving high accuracy in disease detection from tissue samples. Microbiome research has identified specific microbial patterns linked to illnesses such as colorectal cancer and inflammatory bowel disease. When data from digital pathology and microbiome studies are merged using AI, new biomarkers have been found and the prediction of disease outcomes has improved. For example, certain bacteria within tumor environments have been associated with cancer prognosis. Nonetheless, issues like data uniformity, clarity in AI model decisions, and privacy concerns still need to be addressed.

Conclusion: The merging of digital pathology and microbiome research through AI offers promising avenues for personalized medicine. Overcoming technical, clinical, and ethical challenges is essential for fully harnessing this potential. Future work should focus on developing reliable multimodal AI models, establishing standardized datasets, and investigating new applications for disease diagnosis and treatment. Collaboration among experts in pathology, microbiology, and AI is key to driving this interdisciplinary field forward.

Keywords: Digital Pathology, Artificial Intelligence, Microbiome

G-1869

The Use of AI in Midwifery Education for Remote and Rural Communities: A Systematic Review of Virtual Learning Tools

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Abstract:

Background: Midwifery education in rural and remote areas faces unique challenges, including limited access to clinical placements and educational resources. AI-powered virtual learning tools, such as clinical simulations and AI-assisted tutoring, present an opportunity to address these gaps. This systematic review evaluates the effectiveness of AI-based educational tools in midwifery training for underserved populations.

Methods: A systematic review was performed using Scopus, PubMed, and Google Scholar databases for studies published from 2010 to 2024. Initial identification of studies yielded 315 articles, of which 45 were duplicates, removed using Rayyan software. After applying inclusion criteria—(1) studies focusing on AI-powered educational tools for midwifery; (2) studies targeting rural or remote midwifery education; (3) studies with measurable outcomes on educational effectiveness—35 studies were included. Exclusion criteria included (1) studies focusing on non-AI educational tools; (2) studies not addressing midwifery education or rural contexts. Two independent reviewers performed data extraction, resolving disagreements through consensus.

Results: AI-driven tools, including virtual reality simulations and chatbots, improved knowledge retention and clinical skills in rural midwifery students. For example, AI-based virtual scenarios for childbirth led to a 30% increase in student confidence in handling labor complications. However, 12 studies identified challenges related to the availability of technology, with inadequate internet infrastructure in some rural areas impeding access. 6 studies reported mixed results on student engagement and the development of non-technical skills such as communication and empathy.

Discussion: AI-based tools offer significant potential to enhance midwifery education, particularly in areas with limited resources. However, challenges such as technological accessibility and the effectiveness of AI in teaching soft skills, critical in midwifery practice, need further exploration. A balance must be struck between AI-enhanced education and traditional hands-on training, which remains crucial for developing practical clinical skills.

Conclusion: AI-powered educational tools can substantially improve midwifery training in rural areas but must be paired with reliable infrastructure and curriculum modifications to fully realize

their potential. Further research is needed to assess long-term outcomes on clinical practice and patient care.

Keywords: Artificial Intelligence, Midwifery pregnancy, Virtual Learning

G-1870

Application of Artificial Intelligence in Nursing: A Comprehensive Review

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Abstract:

Background and Aims: Nursing is a cornerstone of healthcare, pivotal in delivering high-quality patient care. The advent of advanced technologies, particularly artificial intelligence (AI), has created unprecedented opportunities to enhance nursing performance and healthcare services. AI's ability to process complex data and provide precise solutions can optimize nursing processes. This article explores AI applications in nursing, focusing on their benefits and limitations.

Methods: This comprehensive review aimed to examine AI applications in nursing. A literature search was conducted in reputable databases, including PubMed, Scopus, Web of Science, and Google Scholar, using keywords such as "artificial intelligence in nursing," "AI in healthcare," "nursing and technology," and "ethical challenges of AI." Articles published between 2015 and 2025 were selected to capture recent advancements. Inclusion criteria encompassed studies addressing AI applications in documentation, triage, diagnosis, health prediction, and nursing education. Studies focusing solely on AI's technical aspects without direct nursing relevance were excluded. From 120 identified articles, duplicates were removed, and 15 high-quality studies were selected for analysis after screening. Data were extracted using a qualitative approach and categorized thematically to assess AI's benefits and drawbacks in nursing.

Results: Findings revealed that AI significantly enhances nursing practice. It improves health outcome predictions through clinical data analysis. Automated documentation reduces time spent on administrative tasks, allowing more focus on direct patient care. In triage, AI algorithms prioritize patients, boosting emergency department efficiency. AI-based educational tools, through clinical scenario simulations, enhance nurses' skills. However, only two studies addressed AI's drawbacks, highlighting ethical concerns (e.g., privacy breaches), legal issues (e.g., liability for errors), and social challenges (e.g., reduced human interaction).

Conclusion: AI holds immense potential to transform nursing care quality. To fully leverage this technology, nurses must collaborate with computer science, engineering, and medical experts to test and implement AI tools. Establishing ethical and legal frameworks is crucial to mitigate risks. With strategic AI integration, nursing's future will be more efficient and patient-centered.

Keywords: Artificial Intelligence, Nursing Care, Medical

G-1871

Artificial intelligence in Midwifery for Predicting Obstetric Emergencies: A Systematic Review of Predictive Models and Clinical Implementation

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Abstract:

Background: The use of AI in predicting obstetric emergencies such as pre-eclampsia, placental abruption, and post-partum hemorrhage holds great promise for improving maternal and fetal outcomes. This systematic review evaluates AI-based predictive models used in midwifery to forecast obstetric emergencies, focusing on their predictive accuracy, clinical validation, and barriers to real-world implementation.

Methods: A comprehensive systematic search was conducted in PubMed, Scopus, and IEEE Xplore for studies published between 2015 and 2024. A total of 562 articles were identified, of which 120 were duplicates and removed using EndNote X9. The remaining 442 studies were screened for relevance based on inclusion criteria: (1) studies that applied AI models to predict obstetric emergencies; (2) models using machine learning, deep learning, or AI-driven algorithms; (3) studies published in English. Exclusion criteria included: (1) studies not directly related to obstetric emergencies; (2) studies without clearly defined AI models; (3) non-English language studies. Following full-text review, 34 studies were included for final analysis. Data extraction was performed by two independent reviewers, and disagreements were resolved by a third reviewer. Quality was assessed using the PROBAST tool (Prediction Model Risk of Bias Assessment) to evaluate the risk of bias and model validity.

Results: AI models demonstrated promising predictive accuracy, with deep learning models showing an AUC of 0.83 for predicting pre-eclampsia and 0.88 for post-partum hemorrhage. However, only 5 studies reported implementation in real clinical settings, revealing significant barriers including data quality issues, model transparency, and clinician training. Many models were tested on small sample sizes, with 13 studies reporting no significant improvement in outcomes during clinical trials.

Conclusion: AI-based predictive models for obstetric emergencies offer potential but require further validation and real-world implementation studies to demonstrate their value in improving maternal and fetal health outcomes. Challenges such as data privacy, clinician trust, and model transparency must be addressed for successful integration into midwifery care.

Keywords: Artificial intelligence, Obstetric Emergencies, Predictive Models

G-1872

Robotics in Healthcare: Opportunities and Ethical Challenges

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Abstract:

Background and Aims: In recent years, human-robot interaction has garnered significant interest in healthcare. Robots offer potential benefits, such as accelerating patient rehabilitation, enhancing well-being, and improving quality of life. However, their integration into healthcare raises ethical concerns, including privacy, accountability, and patient rights. This review examines the applications of robotics in healthcare, highlighting their benefits and ethical challenges to inform future implementation strategies.

Methods: This narrative review was conducted to explore the role of robotics in healthcare. A comprehensive literature search was performed in databases including PubMed, Scopus, and Google Scholar, using keywords such as “robotics in healthcare,” “human-robot interaction,” “ethical issues in robotics,” and “assistive robots.” Articles published between 2010 and 2025 were included to capture recent developments. Inclusion criteria encompassed studies addressing robotic applications in patient care, rehabilitation, and eldercare, as well as ethical implications. Non-healthcare-focused studies were excluded. From 100 identified articles, 20 relevant studies were selected after deduplication and screening. Data were analyzed thematically to categorize benefits and ethical concerns.

Results: Robots in healthcare demonstrate significant benefits, including supporting elderly care, assisting mobility-impaired individuals, reminding patients of medication schedules, and facilitating remote care to connect hospitals with homes. They enhance rehabilitation and improve patient independence. However, ethical challenges are notable. Studies highlight concerns such as privacy violations, lack of accountability for errors, limited empathy, psychological harm, deception, restricted access, and inadequate data security. These issues underscore the need for robust ethical frameworks to ensure patient safety and trust.

Conclusion: The growing interest in robotics in healthcare reflects their transformative potential. However, ethical challenges necessitate further research to establish legal and ethical guidelines that maximize benefits while safeguarding patient rights and values. Future studies should focus

on developing strategies for effective and ethical robot integration in healthcare systems, ensuring equitable access and patient-centered care.

Keywords: Robotics, Ethics, Patient-Centered Care

G-1874

Evaluating the Role of AI in Postpartum Care: A Systematic Review of Machine Learning Applications for Early Detection of Postpartum Depression

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Abstract:

Background: Postpartum depression (PPD) is a significant concern in maternal health, often going undetected and untreated. This systematic review evaluates the role of AI, specifically machine learning, in the early detection of PPD, aiming to identify accurate and feasible tools that can be integrated into midwifery care for timely intervention.

Methods: A systematic review was conducted using PubMed, CINAHL, Cochrane and Scopus for studies published from 2010 to 2024. The search identified 412 studies, of which 58 duplicates were removed using Endnote. After screening titles and abstracts, 115 studies were selected for full-text review. Inclusion criteria were: (1) studies using AI-based models (e.g., machine learning, natural language processing) for PPD detection; (2) studies using clinical or interview-based data for AI modeling; (3) studies evaluating predictive accuracy. Exclusion criteria included: (1) studies not focused on postpartum depression; (2) studies with non-machine learning methods; (3) studies that did not report performance metrics. 16 studies met the final inclusion criteria. Two independent reviewers conducted data extraction and resolved discrepancies through discussion. The QUADAS-2 checklist was used to assess the methodological quality of the studies.

Results: Machine learning models demonstrated a sensitivity of 80-92% and specificity of 75-85% for detecting postpartum depression through data from patient questionnaires and electronic health records. Models employing natural language processing (NLP) from clinical interviews showed high potential, with one model achieving an AUC of 0.89. However, there were concerns about the applicability of these models in diverse clinical settings due to the requirement for high-quality, structured data.

Discussion: AI shows great promise in early detection of postpartum depression, offering timely interventions. However, issues such as model generalizability across diverse populations, data privacy concerns, and the interpretability of machine learning models pose significant challenges to widespread clinical adoption. Ethical concerns, particularly regarding the use of personal data, also need to be addressed.

Conclusion: AI-driven approaches for detecting postpartum depression could significantly improve early diagnosis and intervention. However, the development of more robust,

generalizable models and the establishment of privacy safeguards are essential for their effective integration into midwifery care.

Keywords: Postpartum Care, Postpartum Depression, Machine Learning

G-1875

Spatiotemporal Prediction of Crimean-Congo Hemorrhagic Fever Outbreaks in Ardabil Using Random Forest Model and Analysis of Climate Change Impacts (2015–2030)

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Abstract:

Background and Aims: Infectious diseases, including Crimean-Congo Hemorrhagic Fever (CCHF), pose significant challenges to global public health. Climate change may influence the dynamics of these diseases, necessitating accurate computational tools for outbreak prediction. This study aims to develop a spatiotemporal machine learning framework to predict CCHF incidence at the county level in Ardabil, Iran, from 2015 to 2030, while assessing the impact of climate change on outbreak patterns.

Methods: The proposed research will employ the Random Forest model to capture nonlinear relationships and temporal lags (1 to 12 weeks). Epidemiological data (2019–2023), meteorological data (temperature, relative humidity, precipitation), and environmental data (normalized difference vegetation index, land cover) will be collected from local and global sources. Climate change scenarios (RCP4.5 and RCP8.5) will be analyzed to forecast changes in high-risk areas.

Results: It is anticipated that variables such as temperature and relative humidity will be identified as key drivers of CCHF outbreaks. Hotspot analysis is expected to highlight areas like Meshginshahr and Parsabad as high-risk regions. The model is likely to provide high predictive accuracy, enabling the development of an early warning system for targeted interventions.

Conclusion: This study will offer a scalable and effective framework for predicting climate-driven zoonotic diseases, with potential applications for public health policy in Ardabil and similar regions.

Keywords: Crimean-Congo Hemorrhagic Fever, Random Forest, Climate Change

G-1876

Enhancing ICU Resource Planning with Predictive Models: A Data-Driven Approach to Bed Occupancy and Mortality Forecasting Using COVID-19 ICU Data

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Abstract:

Background: The COVID-19 pandemic posed significant challenges for ICU management, emphasizing the need for accurate predictions of ICU bed occupancy and patient mortality. These predictions are vital for resource allocation during crises. Although large datasets typically power robust models, this study uses a limited dataset of 177 ICU entries with 42 features, collected from a single hospital during the pandemic. Despite the small sample size, the study explores machine learning approaches to forecast ICU bed usage and mortality, demonstrating that even limited data can offer insights for optimizing hospital management during future health crises.

Methods: The dataset includes ICU-related variables like department, patient demographics, intubation status, APACHE scores, and outcomes. Preprocessing involved encoding categorical features using Label Encoding and scaling numerical features with StandardScaler. To avoid data leakage, features like "Number of Beds" were excluded. Machine learning models—Ridge, Lasso, Random Forest, XGBoost, CatBoost, and ExtraTrees—were evaluated using 5-fold cross-validation, with hyperparameters optimized through GridSearchCV. Model performance was assessed with Mean Squared Error (MSE) and R^2 .

Results: Despite the small dataset, Random Forest and CatBoost achieved the highest performance, with average R^2 values of 0.91 and 0.92, respectively. These models showed strong generalization, with Random Forest demonstrating consistent results across folds (MSE standard deviation of 0.22). Feature importance analysis revealed that factors like intubation status,

APACHE score, and ICU department significantly contributed to model accuracy, suggesting that predictive modeling can be effective even with limited data.

Discussion: The results show that machine learning models, especially Random Forest and CatBoost, can enhance ICU resource management with small datasets. These models help predict ICU bed occupancy and mortality, which is critical during peak demand periods. The study emphasizes feature selection's importance in healthcare settings, suggesting that these models support real-time ICU management by helping hospitals allocate resources and prepare for surges.

Conclusion: This study demonstrates that even with a small dataset, machine learning models—particularly Random Forest and CatBoost—can predict ICU bed occupancy and patient outcomes. These findings highlight predictive analytics' potential to improve healthcare systems' responses during crises, optimizing resource allocation and patient care.

Keywords: Mortality Forecasting, Bed Occupancy, ICU Resource

G-1878

Generating Simulated Medical Data for Nursing Education Using Artificial Intelligence: A Comprehensive Review

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Abstract:

Background and Aims: Nursing education, a cornerstone of healthcare systems, demands innovative strategies to enhance students' clinical decision-making and critical thinking. Artificial intelligence (AI), through the generation of simulated medical data, offers a secure and ethical environment for training while protecting patient privacy. This review explores the applications, benefits, and challenges of using AI-generated simulated data in nursing education.

Methods: This systematic review included studies published between January 2015 and February 2025, identified through PubMed, Scopus, and Google Scholar. Search terms included: simulated data in nursing education, artificial intelligence in healthcare education, synthetic patient data, virtual simulation in nursing, and AI-generated medical data. Inclusion criteria: (1) English-language peer-reviewed articles, (2) focus on nursing education using simulated data. Exclusion criteria: non-nursing focus, opinion pieces, and unavailable full texts. From 150 initially identified articles, 42 remained after title and abstract screening. Following quality assessment using the CASP checklist, 18 high-quality articles were selected. Data were analyzed via qualitative content analysis and thematically categorized.

Results: Findings from the 18 studies showed that simulated data supported complex clinical scenario reconstruction (77.8%), improved electronic health record (EHR) training (61.1%), and enhanced data interpretation and clinical decision-making skills (88.9%). AI-generated data also increased students' clinical readiness and reduced reliance on real-world environments. Ethical advantages, such as improved patient confidentiality, were noted in 66.7% of studies. However, 50% of studies reported challenges including high development costs, limited access to quality datasets, and concerns about data validity.

Conclusion: Simulated data generated through AI holds significant promise for transforming nursing education. It enhances experiential learning while promoting ethical training environments. Future research should focus on developing cost-effective simulation tools, standardizing data, and integrating AI applications into nursing curricula.

Keywords: Artificial Intelligence, Nursing Education, Computer

G-1879

Metabolic Symphony: A comparison on Machine Learning and Ensemble Algorithms of Lifestyle Promotion Project Data for Predicting Metabolic Syndrome Onset

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Abstract:

Background and Aims: Metabolic Syndrome (MetS) is a complex cluster of interconnected metabolic irregularities that notably foster the risk of cardiovascular disorders and type 2 diabetes mellitus. Forecasting MetS and its associated factors with Machine learning models that offer a promising approach to analyze datasets and uncover patterns associated with MetS risk.

Methods: In this study, we have examined the performance of machine learning models in predicting MetS using distinctive combinations of feature selection and normalization techniques. We employed Decision Tree, K-Nearest Neighbors, Naïve Bayes, Neural Network, Random Forest, and Support Vector Machine, evaluating their accuracy, precision, sensitivity, and specificity. Feature selection methods included Chi2 score, F score, and Mutual info, while normalization techniques comprised MinMax, STD, and Robust.

Results: Our analysis revealed that ensemble models, particularly those combining Support Vector Machine, Random Forest, and K-Nearest Neighbors with Mutual information and STD normalization, outperformed individual models in terms of accuracy and F1 scores, reaching an accuracy of 0.85 and an impressive F1 score of 0.93. Furthermore, we identified common features

such as age, body mass index, waist circumference, high blood pressure, diabetes, and specific nutritional intakes per day that consistently influenced MetS risk across different models.

Conclusion: Findings highlight the efficacy of machine learning models in predicting MetS and the importance of considering both clinical and lifestyle factors in predictive modeling. By using large datasets and advanced algorithms, healthcare practitioners can identify individuals at high risk of MetS and implement interventions to moderate their risk and adjust health outcomes.

Keywords: Metabolic Syndrome, Machine Learning, Ensemble Learning

G-1880

Artificial Intelligence in Caries Detection: A Literature Review of Diagnostic Accuracy and Clinical Applicability

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Abstract:

Background: Dental caries remains one of the most prevalent chronic diseases worldwide, with significant public health implications. Accurate and early diagnosis is essential for preventing progression and minimizing the need for invasive treatments. However, traditional diagnostic methods, such as visual-tactile examination and radiographic interpretation, are subjective and prone to variability. Recent advancements in artificial intelligence (AI), particularly deep learning techniques like convolutional neural networks (CNNs), have shown promising results in automating caries detection from dental radiographs.

Methods: A narrative review of the literature was conducted using PubMed, Scopus, and Google Scholar. Studies were included if they employed AI or deep learning methods—particularly CNNs—for caries detection using radiographic images. Selected articles were reviewed for model architecture, dataset characteristics, diagnostic performance, and clinical relevance.

Results: CNN-based models such as ResNet, VGG, and DenseNet were widely used in the reviewed studies. Training datasets ranged from a few hundred to over 15,000 labeled radiographs, annotated by expert clinicians using standardized diagnostic criteria. AI models demonstrated high diagnostic accuracy, with sensitivities ranging from 82% to 95% and AUC values between 0.85 and 0.97. Several studies reported that AI systems outperformed general practitioners, particularly in detecting early-stage or proximal caries.

Discussion: The integration of AI in caries detection offers notable advantages, including improved diagnostic accuracy, reduced inter-observer variability, and faster analysis of radiographic images. However, certain limitations remain. Challenges include limited dataset diversity, difficulties in generalizing across populations, and lack of transparency in decision-making (black-box models). Ethical considerations, such as liability in AI-assisted misdiagnoses and data privacy, also require attention. Despite these concerns, commercial applications like Pearl AI and Diagnocat have demonstrated successful clinical integration and are currently used in dental practices.

Conclusion: AI-powered caries detection systems, especially those utilizing CNNs, have demonstrated strong potential as diagnostic aids in dentistry. These systems offer high accuracy, consistency, and efficiency, particularly in interpreting radiographs. While promising, their

widespread adoption depends on continued validation in clinical settings, transparent algorithms, and appropriate regulatory oversight. With these considerations addressed, AI can significantly enhance the quality and reliability of caries diagnosis in modern dental care.

Keywords: AI, Caries Detection, Dental Radiographs, CNNs

G-1881

A Review of Artificial Intelligence Models for Breast Cancer Detection

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Abstract:

Background and Aims: The most common cancer among women and leading cause of female mortality worldwide is breast cancer. Early detection highly improves treatment outcome. Over the last two years, with the advent of artificial intelligence (AI), more specifically deep learning, there have been new opportunities to improve the precision and effectiveness of breast cancer diagnosis and screening.

Methods: In this narrative review, an extensive search was conducted in the PubMed database and Google Scholar search engine using English keywords including artificial intelligence, breast cancer, breast cancer detection. 470 articles were found. After removing duplicates, outdated studies, and irrelevant content, 11 articles published between 2020 and 2025 were selected for analysis and review.

Results: Breast cancer detection has been significantly improved by artificial intelligence, particularly through deep learning models in digital mammography and tomosynthesis. The AI approaches are better than traditional CAD algorithms since they reduce false positives and their performance is equal to or superior to that of expert radiologists. They are especially helpful in detecting hard-to-detect cases such as interval and high-grade invasive cancers. Beyond mammography, AI has proved useful in ultrasound, MRI, and infrared thermography, increasing access and diagnostic precision. In pathology, AI assists in tumor categorization, biomarker identification, and treatment prediction, allowing customized therapy. AI also enhances workflow efficiency and reduces diagnostic inconsistency. Obstacles to its entire potential, such as data variability, clinical credibility, and ethics, remain and must be addressed to allow effective clinical use.

Conclusion: AI has already shown great potential to enhance detection, diagnosis, and treatment planning of breast cancer. While current models are truly impressive in their performance, especially in imaging, more research, clinical integration, and validation must be conducted. AI can indeed be a top-notch resource in improving early detection and patient outcome in the treatment of breast cancer with judicious application.

Keywords: Artificial Intelligence, Breast Cancer, Breast Cancer Detection

G-1882

The Impact of Artificial Intelligence in the Diagnosis, Treatment, and Skill Training of Children with Autism Spectrum Disorder: A Review Study

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Abstract:

Background and Aims: Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder characterized by challenges in communication and social interactions, as well as stereotypical and repetitive behaviors. The aim of this study is to investigate the impact of Artificial Intelligence (AI) in the diagnosis, treatment, and skill training of children with ASD.

Methods: This study was conducted by searching the PubMed database and Google Scholar search engine using the keywords "artificial intelligence", "autism" and "effectiveness." Among the relevant articles, 9 articles published between 2020 and 2025 were reviewed.

Results: Studies have shown that early diagnosis is crucial for the effectiveness of treatment in children with ASD. AI, particularly machine learning methods, can accelerate the diagnostic process by creating automated classification systems. Training various skills in children with ASD has a positive impact on improving their challenges and enhancing their performance in different areas. The appeal of this technology for children with ASD has facilitated skills training for these children.

Conclusion: AI-based interventions have positive effects on improving the challenges of children with ASD and facilitating the training of various skills for these children. The accuracy of ASD diagnosis using AI requires further improvement and more studies with a larger statistical population.

Keywords: Artificial intelligence, Autistic Spectrum Disorders, Intervention

G-1883

The Application of Augmented Reality in Nursing Skills Education: A Comprehensive Review

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Abstract:

Background and Aims: Nursing education plays a vital role in preparing healthcare professionals to deliver high-quality care and requires innovative approaches to enhance clinical competencies. Augmented Reality (AR), by overlaying digital information onto the real world, has emerged as a novel tool for clinical training. By simulating real-life healthcare environments, AR provides nursing students with a safe, repeatable, and interactive space to practice essential skills. This review aims to explore the applications, benefits, and challenges of using AR in nursing skills education.

Methods: This systematic review was conducted through a structured search of PubMed, ScienceDirect, BMC Nursing, CINAHL, and Web of Science for articles published between 2010 and 2025. Keywords included "augmented reality in nursing education," "clinical skills training with AR," and "simulation in nursing." Inclusion criteria focused on studies directly evaluating the impact of AR on nursing skill acquisition and clinical performance. After initial screening and removal of duplicates, 18 high-quality articles were selected. Data were extracted and thematically analyzed using a qualitative content analysis approach.

Results: Findings suggest that AR significantly enhances practical skills such as intravenous injection, nasogastric catheter insertion, vital sign assessment, and first aid training. It creates rich and engaging learning environments that boost students' motivation, focus, confidence, and teamwork. Additionally, AR has been effectively utilized in remote and hybrid learning, particularly in response to the COVID-19 pandemic. Despite its advantages, several barriers remain, including high development costs, the need for advanced infrastructure, and limited evidence in specialized fields like intensive care nursing.

Conclusion: Augmented Reality represents a powerful tool for transforming nursing education by bridging the gap between theory and practice. It fosters experiential learning and better clinical preparedness. However, existing limitations warrant further investigation. Future research should prioritize the development of cost-effective AR tools, the standardization of educational content, and long-term evaluations of AR's impact on nursing performance and patient outcomes.

Keywords: Augmented Reality, Nursing Education, Clinical Skills

G-1884

A Review of Artificial Intelligence-Powered Rehabilitation Robots

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Abstract:

Background and Aims: In the recent decades, the integration of robotics with artificial intelligence (AI) has actually transformed the realm of rehabilitation. The technologies support customized training, intelligent motion tracking, and real-time bio-signals processing, which contribute to improved motor rehabilitation of patients with various physical disabilities. In this review, efforts have been made to tackle the applications, trends, and challenges of rehabilitation robots with AI-based in various clinical conditions.

Methods: In this narrative review, an extensive search was conducted in the PubMed database and Google Scholar search engine using English keywords including artificial intelligence, rehabilitation, rehabilitation robots. 87 articles were found. After removing duplicates, outdated studies, and irrelevant content, 13 articles published between 2020 and 2025 were selected for analysis and review.

Results: Rehabilitation robots with AI have shown effectiveness in enhancing motor function, especially in stroke, Parkinson's disease, and rehabilitation of children. EMG signal-based and wearable sensor-based systems identify patient intent and offer adaptive upper limb rehabilitation assistance. AI-controlled exoskeletons and vision-based devices enable real-time feedback and personalized guidance, even in outpatient settings. With promising outcomes and increased patient engagement through VR and serious games, there are however issues of clinical validation and accessibility. However, AI continues to revolutionize rehabilitation with smarter, more responsive technology.

Conclusion: AI rehabilitation robots take center stage in the optimization of motor function, customization of treatment, and enhancing the efficacy of rehabilitation processes. Despite great strides, issues such as requirements for clinical validation, exorbitant costs, and low levels of professional adoption still exist. Future developments of the technology include designing light, accurate, and cost-effective systems that will be suitably established in rural and everyday healthcare services.

Keywords: Artificial Intelligence, Rehabilitation, Rehabilitation Robots

G-1886

Investigating the Effect of Using Mobile Health in Heart failure (HF)

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Abstract:

Background and Aims: Heart failure (HF) is a chronic, complicated syndrome that is manifested by signs and symptoms due to structural or functional defects that impair the heart's ability to fill with or eject blood effectively. Telemedicine, on the other hand, is a form of remote healthcare that encompasses the use of advanced information and communications technologies to connect patients with health care providers or to facilitate communication among medical experts. This article aims to review the advantages, limitations, and future possibilities of telemedicine technologies in chronic heart failure management.

Methods: This study employed the use of PubMed and Scopus databases in the research, applying the PRISMA method in screening all articles. Articles must meet three conditions to be used: they must be original, English language, and clinical trial studies. Reviews and short papers were excluded. The search strategy was built utilizing MeSH keywords and incorporated up to mid-2025 publications.

Results: During the time of search, 404 articles were identified, but only 14 met the inclusion criteria after screening. The articles researched focused on two groups: women and adults over the age of 19. It is also noteworthy that the communication applied in the studies was patient-mobile application use with no other means being reported. Telemedicine, with advances in technology, has shown significant improvements in the management of heart failure by increasing patient participation and empowerment and improving certain aspects of patient care.

Conclusion: Telemedicine represents a promising approach to helping both clinicians and patients in the care of heart failure. It can reduce healthcare utilization cost, hospitalization, and the requirement for face-to-face outpatient visits. Telemedicine interventions can also improve clinical outcomes in this group of patients. Additional research is necessary to evaluate patient satisfaction and ensure the achievement of effective care outcomes in this field.

Keywords: Telemedicine, Heart Failure, Mobile Health

G-1887

Comparing the Quality of Course Plans Designed by Nursing Students and Artificial Intelligence: An Analytical-Comparative Study

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Abstract:

Background and Aims: Effective instructional design is a requirement for training postgraduate nursing students. This study used statistical tests to compare the quality of course plans developed by nursing master's students with artificial intelligence.

Methods: In this quasi-experimental study, 30 nursing master's students, after receiving instructional design training, prepared course plans for teaching patients, nursing students, and clinical nurses. Then, using the same general goals, the course plans were generated by one of the artificial intelligence tools. The quality of the course plans in five areas (session structure, specific objectives, teaching methods, evaluation methods, creativity and innovation) was evaluated by three experts on a Likert scale (1-5) and compared with paired t-tests, Wilcoxon, and analysis of variance.

Results: The mean creativity score in AI course plan was significantly higher (4.2 ± 0.6 vs. 3.1 ± 0.8 , $p=0.001$). AI-designed course plans had innovative suggestions in terms of learning activities and course rules, based on the audience. However, student-designed courses were superior in adapting specific objectives to educational needs (4.5 ± 0.4 vs. 3.0 ± 0.9 , $p=0.002$.) No significant differences were observed in teaching methods, evaluation methods, and session structure. ($p=0.05$)

Conclusion: AI is effective in developing innovative course designs and can help teachers as teaching assistants. However, it requires human review to monitor and fine-tune learning objectives. Combining these two methods can lead to optimal instructional design.

Keywords: Artificial Intelligence, Instructional Design, Course Plan

G-1888

The Pivotal Role of Artificial Intelligence in Advancing Personalized Medicine: From Diagnosis to Targeted Therapy

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Abstract:

Background: Artificial intelligence (AI) has become an essential tool in the advancement of healthcare, including personalized medicine, where treatments and healthcare decisions are tailored to individual patient characteristics. By processing complex biomedical data, AI enhances the accuracy of disease diagnosis and helps identify personalized, targeted therapies.

Methods: In this narrative review, an extensive search was conducted in the PubMed database and Google Scholar search engine using the English keywords personalized medicine, artificial intelligence, machine learning, and deep learning. 76 articles were found. After removing duplicates, outdated studies, and irrelevant content, 9 articles published between 2020 and 2025 were selected for analysis and review.

Results: AI usage has been increased in personalized medicine with growing success. In medical imaging, AI models have raised the accuracy and speed of SPECT and PET image reconstruction, facilitating more rapid and precise disease diagnoses. It also improves dosimetry and adapts therapeutic doses based on the individual features of the patient and make treatments more effective. In cancer treatment, these systems analyze genetic, laboratory, and imaging data to provide real-time, personalized treatment recommendations. Their algorithms also facilitate early cancer detection by identifying subtle imaging patterns and biomarkers missed by the human eye. AI contributes to tumor prediction and metastasis risk, enabling clinicians to direct individualized therapeutic choice. In addition, in autoimmune diseases like RA and PsA, AI helps classify patients based on molecular and immune characteristics, guiding more precise drug choice and predicting response to therapy. This technology can help in managing electronic health records, predicting complications, and optimizing treatment timelines and resources, ultimately improving the quality and safety of healthcare services.

Conclusion: AI can help to improve personalized medicine by advancing disease diagnosis, treatment, and monitoring. However, challenges like data privacy and requirements for large-

scale validation still limit its use in the clinic. The researchers should try to overcome such limitations to reach the maximum potential of AI in personalized medicine.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning, Personalized Medicine

G-1889

Robotic-Assisted Rehabilitation After Stroke: A Systematic Review

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Abstract:

Background and Aims: Stroke remains a major global cause of long-term disability, often resulting in persistent motor deficits that significantly affect patients' quality of life. Over the past decade, robotic-assisted rehabilitation has garnered increasing attention as a promising method to deliver high-intensity, repetitive, and task-specific therapy key components for enhancing neuroplasticity and functional recovery. The aim of this systematic review is to investigate the effects of robotic-assisted rehabilitation after stroke.

Methods: A systematic review was conducted on studies published between 2015 and 2024, investigating the use of robotic devices in post-stroke rehabilitation. Databases including PubMed, Scopus, Web of Science, and Google Scholar were thoroughly searched. Included studies involved adult stroke patients undergoing upper or lower limb rehabilitation using robotic systems, with outcomes focusing on motor recovery, usability, or patient satisfaction.

Results: A total of 39 studies met the inclusion criteria. Among these, 84.6% reported significant improvements in motor function following robotic-assisted rehabilitation, particularly in upper limb recovery. Approximately 71.8% emphasized the benefits of high-intensity, repetitive training in promoting neuroplasticity and functional gains. In 61.5% of the studies, patients demonstrated improved coordination, strength, and movement precision compared to conventional therapy alone. Real-time feedback and interactive interfaces were identified as key motivators in 66.7% of the trials, contributing to increased patient adherence and engagement. Furthermore, 43.6% highlighted the value of personalized therapy intensity and objective progress tracking. Notably, in 53.8% of studies, combined approaches (robotic + conventional physiotherapy) yielded superior outcomes relative to standalone therapies.

Conclusion: Robotic-assisted rehabilitation has evolved from a theoretical concept to a viable component of neurorehabilitation. While evidence for its effectiveness is promising, its

widespread adoption will depend on addressing challenges related to clinical efficacy, accessibility, cost, and integration into routine healthcare practices. Future research should prioritize long-term outcomes, refine user-centered design approaches, and explore ways to enhance system acceptance and usability in rehabilitation settings.

Keywords: Stroke, Robotics, Rehabilitation

G-1890

Comparative Performance Analysis of Large Language Models: ChatGPT, Google Gemini, and DeepSeek in Approach to Resistant Hypertension

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Abstract:

Background: Large Language Models (LLMs) Show Promise for Enhancing Medical Decision-Making, but Their Performance in Specialized Domains Like Hypertension Management Remains Understudied. We Evaluated Three LLMs - ChatGPT-4, Google Gemini, and DeepSeek - Using Guideline-Based Clinical Questions to Assess Their Accuracy and Reliability.

Methods: Thirty Clinical Questions (15 Simple, 10 Moderate, 5 Hard Difficulty) Were Extracted From the 2024 ESC Guidelines for the Management of Elevated Blood Pressure and Hypertension, With Emphasis on Resistant Hypertension. A Senior Cardiologist Scored Responses Using a 4-Point Scale: (1) Completely Incorrect Answer, (2) Correct Answer Containing Incorrect Information, (3) Correct but Inadequate Answer, and (4) Correct and Adequate Answer. We Summarized Non-Normally Distributed Data As Median With Interquartile Range (IQR) and Performed Nonparametric Analyses Using Stata 18 (StataCorp LLC), Including Friedman Tests With Post Hoc Wilcoxon Signed-Rank Tests (Bonferroni-Corrected) to Compare Model Performance Across Difficulty Levels.

Results: ChatGPT-4 Achieved the Highest Median Scores for All Question Types (Hard: 4 [IQR 4-4]; Moderate: 4 [3-4]; Simple: 4 [3.5-4]), With Statistically Superior Performance Over Gemini and DeepSeek for Moderate Questions ($p=0.03$). Differences Were Nonsignificant for Hard ($p=0.3$) and Simple Questions ($p=0.62$), Though ChatGPT Showed Marginally Better Overall Performance ($p=0.059$). Gemini and DeepSeek Performed Comparably but Scored Lower Than ChatGPT (Median Range: 3-3.5). Response Consistency (IQRs) Was Similar Across Models.

Conclusion: While ChatGPT-4 Outperformed Peers in Moderate-Difficulty Questions, the Absence of Significant Differences in Hard Questions - Coupled With the Small Sample of Hard Queries - Highlights the Need for Larger, More Balanced Datasets to Robustly Evaluate LLMs in Complex Clinical Scenarios. These Findings Underscore the Importance of Context-Specific Validation When Deploying LLMs in Medicine.

Keywords: LLMs, Hypertension, AI Validation

G-1891

Establishing Artificial intelligence and reducing health care system costs respond to COVID-19 and beyond

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Abstract:

Background and Aims: The integration of artificial intelligence (AI) and machine learning (ML) into healthcare systems offers transformative potential in addressing challenges posed by the COVID-19 pandemic and beyond. AI and ML algorithms enable rapid processing of extensive datasets, reducing human effort while enhancing diagnostic accuracy and efficiency. In clinical microbiology, these technologies facilitate the development of cost-effective, portable, real-time, and sensitive point-of-care (POC) tools for microbial detection. AI-assisted platforms, such as Real-Time PCR enhanced by ML, promise faster and more economical identification of viral serotypes compared to traditional methods. Furthermore, AI's capabilities extend to predicting disease progression, optimizing treatment strategies, contact tracing, forecasting outbreaks, and accelerating drug/vaccine development.

Methods: Comprehensive searches were conducted across Scopus, Web of Science, EMBASE, PubMed, and Cochrane databases. Two independent reviewers evaluated the eligibility of identified trials based on predefined criteria and subsequently performed data collection and analysis.

Results: Feature selection (FS), a critical preprocessing step in ML, refines datasets by eliminating irrelevant features, improving algorithm efficiency and accuracy. Despite the resource-intensive nature of AI training—particularly in image-based infectious disease diagnostics—the subsequent implementation is cost-effective and scalable. Telemicrobiology exemplifies this scalability, enabling remote diagnostics via internet-connected microscopes. AI-driven solutions thus hold promise for healthcare systems of varying scales, addressing cost-effectiveness and immediacy where conventional techniques fall short. While challenges remain in validation and real-world application, AI's role in revolutionizing healthcare practices is evident, particularly in combating pandemics like COVID-19.

Conclusion: Therefore, AI-based image analysis in infectious disease diagnostics will likely find its niche by providing answers in healthcare systems both large and small where other techniques are not cost-effective, immediate or comprehensive.

Keywords: Artificial Intelligence, COVID-19, Telemicrobiology, Machine Learning

G-1892

Design and Implementation of an AI-based Clinical Decision Support System for Early Detection and Monitoring of Chronic Endometriosis

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Abstract:

Background and Aims: Chronic endometriosis is a multifactorial condition often underdiagnosed due to nonspecific symptoms and variability in disease progression. This study aimed to develop an AI-driven clinical decision support system integrating clinical, imaging, and patient-reported data to improve early diagnosis and personalized monitoring.

Methods: A retrospective dataset was collected from gynecology clinics, comprising pelvic MRI scans, hormone profiles, surgical findings, and longitudinal symptom reports. Imaging data were analyzed using convolutional neural networks (CNNs) trained to detect characteristic radiological patterns. Clinical and patient-reported data were structured and processed using ensemble learning algorithms, primarily random forests and gradient boosting, to identify predictors of disease progression and flare-ups. Multimodal data fusion was conducted using feature-level integration, and system performance was evaluated via cross-validation using area under the curve (AUC) and F1-score metrics.

Results: The AI system demonstrated enhanced sensitivity in detecting early-stage endometriosis when multimodal data were combined, with AUC improving from 0.78 (clinical-only) to 0.91. Flare-up prediction showed strong correlation with cyclical hormonal variations and specific imaging features (e.g., signal intensities on T2-weighted MRI). The inclusion of structured patient feedback enriched the system's ability to personalize monitoring and anticipate symptom fluctuations.

Conclusion: Integrating diverse types of patient data, including clinical, imaging, and self-reported measures, can significantly enhance the early detection and monitoring of chronic endometriosis. This comprehensive framework lays the groundwork for more personalized, proactive care models and highlights the value of systematic, longitudinal data collection in improving gynecological health outcomes.

Keywords: Endometriosis, Clinical Decision Support System, Dianosis

G-1893

Exploring the Role of Blockchain Technology in Educational Data Management: A Systematic Review with an AI Perspective

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Abstract:

Background and Aims: Blockchain technology, known for its decentralization, transparency, and security, has emerged as a promising innovation in the field of education, particularly medical education. In recent years, researchers and educators have increasingly investigated its potential to enhance the management of educational records, authentication systems, and financial transactions. This systematic review examines how blockchain can transform educational data management systems and identifies the benefits and challenges of its implementation.

Methods: Following PRISMA guidelines, a comprehensive search was conducted across four databases: PubMed, Scopus, SID, and Semantic Scholar, covering the period from 2019 to January 2025. Using Persian and English keywords related to blockchain, education, technology, management, and medical education, 50 original articles were initially retrieved. After screening titles, abstracts, and full texts, 13 studies were included for detailed review and thematic analysis.

Results: The findings indicate that blockchain offers robust solutions for storing academic records, issuing certificates, and preventing data manipulation. Many studies highlighted the integration of blockchain with artificial intelligence (AI), particularly in automating processes through smart contracts and enhancing authentication through machine learning algorithms. These technologies collectively help reduce fraud, increase trust, and improve system efficiency. Moreover, blockchain-based financial systems were shown to improve transparency and accountability in budget allocation and expenditure tracking. However, limitations such as high implementation costs, technical complexity, and privacy concerns were commonly reported across studies.

Conclusion: In conclusion, blockchain, especially when integrated with AI-driven tools, holds great potential to improve data management in educational systems. Its adoption can lead to more secure, transparent, and efficient processes in medical education. Still, further research is needed to address infrastructure limitations, promote interoperability, and support the development of user-friendly, scalable blockchain applications for educational environments.

Keywords: Blockchain, Medical Education, Artificial Intelligence

G-1894

Artificial Intelligence in Drug Discovery and Development Against Antimicrobial Resistance

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Abstract:

Background and Aims: Antimicrobial resistance (AMR) presents a formidable global health challenge, jeopardizing the efficacy of current antibiotics and posing a substantial threat to public health. The escalating prevalence of AMR demands innovative solutions. However, the traditional drug discovery process for combating AMR is marked by significant costs, prolonged timelines, frequent inefficiencies, and numerous developmental hurdles. This study explores the potential role of artificial intelligence (AI) in addressing AMR through drug discovery and development.

Methods: This review employed a systematic bibliometric approach to identify and analyze relevant literature on AI applications in AMR drug discovery. The primary database used was the Web of Science Core Collection (WoSCC), recognized for its comprehensive coverage of scientific publications and suitability for bibliometric analysis. The search was conducted on 2024, and covered publications from 2014 to 2024. Only original articles and reviews written in English were included.

Results: Article Selection and Statistics including 2,408 publications (2014–2024) that included in the bibliometric analysis. Annual publication growth was observed, increasing from 4 articles in 2014 to 549 in 2023, indicating a rapidly expanding research field. The United States led with 707 publications, followed by China (581) and India (233). Top contributing institutions included the Chinese Academy of Sciences (53 articles), Harvard Medical School (43), and University of California San Diego (26). Citation analysis highlighted two major breakthroughs: AlphaFold's protein structure prediction (6,811 citations) and deep learning approaches to antibiotic discovery (4,784 citations). Keyword and cluster analysis revealed six enduring research themes: sepsis, artificial neural networks, antimicrobial resistance, antimicrobial peptides, drug repurposing, and molecular docking. Among 483 identified keywords, "machine learning," "antibiotic resistance," and "prediction" were most frequent. Thirty-three keywords appeared more than 50 times, reflecting the centrality of AI and data analysis in this domain.

Conclusion: Research output in this field is rapidly increasing, with significant international and institutional collaboration. These findings underscore the growing impact and promise of AI in overcoming the challenges posed by AMR, while also highlighting areas for further research and interdisciplinary collaboration.

Keywords: Artificial Intelligence, Point-of-care, Convolutional Neural Networks

G-1895

Perceptions of Artificial Intelligence Integration in Rehabilitation Education and Practice: Challenges and Opportunities from Stakeholders' Viewpoints in Northeast Iran

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Abstract:

Background: The integration of artificial intelligence (AI) into rehabilitation sciences has the potential to transform patient care, education, and decision support. This study investigates the perceptions of rehabilitation professors and students regarding the implementation of AI in rehabilitation within an academic and clinical setting in northeastern Iran.

Methods: In this cross-sectional study (Dec 2023 – Jan 2024), a validated questionnaire was distributed via email among faculty members and students of the Rehabilitation School at Mashhad University of Medical Sciences. The study was approved by the university's ethical committee (IR.MUMS.FHMPM.REC.1402.137; Project ID: 4020917).

Results: Most participants (professors: 100%; students: 88.9%) were aware of the basic applications of AI. The most recognized advantage was the use of AI-powered assistive technologies (students: 86.9%; professors: 100%). Key barriers included a lack of hands-on experience, inadequate access to AI tools, and limited educational infrastructure. Interestingly, concerns differed: students emphasized AI's lack of emotional understanding (48.4%), while professors highlighted its inability to make contextual judgments (57.1%).

Conclusion: Educational reform and technological infrastructure are essential to facilitate the integration of AI in rehabilitation. The findings highlight the need for targeted training programs,

the inclusion of virtual intelligent assistants in education, and the development of policy frameworks to support ethical AI use in health sciences education.

Keywords: AI, Rehabilitation, Assistive Technology, AI Acceptance

G-1896

A Review of Deep Learning Techniques for Mandibular Canal Detection in CBCT Images

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Abstract:

Background and Aims: Mandibular canal detection in cone-beam computed tomography (CBCT) images is a crucial step in dental surgeries and implant planning, as the canal contains the inferior alveolar nerve responsible for sensory innervation of the lower jaw. Damage to this nerve during surgery can lead to severe complications such as permanent numbness of the lower lip. Recently, deep learning techniques have gained attention for their ability to automate the detection of anatomical structures in medical imaging. The aim of this review is to evaluate and compare various deep learning methods applied to the detection of the mandibular canal in CBCT images.

Methods: This review investigates a range of deep learning models, particularly convolutional neural networks (CNNs), and advanced architectures such as U-Net, 3D U-Net, and Transformer-based networks. Studies were selected based on their relevance, use of CBCT datasets, and inclusion of performance metrics. The reviewed papers were analyzed in terms of model structure, dataset characteristics, evaluation criteria, and reported performance.

Results: The findings indicate that three-dimensional models generally achieve higher accuracy due to their capacity to capture volumetric anatomical details. Hybrid models integrating attention mechanisms have demonstrated improved focus on critical regions, enhancing segmentation performance. Despite these advancements, several limitations persist, such as inconsistent dataset quality and the need for expert-annotated ground truth.

Conclusion: Deep learning has shown promising potential in automating mandibular canal detection, contributing to safer and more efficient dental procedures. Future work should focus on developing robust hybrid models, generating synthetic training data, and creating standardized benchmarks to facilitate comparative studies and real-world clinical applications.

Keywords: Mandibular canal, CBCT Images, CNN, U-Net

G-1897

Artificial Intelligence in Drug Formulation: Enhancing Efficiency and Precision Through Machine Learning

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Abstract:

Background: Integrating artificial intelligence, particularly machine learning, in pharmaceutical formulation has emerged as a promising strategy to enhance efficiency, precision, and personalization in drug development. This narrative review examines recent literature on the application of artificial intelligence in optimizing various pharmaceutical formulations, including nanoparticles, suspensions, and solid oral dosage forms.

Methods: A structured search was conducted in scientific databases to identify relevant studies between 2022-2025 that employed artificial intelligence or machine learning for formulation optimization. Selected studies were analyzed and categorized based on formulation type, artificial intelligence methodology, and key outcomes. The review compares traditional Design of Experiments with machine learning models such as XGBoost, random forest, support vector machine, and artificial neural networks.

Results: Findings reveal that machine learning models consistently outperform Design of Experiments in predictive accuracy, especially for nanoparticle size and suspension stability, with XGBoost often yielding the best performance (R^2 0.9). However, both approaches showed limited success in predicting zeta potential. In suspension formulations, stabilizer concentration and bead size were identified as key factors using SHAP analysis. Artificial intelligence was also applied in 3D printing-based tablet design, where genetic algorithms enabled the creation of dosage forms with tailored drug release profiles. Additionally, machine learning applications in solid dosage forms addressed formulation design, process optimization, quality control, and regulatory compliance.

Conclusion: In conclusion, artificial intelligence demonstrates significant potential to revolutionize pharmaceutical formulation by reducing trial-and-error, enhancing prediction accuracy, and supporting personalized medicine. Future research should focus on data integration, model interpretability, and regulatory frameworks to further advance artificial intelligence-driven formulation science.

Keywords: Artificial Intelligence, Machine Learning, Pharmaceutical Industry

G-1899

Topic Modeling and Sentiment Analysis of Drug-Related Patient Reviews for Health Management Applications

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Abstract:

Background and Aims: Patient-generated medication reviews hold rich information on actual treatment experiences, but it is difficult to obtain actionable information from these unstructured text. This research seeks to utilize artificial Intelligence by natural language processing methods, namely topic modeling and sentiment analysis, to a large dataset of drug-related patient reviews. The goal is to uncover frequent themes in patient experience and gauge overall sentiment, demonstrating how techniques used in marketing can be translated to healthcare for patient-focused care and improved planning of health services.

Methods: We analyzed 4,075 English-language patient medication reviews on the DrugLib site, harvested from a public online repository. The text data were preprocessed by tokenization, removal of unwanted characters, lemmatization, and normalization. The text was vectorized based on a bag-of-words model following text cleaning. Subsequently, unsupervised topic modeling based on Latent Dirichlet Allocation produced six interpretable and coherent topics. Finally, each review was assigned a sentiment score from the VADER lexicon-based sentiment analysis tool for quantifying its positive or negative content.

Results: Preliminary findings indicate that the extracted topics are aligned with important themes in patient drug experience. These are drug effectiveness over time, side effect onset, perceived efficacy, and behavior associated with adherence. Sentiment analysis provides a complement to these, indicating a spectrum of patient emotion. For instance, reviews centered on long-term effectiveness are positive in sentiment, while ones centered on side effects are negative. Together, the topic and sentiment outcomes provide a rich perspective on patient opinion regarding medication taking.

Conclusion: Topic modeling and sentiment analysis can potentially serve as useful tools for patient-level monitoring and comprehension of drug experience. By systematically extracting emotional content and themes from patients' language, these text analytic methods can be

developed towards patient-focused drug monitoring, real-world evidence generation, and digital health surveillance. This integrated analysis can serve to enable more responsive health governance and improved healthcare provision.

Keywords: Artificial Intelligence, Medicine, Sentiment Analysis, Topic Modeling, Health Management

G-1900

Beyond Diagnosis: Evaluating Artificial Intelligence (AI) Models for Predicting Posttraumatic Stress Disorder (PTSD): A Systematic Review of AI and Machine Learning Techniques

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Abstract:

Background and Aims: Posttraumatic stress disorder (PTSD) is a complex psychiatric condition that may arise after experiencing traumatic events, significantly affecting an individual's quality of life. PTSD's unpredictable nature is influenced by biological, psychological, and environmental factors. Recent advancements in computational psychiatry have underscored the potential of machine learning (ML) in predicting PTSD prognosis. This systematic review aims to compile recent evidence on the use of ML for forecasting PTSD onset and progression, focusing on model types, data sources, predictive accuracy, and methodological quality.

Methods: A systematic literature search was conducted across six databases: Scopus, PubMed, EMBASE, Web of Science, Science Direct, and ACM Digital. The search was guided by keywords linked to PTSD and ML methods. Out of 2,285 results (after removing duplicates), 34 studies met the inclusion criteria. Meta-analysis was not feasible due to variability in outcome measures and data sources. The protocol for this review was registered in PROSPERO (CRD42024612882).

Results: The included studies demonstrated that ML models effectively predict the onset and progression of PTSD, with areas under the curve (AUC) ranging from 0.80 to 0.93. Ensemble methods like XGBoost and random forests outperformed other models, including deep learning architectures such as recurrent neural networks, particularly when using multimodal data (e.g., actigraphy, biomarkers). Prediction accuracy varied from 68% to 97%, with the highest performance linked to physiological and behavioral time-series data, vital for real-time risk assessments. Various trauma types were covered, including both acute and chronic stressors. Key predictors of PTSD persistence included early symptom severity, trauma chronicity, cortisol dysregulation, and sociodemographic factors, but the studies showed notable heterogeneity in symptom trajectories with limited external validation and discussions on model interpretability.

Conclusion: ML models show considerable potential in predicting the onset and development of PTSD, particularly when integrated with multi-domain and longitudinal data. Identifying critical

prognostic variables suggests that ML can inform early interventions. However, the field requires increased external validation, transparent reporting, and improved model interpretability to enhance clinical applicability and advance personalized PTSD care.

Keywords: Posttraumatic Stress Disorder, Prognosis, Machine Learning

G-1901

Artificial Intelligence in Nursing: Yes or No? Challenges and Benefits

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Abstract:

Background and Aims: Artificial intelligence in nursing can be utilized for planning and time management, improving efficiency and decision-making, providing better care, and facilitating remote work. However, based on findings, the use of artificial intelligence in nursing has both benefits and challenges. This study aims to review the findings of studies conducted in the areas of application of artificial intelligence in nursing and examine the results to assess the applicability and usefulness of this technology in nursing.

Methods: The necessary information was obtained through keyword searches in the PubMed database. Initially, 960 articles were retrieved, and ultimately, 32 articles that examined the areas of application of artificial intelligence in nursing were included in the results table.

Results: A narrative review of the studies conducted classified the results of integrating artificial intelligence in clinical environments into six areas: clinical decision support systems, predictive analytics, remote patient monitoring, intelligent physical robots, nursing care plan development, and nursing learning and education. In addition to the benefits of using artificial intelligence in nursing, challenges and considerations for its use were also identified, including accuracy and reliability, bias and fairness, ethical and legal issues, transparency, and explainability. Concerns have been raised about artificial intelligence-based technologies in nursing, with many fearing that they could replace human-to-human interaction and compromise the ethics of care. Other major concerns revolve around the ethical use of these technologies, such as managing data bias and using it to train algorithms. Some of these fears can be alleviated by providing end-users with sufficient information about AI, understanding current research on these technologies, and engaging in transparent discussions about the ethics of AI in nursing.

Keywords: Artificial Intelligence, Nursing, Machine Learning

G-1903

Multimodal Deep Learning in Prediction of Chronic Disease Risk: A Systematic Review

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Abstract:

Background and Aims: Traditional monomodal artificial intelligence (AI) models often fall short in accurately predicting chronic disease trajectories, as they fail to account for the complex, multimodal nature of such conditions. This systematic review aims to synthesize current evidence on deep learning frameworks that integrate multimodal medical data—including physiological signals, imaging, and omics—for improved prediction and clinical relevance in chronic disease management.

Methods: Following PRISMA guidelines, a comprehensive search was conducted across PubMed, Scopus, and Web of Science for English-language studies published between 2015 and 2024. Eligible studies involved adult populations and employed at least two data modalities in deep learning models for predicting chronic diseases (e.g., cardiovascular, cancer, diabetes). Studies were screened independently by two reviewers, with quality assessed using the PROBAST tool. A narrative synthesis was performed, supplemented by pooled accuracy comparisons when appropriate.

Results: Out of 832 retrieved articles, 39 met inclusion criteria. Most utilized hybrid neural architectures, such as Long short-term memory networks for time-series physiological data, ResNet-based convolutional neural networks (CNNs) for CT/MRI analysis, and Principal Component Analysis-attention mechanisms for high-dimensional omics data. Compared to unimodal baselines, multimodal models demonstrated significant gains in diagnostic accuracy (mean improvement: 21.8%), early detection sensitivity (+17.5%), and risk stratification (e.g., AUC-ROC of 0.94 vs. 0.81). Several studies reported novel biological-radiological correlations, including a robust association between BRCA1 gene expression and MRI texture features. However, heterogeneity in outcome metrics and reporting limited meta-analytic synthesis.

Conclusion: Multimodal deep learning frameworks offer substantial promise in enhancing the predictive accuracy and interpretability of chronic disease models. Nevertheless, variability in study design, lack of standardized evaluation protocols, and dependency on publicly available datasets highlight the need for cross-institutional validation and methodological harmonization. Future directions include improving model transparency and mitigating modality dropout effects to strengthen clinical integration.

Keywords: Multimodal Data, Deep Learning, Chronic Disease

G-1904

Machine Learning Bias in Medical Imaging: A Scoping Review

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Abstract:

Background and Aims: Machine learning, which is a subset of artificial intelligence, is increasingly being utilized in numerous different areas, and particularly in the medical profession. However, its usage comes with a potential for malfunction and bias. The present study examines errors and biases in machine learning in the case of medical imaging.

Methods: This scoping review was conducted based on the framework proposed by (Arksey & O'Malley, 2005) To identify relevant studies, the following keywords were used: Bias, Error, Machine Learning Bias, Algorithm Bias, machine learning, ML, Artificial intelligence, AI, medical imaging, radiology, imaging, radiography, Diagnostic Imaging, Diagnosis, Magnetic Resonance Imaging, MRI, Computed Tomography, CT, CT scan, Ultrasonic, X-ray. Searches were performed in PubMed/MEDLINE, EMBASE, Scopus, Web of Science, and IEEE Xplore. Following the examination of titles and abstracts, 45 articles were incorporated in the research.

Results: Bias in the input datasets, the application of training data with constrained or non-standard samples, disparities in racial and demographic attributes (such as age, gender, socioeconomic standing, lifestyle, and genetic background), fluctuations in image quality, luminance, and resolution (MRI, CT, X-ray), as well as differences between imaging devices, were among the most significant sources of bias in machine learning-based algorithms in the reviewed studies.

Conclusion: Executing requisite strategies to alleviate these biases is crucial not solely for enhancing the precision of medical diagnosis and analysis but also for guaranteeing the just provision of healthcare services.

Keywords: Bias, Machine Learning, Artificial Intelligence

G-1905

Design and Feasibility Evaluation of an Interactive VR-Based Game System for Upper Limb Stroke Rehabilitation

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Abstract:

Background and Aims: Stroke is one of the leading causes of long-term disability worldwide. Intensive and repetitive upper limb rehabilitation is essential for improving motor recovery post-stroke. Recently, game-based rehabilitation systems have emerged as a promising approach to increase patient motivation, engagement, and adherence. This study aimed to assess the feasibility and user experience of a serious game-based rehabilitation system using non-immersive virtual reality (VR) technologies tailored for upper extremity recovery in stroke patients.

Methods: This feasibility study was conducted in Mashhad, Iran, and included adult stroke patients requiring regular rehabilitation. The system employed Kinect Xbox 360 to track upper limb movements and was integrated with a therapist portal. The games were designed using Unity 2020 and Python/OpenCV, with features such as adaptive difficulty levels, visual/audio feedback, and real-time motion calibration. Each game targeted specific horizontal or vertical upper limb movements. A performance report tracked metrics such as movement accuracy, range of motion, reaction time, and game duration.

Participants completed validated questionnaires based on the Technology Acceptance Model (TAM) after three sessions and reported their in-game experiences after each session. Quantitative metrics included perceived presence, enjoyment, exertion, pain, perceived usefulness, ease of use, and intention to use.

Results: Twelve patients participated. Most reported high enjoyment and moderate-to-high levels of presence and exertion. Visual and auditory feedback, progressive challenges, and motion calibration contributed positively to engagement. Participants expressed a positive view of the game-based rehabilitation system, potential to enhance rehabilitation, and boost productivity (perceived usefulness score: 0.83). Overall attitude toward system use was positive (attitude

score: 0.87), while opinions on clarity, understandability, flexibility, and ease of use were moderate (perceived ease of use score: 0.67). Intention to use the system, both at home and in a clinical setting, was moderate (intention to use score: 0.64).

Conclusion: The Kinect-based rehabilitation game system demonstrated high feasibility and positive reception among stroke patients. Its ability to adapt to individual needs and provide meaningful feedback supports its potential as a supplementary tool in stroke rehabilitation. Further studies are warranted to explore its long-term efficacy and clinical outcomes.

Keywords: Stroke, Rehabilitation, Serious Game, Virtual Reality

G-1906

AI algorithms for predicting orthodontic treatment outcomes based on craniofacial morphology

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Abstract:

Background and Aims: Orthodontic treatment planning relies on cephalometric analysis (X-ray measurements) to assess jaw and tooth positions. This process is time-consuming and subject to clinician variability. Artificial intelligence (AI) offers potential for automation and standardization. This study aims to develop neural networks to predict three clinical decisions: (1) necessity of tooth extraction, (2) specific teeth for extraction, and (3) orthodontic appliance selection, based on craniofacial morphology.

Methods: Retrospective analysis of 302 anonymized orthodontic patient records (2018–2023) was conducted. Data included lateral cephalograms, intraoral photographs, and 3D dental models. Twenty-four validated cephalometric parameters (e.g., ANB angle, overjet, crowding index) were extracted. Three neural networks (multilayer perceptrons) were trained:

Binary classification (extraction yes/no)

Multi-class classification (teeth extraction pattern)

Appliance selection (fixed vs. removable)

Data were partitioned into training (70%), validation (15%), and test sets (15%). Missing data (5%) were imputed via k-nearest neighbors. Model performance was evaluated using accuracy, AUC-ROC, sensitivity, and specificity.

Results: Extraction necessity: Accuracy = 89.3% (AUC = 0.95, sensitivity = 88.1%, specificity = 90.4%)

Teeth selection: Accuracy = 79.8% (Top-3 accuracy = 92.1%)

Appliance setup: Accuracy = 87.6%

Key predictive features included anterior crowding index (ACI), ANB angle discrepancy, and incisor inclination. AI reduced planning time by 68% compared to manual analysis.

Conclusion: AI models demonstrated clinically relevant accuracy in orthodontic decision-making, with potential to reduce subjectivity and improve efficiency. Limitations include dataset size and

single-center data. Future work will focus on multicenter validation, integration with 3D imaging, and ethical AI auditing.

Keywords: Artificial Intelligence, Orthodontics, Teeth Alignment, Neural

G-1907

AI Models for Predicting Adverse Drug Reactions in Polypharmacy Dental Patients

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Abstract:

Background and Aims: Polypharmacy is the use of more than one medication at a time. Many medications increase the risk of adverse drug reactions (ADRs). ADRs will be increasingly relevant to dentistry, with polypharmacy being a common occurrence in dental therapy such as extractions and implants. AI and machine-learning based models appear to predict ADRs by analyzing complex data patterns from patient medications, conditions, and treatments. This review aims to summarize the available methodologies in AI to predict ADR in polypharmacy dentistry patients and to examine the performance of AI to predict ADRs.

Methods: literature search in PubMed, Scopus, and Web of Science (2015–2024) for the terms "AI in dentistry", "polypharmacy" and "adverse drug reactions" was performed using selected keywords, and articles that focused on machine learning models applied to patient data with three or more medications met the selection criteria. The recurring sources of data extracted were: demographics, comorbidities, medications, and treatment. XGboost provided the highest performance for predicting ADR from structured medical data and using the patient data, predict the effect of ADR on patient outcome. Missing data was addressed by utilizing multiple imputation techniques and accuracy, AUC, sensitivity, specificity and F1-score were used to demonstrate model performance. SHAP values were used to assess feature importance.

Results: AI models, especially gradient boosting models, demonstrated robust predictive performance, with AUC values ranging from 0.85 to 0.90. Key predictors of ADR risk included drug interactions (e.g., ibuprofen-warfarin), high medication dosages (e.g., amoxicillin), and comorbidities such as cardiovascular disease. These models successfully identified over 80% of high-risk ADR cases, providing clinicians with actionable insights for preventive measures.

Conclusion: AI models can predict ADR in polypharmacy dentistry patients. It will improve patient safety and outcomes. Future research can validate in real-world settings, health datasets, and ensure ethical frameworks are complete for fair and clinically trusted data sharing. References 1. Li X, et al. Machine learning for predicting drug reactions in polypharmacy. J Am Med Inform Assoc. 2021. [DOI: 10.1093/jamia/ocab013] 2. Patel S, et al. AI in dental drug safety: A review. J Dent Res. 2023.

Keywords: Artificial Intelligence, Dentistry, Polypharmacy, Adverse Drug

G-1908

Production and Evaluation of the Educational Effectiveness of AI-Based Musical Clips in Teaching Anatomy and Histology

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Abstract:

Background and Aims: Teaching basic medical sciences has always faced challenges such as the overwhelming content and student fatigue during lectures. This study investigates the impact of using scientific-musical clips, enhanced by artificial intelligence technologies, as an innovative educational tool.

Methods: Educational musical clips were prepared in the Field of Anatomy using AI technologies, specifically Suno.ai. Subsequently, in a separate session with medical, dental, and radiotherapy students, the clips were shown after a 50-minute lecture on the specialized subject. A validated and reliable questionnaire was designed for the students, comprising 15 questions across three domains: motivational, educational, and quality of the clips, using a 5-point Likert scale ranging from very high (5) to very low (0). The motivational domain included 5 questions (interest in this learning method, reduction of fatigue during learning, etc.), the educational domain included 5 questions (understanding complex concepts, aiding long-term learning, etc.), and the quality assessment domain included 5 questions (evaluation of sound quality, music used, clip duration, etc.).

Results: Of the 74 students who filled in the questionnaire, 42 were female (52.6%) and 32 were male (47.4%). Analysis of the data demonstrated mean scores in the motivational area (3.776 ± 0.075), education area (3.762 ± 0.078), and the quality assessment area (3.781 ± 0.069), such that the mean scores of the three domains were very similar. The maximum mean score belonged to the query, "The effect of the use of such clips to minimize fatigue during learning" (4.041 ± 0.0931), 78.9%, the minimum mean score belonged to the query, "The clip helped to better comprehend difficult anatomical concepts" (3.541 ± 0.1075) out of 5 scale (%48.4).

Comparison of satisfaction among the genders, study fields, and universities' GPAs revealed no differences.

Conclusion: Based on the outcome of the work in the study, scientific musical clips in the break times scored a reasonable grade of around 3.7 out of 5 using the Likert scale. Hence, it is suggested that in courses with complex context, the structure of such study musical clips can be implemented as an educational assistance technique in combination with the traditional teaching method.

links of Anatomical clips:

<https://drive.google.com/file/d/1LJPAHt03ouWVPWrplPsje3JapaQwOa9p/view?usp=sharing>

<https://drive.google.com/file/d/1Vs0NZWqQAfvolN55CQzpq5cEe4KL7zr/view?usp=sharing>

Keywords: musical clips, Anatomy, Artificial intelligence

G-1910

Role of machine learning in predicting outcomes and adverse effects of eclampsia: A systematic review

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Abstract:

Background and Aims: There are approximately 46,000 maternal deaths due to pre-eclampsia and approximately 500,000 fetal or neonatal deaths annually. The dramatic growth of artificial intelligence models and their use in medical science can be helpful in predicting the complications of preeclampsia. The aim of this study is to investigate artificial intelligence in predicting the outcomes and side effects of pre-eclampsia.

Methods: In this systematic review, an extensive search was conducted with keywords related to "eclampsia, artificial intelligence, outcomes" in the international databases PubMed/Medline, Google Scholar search engine, and SID database. In the initial search, "101" studies were obtained. The inclusion criteria were "studies in which artificial intelligence models were used to predict the outcomes of eclampsia" and open access to the full text of the article. Gray literature was excluded. After removing duplicates and criticizing with relevant tools, "6" studies were finally analyzed. Ethical considerations, lack of bias in the stages of selection, extraction, analysis, and classification of evidence were observed, and the abstract was reported according to PRISMA.

Results: The results of this study showed that artificial intelligence and machine learning models, especially Random Forest, XGBoost, and neural networks, performed well in predicting preeclampsia and its outcomes (AUC up to 0.98). The most important input measures included pre-pregnancy blood pressure and BMI, sFlt-1/PLGF ratio, PLGF levels in the first and second trimesters, and genetic polymorphism. Combining clinical and genetic data significantly increased the accuracy of the models (MLP model with gene expression data had an F1-score of 82.3%). Also, simple models with only three variables (AST, uric acid, BMI) were able to predict the need for intensive care with an accuracy of 88%.

Conclusion: Recent studies have highlighted the importance of machine learning models in predicting preeclampsia. New and novel approaches, including unbiased models, sequential risk assessment, and combinations of clinical and biochemical markers for early screening of at-risk patients, may enable preventive interventions and improve maternal and neonatal outcomes. However, limitations like fixed populations, incomplete data, and limited model applicability in diverse populations require further investigation and independent validation.

Keywords: Eclampsia, Artificial intelligence, Machine learning, Outcomes

G-1911

AI robotic systems for precise implant placement in edentulous patients

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Abstract:

Background and Aims: Edentulous patients face challenges in dental implant placement due to missing anatomical guides, which can lead to functional or aesthetic issues. AI-guided robotic systems have emerged as potential tools to improve surgical precision. The purpose of this review is to assess the role of AI-guided robotic systems in comparison to manual methods in the placement of dental implants by evaluating accuracy, efficiency, and patient outcomes.

Methods: A literature review was conducted using both PubMed and Scopus databases, specifically including materials published between 2015–2024, and using the following search terms: "AI in dental implants"; "robotic surgery" and "precision in implant dentistry". Selected papers must make comparisons between manipulating the AI accessed robotic systems with the manual methods employed by standard dental and surgical processes. Data sources included cone-beam computed tomography scans and convolutional neural networks to suggest the ideal position for implant placement. Furthermore, common outcome measures across studies included displacement of placement from planned position, surgical intervention time, complication rates, and patient satisfaction. Robotic systems were compared based on their accuracy to sub-millimeter precision for restorations, as well as their capacity to make modifications to implants in real-time during procedures.

Results: The robotic group showed a mean implant deviation of 0.3 millimeters, highly significantly lower than 1.2 millimeters in the manual group. Surgical time dropped 15% (72 to 61 minutes). Complications occurred in 8% of robotic cases (mainly minor infections) versus 28% in manual cases (infections, nerve injuries, implant failures). Patient satisfaction was higher in the robotic group, with 95% reporting excellent function and aesthetics versus 80% in the manual group.

Conclusion: AI-guided robotic systems increase accuracy in implant placement, while reducing the time taken for surgery, and improving patient satisfaction. The advancements made in AI-guided robotic systems demonstrate the potential for growth in the future of robotic assistance in implant dentistry. Future directions may include research related to long-term outcomes of AI-guided robotic systems for dental implants, multi-center trial studies, and also consider the ethics behind patient safety and data privacy. • References • Chen L, et al.

Keywords: Artificial Intelligence, Robotics, Dental Implants, Edentulism

G-1912

NLP chatbots for pre-appointment dental symptom triage

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Abstract:

Background and Aims: Possible delay in the care of dental patients is a common occurrence due to improper triage based on the severity of their symptoms or holding of patients at a similar acuity level. Recent evidence emphasizes the utility of Natural Language Processing (NLP) based chatbots for triaging symptoms. This review aims to evaluate compositional evidence as to the performance of transformer based NLP chatbots for pre-appointment dental symptom classification, primarily based on accuracy and workflow improving efficiencies. Results: The majority of studies demonstrated that BERT-based NLP chatbots could accurately classify dental symptoms, with typical performance metrics such as 87–89% precision and recall. Chatbots were particularly effective in identifying emergent cases such as abscesses and moderate pain. Post-deployment, clinics saw a 10-15% reduction in patient wait times and a significant increase in patient satisfaction, with 68% of inquiries being handled autonomously, thus reducing staff workload.

Methods: A systematic review, utilizing PubMed and Scopus (2015-2024), was conducted using potential keywords of "NLP triage", "chatbots in dentistry", "AI in patient care". Articles with references to assessing NLP models, particularly BERT based systems, used for classification of symptoms and triage in health care were included. Data were split to identify the types of symptoms such as tooth pain, bleeding, swelling, etc., different NLP models were trained to classify urgency into levels of emergent, urgent or routine levels of care. Important performance indicators included precision, recall, F1-score and accuracy. Workflow efficiencies were assessed by comparing 'wait times' and satisfaction levels prior to using the chatbot and after its implementation in clinic.

Conclusion: Transformer based NLP chatbots potentially provide an effective solution for dental symptom triage, enhancing patient centered care, easier clinic workflow efficiencies through time management and operational efficiencies. Using free-text with natural-language input for classification, is an innovative novel aspect of dental digital health.

Keywords: Patient-Centered Care, Dental Workflow, NLP Innovation

G-1914

Feasibility Study of a Serious Interactive Game-Based VR System for Physical and Cognitive Rehabilitation in Parkinson's Disease

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Abstract:

Background and Aims: Parkinson's disease (PD) is the second most common neurodegenerative disorder, characterized by both motor and non-motor impairments. Physical and cognitive rehabilitation play a pivotal role in managing PD symptoms, yet traditional therapy often lacks engagement and long-term adherence. This study aimed to evaluate the feasibility and user experience of a serious interactive virtual reality (VR)-based game system designed for the rehabilitation of individuals with Parkinson's disease.

Methods: A three-phase descriptive study was conducted, involving the design, implementation, and user evaluation of an interactive VR-enhanced rehabilitation game system. Two motor-based games, each featuring three difficulty levels, were developed and tailored for upper-body movement training in a semi-immersive virtual environment. The system was deployed in a supervised clinical setting, engaging 12 patients diagnosed with PD and 9 physical or occupational therapists. Each patient participated in at least two sessions, each lasting a minimum of 10 minutes. User experience and technology acceptance were assessed using two customized questionnaires-one for patients and another for therapists-focusing on perceived usefulness, ease of use, engagement, and willingness for future adoption.

Results: Findings indicated high feasibility and user satisfaction. Among patients, 95% reported moderate to high immersion in the VR-based game environment, and 97% expressed interest in continuing with the game-based rehabilitation. In the domain of perceived usefulness, 88% of patients and 92% of therapists agreed that the system enhanced rehabilitation by improving efficiency, simplifying exercises, and potentially accelerating recovery. The perceived ease of use

was rated positively by 80% of both groups, suggesting that the system required minimal effort to learn and operate. Positive attitudes toward the system were observed in 92% of patients and 94% of therapists. Additionally, 86% of patients and 88% of therapists showed interest in integrating the system into home-based or long-term rehabilitation programs.

Conclusion: The results support the feasibility of using a serious VR-based game system for physical and cognitive rehabilitation in Parkinson's disease. High levels of engagement, enjoyment, and ease of use, combined with low reported discomfort, highlight the system's potential to enhance patient motivation and adherence in rehabilitation settings.

Keywords: Parkinson's disease, Rehabilitation, Serious Game, Virtual Reality, Technology Acceptance

G-1922

Assessing the Trackability of Nanomotors in Targeted Motion Using Machine Learning

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Abstract:

Background and Aims: The dynamic behavior of nanomotors—nanoscale particles capable of self-propulsion is critical to their functionality. However, distinguishing their intentional motion from random Brownian movement remains a key challenge. Our study aimed to develop a robust framework for tracking and classifying nanomotor behavior under fuel-driven and fuel-free conditions, enabling reliable differentiation between passive diffusion and active propulsion.

Methods: Using an Olympus BX61 microscope, we captured high-speed videos (30 fps, 9 s average) of nanoparticles in fuel-driven (3% H₂O₂ + NIR) vs. fuel-free conditions to differentiate directed nanomotor motion from Brownian dynamics.. To enhance particle visibility, we adjusted video parameters (contrast, brightness, and shadows) and converted TIFF files to JPEG for compatibility. Next, we segmented the processed images to isolate individual nanoparticles from background noise. Using LabKit's tracking plugin, we extracted quantitative properties such as velocity, displacement, and trajectory patterns. These features, combined with motion descriptors, were fed into a Random Forest algorithm. To train the model, we labeled trajectories as either Brownian (random) or directed (purposeful) motion, leveraging known physical principles of nanoparticle dynamics.

Results: Due to dataset imbalance, we reported class-specific accuracy: our Random Forest model distinguished fuel-driven nanomotors (14.8% error, 85.2% accuracy) from fuel-free particles (11.5% error, 88.5% accuracy).Key discriminators included velocity consistency and trajectory linearity, with directed motion showing predictable displacement patterns versus Brownian movement's randomness.

Conclusion: By integrating image processing, automated tracking, and machine learning, we established a reproducible pipeline for analyzing nanomotor behavior. This approach not only addresses the challenges of nanoparticle tracking in noisy environments but also provides a scalable framework for future studies. Our work paves the way for optimizing nanomotor design for applications such as targeted drug delivery, where controlled motion is essential.

Keywords: Nanomotors, Brownian motion, Machine Learning, Tracking

G-1924

Artificial Intelligence and Precision Medicine: A Systematic Review of Clinical Decision Support Systems in Digital Health

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Abstract:

Background: Digital health is changing the way doctors and nurses care for patients, and artificial intelligence is at the heart of this shift, helping clinicians make smarter decisions. This systematic review explores how well artificial intelligence-driven clinical decision support systems work in sharpening diagnoses and improving patient health. We believe these systems can outperform traditional methods, delivering better results for both healthcare providers and patients.

Methods: We dug into databases like PubMed, Scopus, and Web of Science, looking at studies from 2015 to 2025. Our focus was on research randomized trials, cohort studies, and observational work that involved healthcare workers, such as doctors or specialists, using artificial intelligence tools. We paid close attention to who was involved (e.g., their roles and experience), the technology behind the systems (like machine learning or neural networks), and how these tools were used in real-world settings, from bustling hospitals to virtual telemedicine platforms.

Results: From 35 studies, we found that artificial intelligence-powered systems boosted diagnostic accuracy by about 18% compared to older methods. They also cut mistakes in clinical practice by roughly 22%, making a real difference in patient care, especially for chronic illnesses like diabetes and in high-stakes emergency rooms. However, the systems weren't flawless; their effectiveness sometimes hinged on the caliber of the data they were trained on and how well they integrated with a clinic's regular operations.

Conclusion: Clinical decision support systems powered by artificial intelligence are revolutionizing digital health by enabling more accurate diagnosis and better patient care. Their success depends on having accurate data and being carefully integrated into the healthcare process. Going forward, we require precise rules to guarantee that these resources are applied consistently and equitably, particularly for marginalized populations. In addition to highlighting the fascinating potential of AI in medicine, this review urges further research to realize its full potential.

Keywords: Artificial Intelligence, Digital Health, Clinical Decision Support, Precision Medicine

G-1925

Prognostic Factors and Machine Learning Models in Colon Cancer Survival: A Retrospective Cohort Study

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Abstract:

Background and Aims: Colon cancer remains a leading cause of cancer-related mortality globally. This study aimed to identify prognostic factors and evaluate predictive models for survival in colon cancer patients treated at Imam Khomeini Hospital, Sari, Iran.

Methods: A retrospective cohort analysis was conducted on 1,106 patients diagnosed with colon cancer between 2012–2017, with follow-up until April 2021. Data were collected via a validated checklist, including demographic, clinical, and treatment variables. Survival analysis employed Kaplan-Meier curves, Cox proportional hazards regression, and machine learning models (SVM, Random Survival Forest, Gradient Boost Survival). Model performance was assessed using the concordance index (C-index) and time-dependent AUC.

Results: Among 1,106 patients, 234 (21.2%) experienced mortality. The KM curve revealed a progressive decline in survival rates, from 80% at 5 months to 20% by 50 months, highlighting the critical impact of early intervention. Also, Kaplan-Meier analysis stratified by survival quality revealed markedly lower survival in patients with impaired activity versus normal activity.

Cox regression identified significant predictors of survival: synchronous CRC cancer (HR=0.17, 95% CI:0.05–0.55, p0.005), IV drug use (HR=21.62, 95% CI:2.86–163.49, p0.005), blood per rectum (HR=1.67, 95% CI:1.20–2.31, p0.005), marital status (married vs. unmarried: HR=0.53, 95% CI:0.35–0.79, p0.005), inflammatory bowel disease (HR=4.93, 95% CI:1.83–13.28, p0.005), and survival quality (normal activity vs. impaired: HR=0.10, 95% CI:0.07–0.14, p0.005). Machine learning models demonstrated strong predictive performance, with the Random Survival Forest achieving the highest C-index (0.791), followed by Gradient Boost (0.745), SVM (0.744), and Cox PH (0.723). Time-dependent AUC curves indicated robust discrimination across follow-up periods.

Conclusion: Key prognostic factors, including comorbidities, lifestyle factors, and treatment response, significantly influence colon cancer survival. Machine learning models, particularly Random Survival Forest, outperformed traditional Cox regression in prediction accuracy. These findings underscore the clinical utility of integrating patient-specific risk factors and advanced

predictive models to optimize survival stratification and personalized care. Further validation in multi-center cohorts is warranted to enhance generalizability. The KM plot underscores temporal mortality trends, reinforcing the need for timely clinical management. These insights advocate personalized care strategies and further validation in diverse cohorts.

Keywords: Colon Cancer, Survival Analysis, Cox Regression

G-1926

LLM-Driven Literature Review Generation in Medicine: A Rapid and Reproducible Pipeline for CRSwNP Research

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Abstract:

Background and Aims: Synthesizing extensive biomedical literature for comprehensive reviews is traditionally time-consuming and labor-intensive. Large Language Models (LLMs) equipped with million-token context windows offer potential avenues for automating information extraction and drafting, but standardized, reproducible protocols are needed. We aimed to develop and demonstrate a reproducible, human-supervised, end-to-end LLM-driven pipeline capable of generating a comprehensive, citation-accurate academic literature review addressing the research question: Role of Vitamin D in Chronic Rhinosinusitis with Nasal Polyps (CRSwNP) Pathogenesis.

Methods: A corpus of 60 relevant English-language full-text research papers was manually curated by an otolaryngology faculty panel. Due to significant format variability hindering direct LLM ingestion, PDFs were uniformly batch-converted to Markdown using the open-source Marker package, which internally leverages Gemini Flash 2.0 for layout-aware extraction. The resulting concatenated Markdown corpus (~700 pages; ~700,000 tokens) was processed within a single context window using Gemini Pro 2.5 (1M token capacity) via Google AI Studio. All Prompts were formatted using Google's Prompt Engineering book. A single prompt was deployed sequentially: first generating a hierarchical outline, which was reviewed and approved by authors. Subsequently, using the approved structure and the corpus, the LLM drafted the manuscript with deterministic settings (Temperature=0, Top-P=0.95) to ensure reproducibility and mitigate hallucination, strictly using only the provided information and generating inline author-date citations. Human oversight occurred at critical checkpoints: outline approval, first-draft appraisal, and targeted gap-filling. Supplementary literature identified during gap-filling underwent the same PDF-to-Markdown processing and was used for LLM-assisted section-level revisions. Final reference management was handled manually using EndNote, followed by scientific proofreading.

Results: The pipeline successfully yielded a cohesive, structured, 4400-word draft literature review manuscript containing 38 correctly formatted inline citations derived solely from the provided corpus. This was achieved in less than two working days with no direct API cost.

Conclusion: This proof-of-concept establishes a scalable methodology integrating high-fidelity PDF-to-Markdown conversion, large-context LLM synthesis within a single call, deterministic prompting, and staged human oversight. It demonstrates the potential for rapid, reproducible generation of domain-specific literature reviews directly from primary source material, significantly accelerating evidence synthesis in specialized biomedical fields like CRSwNP research.

Keywords: LLM, Evidence Synthesis, Automated Literature Review, Human Oversight

G-1927

The Role of Artificial Intelligence in Improving Nurses' Decision-Making in Critical Care: A Systematic Review

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Abstract:

Background and Aims: Critical care environments demand rapid and accurate decision-making from nurses, often under high-pressure conditions. Artificial Intelligence (AI) technologies have emerged as potential tools to support clinical decisions, enhance patient outcomes, and reduce cognitive workload. This systematic review aims to evaluate the impact of AI-based interventions on the decision-making abilities of nurses in intensive care units (ICUs), identifying both effectiveness and limitations.

Methods: A systematic search was conducted across PubMed, Scopus, Web of Science, and CINAHL for peer-reviewed articles published between January 2015 and December 2024. Inclusion criteria focused on studies where AI tools were implemented to support nurse-led decision-making in ICU or high-dependency units. The PRISMA 2020 guidelines were followed. A total of 2,147 articles were initially identified, with 32 studies meeting the final inclusion criteria after screening and full-text review. Data were extracted and synthesized using narrative synthesis and quantitative effect size analysis where possible.

Results: The review found that 81.3% (n = 26) of the included studies reported a positive impact of AI tools—such as predictive analytics, clinical decision support systems (CDSS), and machine learning algorithms—on nurses' decision accuracy and timeliness. AI-assisted tools reduced decision-making time by 28–42% on average and improved diagnostic accuracy by 15–25% compared to standard practice. However, 34.4% (n = 11) of the studies noted barriers to adoption, including lack of training, data quality issues, and integration challenges within electronic health record systems.

Conclusion: AI technologies show strong potential to enhance nurses' decision-making in critical care settings, particularly in areas of early warning detection, triage prioritization, and ventilator management. Nonetheless, successful implementation requires addressing usability, training, and ethical concerns. Further large-scale, randomized trials are recommended to validate long-term outcomes and standardize AI integration protocols.

Keywords: Artificial Intelligence, Nursing, Critical Care, Decision-Making

G-1928

Predictive Artificial Intelligence for Precision Oncology: Evaluating Lymph Node Metastasis in T1 and T2 Colorectal Cancer

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Abstract:

Background and Aims: Colorectal cancer (CRC) remains a major cause of cancer-related mortality worldwide. Early-stage detection and accurate prediction of lymph node metastasis (LNM), particularly in T1 and T2 tumors, are crucial for determining optimal treatment strategies. Artificial intelligence (AI) and deep learning have emerged as powerful tools for histopathological image analysis, evaluation of diverse risk factors for metastasis and micro metastasis, predictive modeling of metastatic sites, and the potential to enhance diagnostic accuracy and assist in risk stratification. This review aims to evaluate the current applications of AI in the prediction of the probability of LNM in patients with T1 and T2 CRC.

Methods: In this review, we comprehensively examined studies that employed various AI tools to predict the probability of LNM in patients with stage T1 and T2 CRC. We analyzed the performance of these AI models and conducted a comparative evaluation of their effectiveness.

Results: These studies investigated the possibility of LNM from various perspectives, including histopathological image analysis, tumor microenvironment assessment, patient-specific clinical features, and tumor-related morphological and immunological characteristics. The primary focus of these studies was on the application of advanced deep learning techniques, particularly convolutional neural networks and random forest algorithms. Compared to traditional methods such as CT scans, MRIs, and conventional pathology, the use of these AI-based approaches has significantly improved the accuracy of LNM prediction and diagnosis, leading to a reduction in unnecessary surgical procedures, which cause high mortality and morbidity, by up to 70%.

Conclusion: AI and deep learning offer significant potential in improving diagnostic precision and predicting LNM in CRC, particularly in early-stage disease. These technologies can support personalized treatment decisions and reduce overtreatment. However, further validation through multicenter prospective studies is essential to ensure clinical reliability and generalizability before widespread adoption in routine practice.

Keywords: Artificial Intelligence, Colorectal Cancer, LNM

G-1931

Artificial Intelligence Models for Predicting Lung Cancer Recurrence Based on Gene Biomarkers: A Review

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Abstract:

Background and Aims: Lung cancer, one of the most common cancers globally, is the leading cause of cancer-related fatalities. Recurrence of lung cancer, particularly in NSCLC, poses a significant challenge, especially those with non-small cell lung cancer (NSCLC), with rates between 30% and 70% following initial treatment. Conventional predictors such as TNM staging and histopathology do not adequately address tumor diversity and immune interactions. This study investigates artificial intelligence (AI) models that predict lung cancer recurrence by incorporating genomic biomarkers (TP53, KRAS, FOXP3, PD-L1, CD8), aiming to enhance personalized risk assessment.

Methods: Adhering to PRISMA guidelines, we systematically reviewed AI-based models for predicting lung cancer recurrence, focusing on genomic biomarkers. Studies were selected based on specific criteria, highlighting AI/machine learning approaches that incorporate gene expression, radiomics, and clinical data. Data extraction included study design, AI algorithms (such as neural networks, SVM, and gradient boosting), performance metrics (AUC, sensitivity), and clinical relevance. Two reviewers independently screened and evaluated the studies to ensure accuracy and reduce bias.

Results: An analysis of 18 studies (2019–2024) from 14 countries, involving 4,861 patients with NSCLC and small-cell lung cancer, indicated that AI models surpassed traditional methods. AI achieved AUCs ranging from 0.73 to 0.92, compared to 0.61 for TNM staging. Multi-modal approaches that combined gene expression (e.g., PDIA3, MYH11), radiomics, and clinical data enhanced predictive accuracy, with SVM models achieving a 92% AUC. Important predictors included immune-related signatures (such as tumor-infiltrating NK cells and PD-L1 expression) and pathway changes (NF-κB, JAK-STAT). However, challenges included small sample sizes (41–1,348 patients), data variability, and limited external validation.

Conclusion: AI-based models shows potential for predicting recurrence and adjuvant therapies in high-risk NSCLC patients. To facilitate real-world application, it is essential to expand multi-institutional datasets, standardize validation processes, and

enhance clinical integration. Optimizing biomarker panels and ensuring the ethical use of AI can improve precision oncology, allowing for early and tailored interventions to decrease mortality rates.

Keywords: Lung Cancer Recurrence, Gene Biomarkers

G-1932

Artificial Intelligence Assesses the Risk of Gastric Cancer: A Review Study

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Abstract:

Background and Aims: Gastric cancer is a major worldwide health concern. The five-year survival rate is markedly low, sometimes below 40%, primarily due to late-stage diagnosis. The complex nature of gastric cancer development hampers risk assessment and early intervention. Artificial intelligence (AI) improves predictive accuracy and enables detection by analyzing high-dimensional datasets. This article aims to evaluate, analyze, and assess the merits and shortcomings of studies predicting gastric cancer risk with AI while providing recommendations for improving accuracy and facilitating broader clinical application.

Methods: We looked at 20 papers from PubMed that used artificial intelligence to predict stomach cancer risk. Articles were categorized by the artificial intelligence method used and the kind of dataset, including clinical/demographic, imaging, molecular, laboratory, cohort, and administrative data.

Results: Clinical and demographic data were subjected to basic models like Logistic Regression, Decision Trees, and Support Vector Machines. Advanced models like Artificial Neural Networks, Deep Neural Networks, and Autoencoders were used with imaging and molecular data. Extreme Gradient Boosting and Light Gradient Boosting Machine analyzed laboratory data, while models like Cox proportional hazards regression assessed large cohort datasets. Administrative health records were subjected to ensemble techniques such as Random Forest and Classification and Regression Trees (CART). Among these, deep learning models, especially Convolutional Neural Networks, reached peak performance with 94.3% accuracy in endoscopic and histopathological analysis and early-stage detection with 92.5% sensitivity and 88.7% specificity. Extreme Gradient Boosting demonstrated exceptional performance in processing laboratory data, achieving an area under the curve (AUC) of 0.91. Ensemble approaches enhanced stability by 18%. While 15% of studies demonstrated the therapeutic application of artificial intelligence, revealing a deficiency in practical implementations, some have achieved advancements.

Conclusion: Deep learning algorithms possess the ability to markedly enhance prediction and early detection and diminish diagnostic delays in gastric cancer. Despite its robust prediction capabilities, artificial intelligence faces limitations, including dataset heterogeneity and restricted clinical implementation. Future initiatives should prioritize multi-center validation, clinical

workflow integration, and enhanced model interpretability to promote broader real-world application.

Keywords: Gastric Cancer, Artificial Intelligence, Risk Predicting

G-1934

Artificial Intelligence in COVID-19 Drug Prescription: A Systematic Review of Clinical Trial Applications

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Abstract:

Background: Artificial intelligence emerged as a game-changer for determining which medications could be helpful when COVID-19 struck, as the push to develop cures quickly was on. The use of artificial intelligence techniques in clinical trials to direct medication prescriptions for COVID-19 patients is examined in detail in this systematic review. We're betting these systems can make treatments work better and speed up trials compared to the old-school ways of doing things.

Methods: We combed through PubMed, Scopus, and Web of Science, looking at studies from 2019 to 2025 that tested artificial intelligence in COVID-19 drug trials. We zeroed in on randomized trials and observational studies where doctors, pharmacists, or other healthcare pros used artificial intelligence tools—think machine learning or deep learning setups. We checked out who was involved, what kind of tech powered the systems (like neural networks or knowledge graphs), and where the trials happened, from busy hospitals to online platforms.

Results: Out of 42 studies, artificial intelligence systems, especially those digging into drug repurposing with deep learning, pinpointed promising drugs like remdesivir and baricitinib. About 16% of these drugs made it to late-stage trials. The systems bumped up prescription accuracy by roughly 15% and slashed the time spent screening drugs by about 30% compared to manual methods. But it wasn't all smooth sailing—spotty data quality and trouble applying results to diverse groups were issues, with only 20% of studies backing their findings with lab tests.

Conclusion: Artificial intelligence tools are showing real potential to shake up how we pick drugs for COVID-19, making trials quicker and prescriptions sharper. But they need solid, varied data and thorough testing to shine. Moving forward, we need clear rules for using these tools and a focus on fairness, like making sure everyone can benefit from them. This review highlights how artificial intelligence could change the game for pandemics but calls for careful, real-world checks to make sure it lives up to the hype.

Keywords: Artificial Intelligence, COVID-19, Drug Prescription, Clinical Trials

G-1935

Validity and Effectiveness of GPT-4o–Generated Case-Based Multiple-Choice Questions in Pharmacy Education: A Comparative Study

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Abstract:

Background: Artificial intelligence (AI) is becoming an influential part of modern education, especially in how we design and deliver assessments. In pharmacy programs, MCQs play a key role in checking students' clinical decision-making skills. With its advanced language capabilities, GPT-4o offers a new way to support the creation of meaningful, case-based questions. This study looked into how reliable and effective GPT-4o is at generating MCQs about asthma—a core topic in pharmacy education—and how these compare to questions written by experienced educators.

Methods: Fifty-four final-year pharmacy students took a 20-question quiz that included 10 questions written by GPT-4o and 10 written by pharmacy experts. All questions were case-based, had one correct answer and three distractors, and were designed to cover a range of cognitive levels based on Bloom's Taxonomy. Prompts were carefully written to guide both AI and human question writers toward balanced difficulty and strong educational value. Ten independent pharmacy educators reviewed all items for content validity using the CVI/CVR method (score: 0.78). Reliability was measured with Cronbach's alpha (0.82 for student answers, 0.91 for expert reviews). SPSS was used for statistical analysis.

Results: Students scored slightly higher on expert-written questions (mean = 7.39) than on AI-generated ones (mean = 7.02), and this difference was statistically significant ($p = 0.008$). However, response times were similar across both question types. Expert ratings also showed no meaningful differences between AI and human items in any of the seven quality categories. Both types of questions showed acceptable difficulty and discrimination.

Discussion: While human-written questions had a slight performance edge, AI-generated ones held up well. The gap may be more about language familiarity than actual difficulty. Strong prompt design likely helped improve the quality of the AI's output.

Conclusion: With thoughtful guidance and expert review, GPT-4o can be a useful tool in writing high-quality MCQs—helping educators save time without lowering standards.

Keywords: Educational Assessment, Pharmacy Education, Prompt Engineering

G-1936

Decoding the Black Box: A Systematic Review of Explainable AI Applications in Mammographic Breast Cancer Detection

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Abstract:

Background: Breast cancer remains one of the major causes of cancer-related mortality among women worldwide. Earlier diagnosis enhances survival, and imaging procedures form the cornerstone of diagnosis. Current development in Explainable Artificial Intelligence (XAI) has introduced transparency and trust in AI-based medical imaging diagnostics. The aim of this study is to explore the application of XAI for detecting mammographic breast cancer.

Methods: A comprehensive search was conducted in Scopus, PubMed, Web of Science, IEEE, and Google Scholar. Searching was conducted with keyword categories (1) Artificial Intelligence, (2) Explainable; and (3) Mammography. Articles yielded from these databases were collated and duplicates removed using Mendeley desktop software. The remaining articles were imported into the Rayyan site for screening. Screening of title and abstract was conducted separately by two authors and followed by full-text evaluation. PRISMA guideline was adopted in this study.

Results: The search results in the databases were as follows: Scopus=354, PubMed=186, Web of Science=341, IEEE=59, and Google Scholar=99. After removing duplicates, 581 were reviewed with titles and abstracts, and of these, 44 articles were reviewed with full text. Finally, 11 studies were included. The vast majority of AI applications used classification models. Accuracy (98.04%) has the highest number of performance metrics, followed by sensitivity (98.21%) and Area Under the Curve at 0.97. Additionally, the Convolutional Neural Networks, particularly pre-trained models such as ResNet, DenseNet, and VGG, were the best models of choice in several studies due to their superior performance in image classification tasks related to breast cancer. Also, radiomics-based machine learning approaches showed high effectiveness, with algorithms like XGBoost achieving notable diagnostic accuracy (94.34%) and excellent interpretability through feature importance metrics such as GLCM Contrast and FO Entropy. Attention-guided methods like Grad-CAM enhanced visual interpretability, effectively localizing critical diagnostic features

such as microcalcifications and lesion regions in mammographic, thermographic, and histopathological images.

Conclusion: The transformative power of XAI for breast cancer diagnosis is what comes into focus with this systematic review. With both high accuracy and interpretability, these models enable clinicians to integrate AI insight into clinical pathways, thus opening the door to earlier detection and

Keywords: Explainable, Artificial intelligence, Mammographic, Breast Cancer

G-1937

Applications of Artificial Intelligence in the Diagnosis of Idiopathic Intracranial Hypertension: A Review of Neuroimaging and Machine Learning Approaches

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Abstract:

Background and Aims: Idiopathic Intracranial Hypertension (IIH), also known as pseudotumor cerebri, is a complex neurological disorder characterized by elevated intracranial pressure without an identifiable cause. The accurate diagnosis of IIH is challenging due to the non-specific nature of its symptoms and reliance on invasive procedures like lumbar puncture. Advances in medical imaging, particularly MRI, CT, and optical coherence tomography (OCT), along with the integration of artificial intelligence (AI), offer new opportunities for non-invasive, accurate, and rapid diagnosis.

Methods: This review explores recent applications of machine learning (ML) and deep learning (DL) algorithms in the diagnosis and monitoring of IIH, focusing on neuroimaging modalities. A systematic analysis of existing models—including logistic regression, support vector machines (SVM), decision trees, random forests, k-nearest neighbors (KNN), discriminant analysis, and neural networks (CNNs and RNNs)—was conducted, with emphasis on their clinical relevance and diagnostic accuracy.

Results: AI models demonstrated promising performance in classifying IIH-related abnormalities across various imaging modalities. In MRI and CT, CNNs and SVMs showed robust feature extraction and classification of papilledema and optic nerve sheath dilation. Logistic regression models were effective in associating imaging findings with clinical outcomes. OCT-based analysis revealed that CNNs, SVMs, and KNNs could accurately grade papilledema and predict Frisén scale values using retinal thickness parameters. Logistic and linear regression approaches also supported surgical decision-making and early detection through predictive modeling.

Conclusion: AI, particularly when combined with high-resolution imaging, offers a powerful toolkit for the non-invasive diagnosis of IIH. While several models show clinical potential, further validation using larger, multi-center datasets and explainable AI approaches is needed to ensure real-world applicability and physician trust.

Keywords: Idiopathic Intracranial Hypertension, AI, ML

G-1938

The role of artificial intelligence in disaster prediction and preparedness

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Abstract:

Background and Aims: Artificial Intelligence (AI) has emerged as a transformative tool in disaster prediction and management, offering unprecedented capabilities in data analysis, pattern recognition, and decision-making. The purpose of this study is to investigate the role of artificial intelligence in disaster prediction and preparedness

Methods: The present study is a systematic review study conducted in 2025. International databases included PubMed, Scopus, Web of science and Google scholar, and Iran's national databases included the Scientific Database Sid and Magiran. In total, 2700 articles were retrieved. Finally, After applying the entry and exit criteria 10 articles were included in the study and their results were analyzed.

Results: Artificial Intelligence has become a powerful ally in disaster prediction, enabling faster, more accurate forecasts by leveraging vast amounts of data and complex algorithms. By incorporating machine learning, deep learning, real-time analytics, and data from diverse sources, AI systems can detect patterns and anomalies that traditional methods might miss. Artificial Intelligence plays a crucial role in managing disasters once they occur. AI technologies significantly enhance situational awareness, decision-making, and coordination during and after a disaster. From early warnings to real-time crisis mapping and automated logistics, AI enables faster, smarter, and more efficient disaster response mechanisms. AI-powered early warning systems analyze real-time data from weather stations, seismic networks, and IoT sensors to detect the onset of disasters. These systems issue alerts via mobile apps, text messages, and public sirens. For example, Google's AI-based flood alert system sends localized warnings via Android phones in vulnerable regions, alerting millions in advance of rising water levels.

Conclusion: This paper explored how Artificial Intelligence is revolutionizing disaster prediction and management by providing accurate forecasts, enhancing early warning systems, streamlining emergency responses, and optimizing recovery efforts. From machine learning models that predict earthquakes and floods to drones and robots aiding in search and rescue, AI technologies are

proving invaluable in minimizing the human and economic toll of disasters. As the world faces increasingly complex and unpredictable threats, the integration of AI into disaster management is not just a technological advancement—it is a growing necessity.

Keywords: Artificial Intelligence, Disaster Prediction, Emergency Management

G-1939

Detecting multiple myeloma by a deep learning algorithm from lytic bone lesions on computed tomography

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Abstract:

Background: Multiple myeloma (MM) is the second most common hematologic malignancy, with early detection crucial for improving patient outcomes. Imaging, particularly CT scans, plays a key role in identifying lytic bone lesions, but manual detection is time-consuming and challenging. Deep learning (DL) offers a promising solution by automating lesion detection, potentially enhancing diagnostic accuracy and efficiency.

Methods: To maintain a rigorous and systematic methodology, we followed the PRISMA framework during our review. An extensive literature search was performed using prominent databases such as PubMed, Cochrane, Web of Science, and Scopus. Key search terms included "artificial intelligence", "deep learning", "image processing", "multiple myeloma", and "computed tomography" combined with Boolean operators (AND, OR) to optimize retrieval. The search was restricted to studies published from December 2018 to November 2024, yielding an initial set of 741 articles. Following a quality assessment using the 2018 CASP checklists, we finalized our review with 14 selected studies.

Results: Machine learning algorithms, particularly deep learning models, show significant promise in detecting lytic lesions associated with MM, achieving accuracy rates over 80% in distinguishing between MM patients and healthy individuals. A multimodal approach combining CT imaging, laboratory assessments, patient histories, and bone marrow biopsies demonstrated a sensitivity of 91.6%, specificity of 84.6%, and a lesion detection AUROC of 90.4%. However, challenges remain in implementing these methods clinically, including data variability, algorithm interpretability, and the need for extensive validation studies.

Conclusion: AI-enhanced CT imaging holds significant potential for early MM diagnosis and personalized risk assessment. Integrating deep learning with clinical data could revolutionize MM screening and treatment planning. Future research should focus on improving algorithm robustness, generalizability across diverse populations, and real-world validation to ensure

clinical utility. This advancement could lead to faster, more accurate diagnoses, ultimately improving patient survival and quality of life.

Keywords: Multiple Myeloma, Deep Learning, Computed Tomography

G-1940

Artificial Intelligence in Mobile Health and Telemedicine: A Comprehensive Review of Current Applications and Future Directions

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Abstract:

Background: The convergence of artificial intelligence (AI) with mobile health (mHealth) and telemedicine is fundamentally transforming how healthcare is delivered. AI-driven tools are now widely adopted for remote patient monitoring, advanced diagnostics, and individualized care, helping to bridge gaps in healthcare access and operational efficiency. These advancements are particularly impactful for managing chronic illnesses and supporting populations with limited healthcare resources.

Methods: A comprehensive literature review was conducted to assess the application of artificial intelligence (AI) in mobile health (mHealth) and telemedicine. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Electronic databases including PubMed, Web of Science, Scopus, and IEEE Xplore were systematically searched for peer-reviewed articles published between January 2014 and December 2023. Search terms included combinations of “artificial intelligence,” “machine learning,” “deep learning,” “mobile health,” “mHealth,” and “telemedicine.”

Results: AI-powered mHealth and telemedicine systems have shown notable advantages in preventive care, early detection, and tailored treatment strategies. Key uses include remote health monitoring via wearable technology, AI-assisted analysis of medical images, and automated triage systems. In certain diagnostic areas—such as detecting cardiac and cancer-related conditions—AI algorithms have outperformed traditional techniques. These innovations have expanded healthcare reach, especially in remote or underserved regions, and increased patient engagement through personalized interventions. Nonetheless, issues remain around data integrity, user adoption, system usability, and the necessity for physician oversight to maintain clinical reliability and trust.

Conclusion: AI is essential for scaling and enhancing the effectiveness of mHealth and telemedicine, unlocking new possibilities for precision medicine and integrated care. To maximize these benefits, future initiatives should focus on establishing strong quality assurance frameworks, fostering user engagement, and ensuring seamless integration with existing clinical

workflows. Continuous education and training for healthcare professionals will also be vital for successful AI adoption.

Keywords: Artificial Intelligence, Machine Learning, Mobile Health,

G-1941

The Role of Artificial Intelligence in Transforming Standards and Interoperability for Health Data Exchange: A Comprehensive Review of Current Applications and Future Directions

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Abstract:

Background: The incorporation of artificial intelligence (AI) into healthcare is rapidly advancing, presenting significant opportunities to enhance data-driven clinical decision-making and patient care. However, fully harnessing AI's potential requires the establishment of strong standards, seamless interoperability, and efficient data exchange across various health information systems. Reliable access to, interpretation of, and sharing of high-quality data by AI systems are critical to ensuring clinical safety, scalability, and ongoing innovation.

Methods: This review consolidates insights from recent systematic and umbrella reviews, evaluations of guidelines, and technical reports focused on AI-related healthcare data standards and interoperability. Relevant sources were gathered from peer-reviewed publications and authoritative bodies such as NIST and ONC, covering the period from 2019 to 2025. Studies and guidelines were chosen based on their emphasis on AI quality standards, interoperability frameworks like HL7 and FHIR, and regulatory progress. Extracted data included the types of standards reviewed, methodological quality, stakeholder engagement, and documented outcomes or challenges.

Results: Standards and Frameworks: Core standards like HL7, FHIR, and USCDI enable structured, interoperable data exchange, supporting both clinical workflows and AI model development. Quality and Applicability: While frameworks such as TRIPOD+AI, SPIRIT-AI, and CONSORT-AI involve diverse stakeholders, their methodological rigor and real-world applicability vary, making reproducibility and relevance ongoing challenges. Data Exchange and Interoperability: Regulatory measures like the 21st Century Cures Act and ONC rules, along with APIs and standardized formats, have improved secure, real-time data sharing, fostering broader AI adoption and more effective clinical decision support.

Conclusion: The transformative impact of AI in healthcare depends heavily on adopting robust standards and interoperable frameworks that facilitate secure, high-quality, and scalable data

exchange. Despite notable advancements with standards like HL7 and FHIR and supportive regulatory measures, challenges related to practical applicability, data integrity, and integration into clinical workflows remain. Sustained cooperation among healthcare providers, technology vendors, regulators, and standards organizations is crucial to realizing AI's full potential in enhancing patient outcomes and operational efficiency.

Keywords: Artificial Intelligence, Transforming Standards, Interoperability

G-1942

Artificial Intelligence-Driven Approaches in Systems Biology: A Comprehensive Review of Current Applications and Future Directions

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Abstract:

Background: Artificial intelligence (AI) is reshaping systems biology by enabling advanced analysis, modeling, and interpretation of intricate biological systems across various levels. The surge in biological data from high-throughput technologies has surpassed the capabilities of conventional computational tools, making AI-driven methods crucial for detecting hidden patterns, forecasting system behaviors, and deepening insights into biological networks.

Methods: This review systematically examined literature from 2018 to 2025, adhering to PRISMA guidelines. Searches were conducted in major databases such as PubMed, Embase, Web of Science, and Google Scholar, using terms like “artificial intelligence,” “machine learning,” “deep learning,” and “systems biology.” Included studies utilized AI techniques—including machine learning, deep learning, and natural language processing—for systems biology applications such as omics data integration, network modeling, and pathway analysis. Data extraction emphasized AI methodologies, biological use cases, performance metrics, and reported challenges.

Results: AI has significantly advanced systems biology by automating feature extraction, enhancing adaptability, and supporting the integration of diverse omics data. Machine learning models—such as support vector machines, random forests, and neural networks—are widely used for modeling gene/protein networks, predicting molecular interactions, and simulating metabolic pathways. Deep learning has enabled the analysis of complex omics datasets, uncovering new biomarkers and regulatory pathways. AI-powered tools have also improved the accuracy and scalability of disease mechanism predictions, drug response modeling, and evolutionary studies. However, challenges persist, including data heterogeneity, limited interpretability of AI models, and difficulties in integrating multi-modal datasets.

Conclusion: AI has transformed systems biology by offering robust tools for modeling, prediction, and discovery within complex biological systems. Its capacity to process and integrate large-scale biological data has yielded new understanding of cellular functions, disease pathways, and therapeutic targets. Future progress will rely on overcoming challenges related to data quality,

model transparency, and integrating AI with experimental research, ultimately advancing predictive and personalized approaches in the life sciences.

Keywords: Artificial Intelligence, Machine Learning, Systems Biology

G-1943

Artificial Intelligence-Driven Approaches for Omics Data Analysis and Integration: A Comprehensive Review of Current Applications and Future Directions

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Abstract:

Background: The rapid expansion of omics data, fueled by advancements in high-throughput technologies, has opened new possibilities and posed significant challenges for biological research and precision medicine. Conventional analytical techniques often fall short when handling the vast scale, diversity, and complexity of omics datasets. Artificial intelligence (AI)—especially machine learning (ML) and deep learning (DL) methods—has become an essential tool for uncovering valuable insights, enhancing predictive models, and integrating multiple omics layers to achieve a more holistic understanding of biological systems.

Methods: This review systematically analyzed peer-reviewed articles published from 2018 to 2024, concentrating on the use of AI in genomics, proteomics, and other omics fields. Comprehensive searches were conducted in databases like PubMed, Web of Science, and Scopus using terms such as “artificial intelligence,” “machine learning,” “deep learning,” and “omics data analysis.” Studies were selected if they assessed AI techniques for gene prediction, protein structure analysis, functional annotation, or multi-omics integration. Data extraction focused on the types of AI models used, performance outcomes, biological applications, and reported limitations.

Results: AI-driven models—including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and support vector machines (SVMs)—have consistently surpassed traditional statistical methods in various omics applications. For instance, CNNs achieved gene prediction accuracies as high as 98.5%, while RNNs improved protein structure prediction accuracy to 85.7% over conventional approaches. SVMs also yielded superior F1 scores in protein function annotation. AI has facilitated the integration of different omics data types, leading to the discovery of new biomarkers and a deeper understanding of disease mechanisms. Nonetheless, challenges persist related to model interpretability, data heterogeneity, and effective multi-omics integration.

Conclusion: AI has transformed omics data analysis by greatly improving accuracy, scalability, and biological interpretation across genomics, proteomics, and multi-omics research. Ongoing advancements will depend on addressing challenges such as data quality, model transparency, and the smooth incorporation of AI tools into biological research pipelines. Future efforts should prioritize enhancing model interpretability, integrating diverse data sources, and promoting interdisciplinary collaboration to fully realize the promise of AI in omics-based discovery and clinical practice.

Keywords: Artificial Intelligence, Omics DataAnalysis, Machine Learning

G-1945

Investigating the role of artificial intelligence tools in emergency department management with emphasis on patient triage

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Abstract:

Background and Aims: In recent years, the use of artificial intelligence as a tool to increase efficiency and support decision-making in the healthcare domain, such as in emergency departments, has received considerable attention. The aim of this research is to examine the role of AI tools in managing emergency departments, with an emphasis on patient triage. Through this study, it is possible to analyze how to improve the accuracy and speed of initial assessments, streamline clinical workflows, and address related challenges including data quality and integration with existing systems, ...

Methods: This study is a library-based, descriptive-analytical study that has reviewed articles related to artificial intelligence, patient triage, and emergency department management published between 2021 and 2025, by searching electronic databases such as Web of Science, PubMed, Scopus, Science Direct, and others.

Results: The study's findings indicate that the use of tools such as Corti AI, Clinical Data-Based Systems (Montefiore Nyack, Mayo, TriageGO), OpenPose, and YOLO globally has demonstrated significant advancements in patient triage. These tools have led to reduced diagnostic time, improved accuracy, decreased workload for medical teams, optimized resource allocation, and enhanced patient treatment outcomes, among other benefits. Therefore, artificial intelligence is regarded as a high-potential complementary tool for improving the quality of emergency services. However, it is also accompanied by challenges such as ensuring accurate and up-to-date data, maintaining patient privacy, guaranteeing transparency, and addressing algorithmic fairness, among others.

Conclusion: aligning clinical experience with modern technological advancements and creating opportunities for training and organizational cultural shifts paves the way for the optimal use of AI in emergency departments. Future initiatives—such as integrating AI systems with telemedicine and real-time analytics—offer promising prospects for strengthening healthcare systems and improving responsiveness during critical situations.

Keywords: Artificial Intelligence Tools, Emergency Department, Triage

G-1946

Deep Learning-Driven Segmentation and Grading of Oral Squamous Cell Carcinoma: A Comparative Analysis of Architecture-Specific Performance Across Multi-Zoom Augmented Histopathological Datasets

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Abstract:

Background and Aims: Oral squamous cell carcinoma (OSCC), the predominant head and neck cancer, faces rising global incidence with persistently low 5-year survival rates. Traditional histopathological grading, based on differentiation levels, lacks prognostic reliability and suffers from inter-observer variability, particularly in distinguishing low- versus high-grade OSCC. Junior pathologists often struggle with diagnostic accuracy, underscoring the need for automated tools to enhance precision. This study aims to develop a deep learning-based framework for automated OSCC segmentation and grading, addressing challenges in tumor heterogeneity and data scarcity while improving diagnostic consistency.

Methods: Four datasets were curated: (1) 750 manually masked tumor images (normal, low/high-grade); (2) color-normalized images via LAB-space transformation and histogram adjustments; (3) multi-zoom augmented data (rotations, magnifications); and (4) integrated augmented-normalized images.

Four architectures—U-Net, U-Net++, FCN, and DeepLabV3 (ResNet-34 backbone)—were trained uniformly (25 epochs, batch size 32, Adam optimizer) and evaluated using Dice, IoU, and accuracy. A composite score identified optimal models for each grade.

Composite Score=(wDice·Dice) + (wIoU·IoU) + (wAcc·Accuracy)

Results: For low-grade OSCC, FCN and DeepLabV3 excelled, achieving top composite scores (FCN: 242 and DeepLabV3: 241 on augmented data). U-Net and U-Net++ outperformed others in high-grade OSCC segmentation, with U-Net scoring highest (231) on Type 4 data Normalization stabilized feature extraction, whereas multi-random zoom augmentation significantly boosted

model generalizability across heterogeneous tumor patterns. FCN's simplicity suited low-grade patterns,

whereas U-Net's captured high-grade complexity.

Conclusion: Tailoring deep learning architectures to OSCC grades improves segmentation accuracy. FCN and DeepLabV3 optimize low-grade detection, while U-Net variants excel in high-grade scenarios. Combining preprocessing strategies mitigates data limitations, offering a scalable tool to reduce diagnostic subjectivity. This approach promises to augment pathological workflows, particularly in resource-constrained settings.

Keywords: Oral Squamous Cell Carcinoma, Deep Learning

G-1948

Automated Tibia Bone Segmentation in Anterior-Posterior X-Ray Images Using a 2D U-Net Architecture: A Clinical Dataset Study

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Abstract:

Background and Aims: Accurate segmentation of the tibia in X-ray images is a critical component of orthopedic diagnostics, surgical planning, and the advancement of intelligent image-guided systems. Tibial plateau fractures, which account for approximately 1% of all bone fractures, present significant diagnostic challenges due to subtle imaging features and frequent misinterpretations in standard radiographs. Manual delineation of the tibia is time-consuming and subject to inter-observer variability. To address these issues, this study proposes and evaluates a deep learning-based method using a 2D U-Net architecture for automated tibial segmentation in anterior-posterior X-ray images, aiming to enhance diagnostic accuracy and reduce errors in clinical workflows.

Methods: We retrospectively collected 425 anterior-posterior (AP) X-ray images from 181 patients with tibial plateau (TP) fractures, all hospitalized between June 2016 and June 2023 at Tehran Shariati Hospital. The radiographs were taken using a Fujifilm FDR Smart Digital X-Ray System. We employed the UNet deep learning network consists of an encoder with convolutional blocks for feature extraction, dropout for regularization, and MaxPooling layers to reduce dimensions. A bottleneck layer with the most filters connects the encoder to the decoder. The decoder uses up-convolutions and skip connections to restore spatial details. The model is compiled with the Adam optimizer and Binary Cross-Entropy (BCE) loss, then trained with a batch size of 4 over 500 epochs. Furthermore, the model's performance was assessed using standard metrics, including the Dice Similarity Coefficient (DSC) and Intersection over Union (IoU).

Results: The proposed U-Net-based model achieved a DSC of 89.16%, an IoU of 81.83%, and a BCE loss of 0.142, demonstrating high accuracy in delineating tibial fracture boundaries in AP X-rays. These results suggest the model's potential for clinical application in orthopedic imaging workflows.

Conclusion: The proposed deep learning framework offers a reliable and automated solution for tibia segmentation in X-ray images, demonstrating strong performance on a real-world clinical dataset. This approach holds promise for enhancing orthopedic diagnostics and enabling future AI-driven applications in musculoskeletal imaging.

Keywords: Artificial Intelligence, Tibia Segmentation, U-Net, X-ray

G-1949

The Ethical and Security Risks of Using Generative Artificial Intelligence in Medical Diagnostics: A Systematic Review

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Abstract:

Background and Aims: The integration of generative artificial intelligence (GAI) in medical diagnostics promises increased efficiency and accuracy. However, its deployment raises substantial ethical and security concerns. This review aims to systematically assess the current literature on the ethical and cybersecurity risks associated with the application of GAI in medical diagnostic systems, with a focus on data privacy, algorithmic bias, informed consent, accountability, and system vulnerability.

Methods: A systematic review was conducted following PRISMA guidelines. Databases including PubMed, Scopus, IEEE Xplore, and Web of Science were searched for peer-reviewed articles published between January 2018 and February 2025. Search terms included combinations of "generative AI", "medical diagnostics", "ethics", "privacy", "bias", and "cybersecurity". A total of 1,214 studies were initially identified, with 64 studies meeting the inclusion criteria after full-text screening. Data extraction focused on reported ethical concerns, security vulnerabilities, and mitigation strategies.

Results: Among the 64 included studies, the most frequently cited ethical risks were algorithmic bias (76.6%), lack of transparency (68.8%), and inadequate informed consent mechanisms (54.7%). Security risks included susceptibility to adversarial attacks (63%), data leakage during model training (58%), and misuse of synthetic medical data (45%). 34 studies (53%) reported real-world case studies or simulations where AI systems generated false or misleading diagnoses due to training data bias or adversarial manipulation. Notably, 41% of studies reported that current regulatory frameworks are insufficient to address the rapid development of GAI in clinical settings. Only 18 studies (28%) proposed concrete governance or technical mitigation strategies.

Conclusion: The use of generative AI in medical diagnostics presents significant ethical and security challenges that are inadequately addressed by current systems. As GAI adoption accelerates, there is an urgent need for robust policy frameworks, transparency standards, and AI governance models tailored to the medical domain. Multi-stakeholder collaboration, including

ethicists, technologists, clinicians, and policymakers, is essential to ensure that GAI is deployed responsibly in healthcare.

Keywords: Generative AI, Medical Diagnostics

G-1953

Parkinson's Disease Diagnosis Using Deep Convolutional Neural Networks with Transfer Learning and Data Augmentation

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Abstract:

Background and Aims: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor impairments such as tremors, rigidity, and bradykinesia. Early diagnosis of PD is essential for slowing the disease's progression and improving patient outcomes. Traditional diagnostic methods rely heavily on clinical evaluations, which are often subjective and time-consuming. This study aims to present a more accurate and efficient method for diagnosing PD by utilizing deep learning techniques and MRI scans, focusing on overcoming the limitations of existing diagnostic approaches.

Methods: This paper proposes a hybrid deep learning approach combining transfer learning and Generative Adversarial Networks (GANs) for PD diagnosis. We used MRI images from the Parkinson's Progression Markers Initiative (PPMI) database, which contains 1,700+ MRI scans from over 500 PD patients and healthy controls, to train and evaluate the model. Transfer learning helps improve classification performance by leveraging knowledge from large-scale datasets despite limited labeled data for PD. Additionally, GAN-based data augmentation is applied to generate synthetic MRI images, which alleviates the issue of overfitting caused by small sample sizes.

Results: Our method achieved 89.23% classification accuracy, with improvements in both sensitivity and specificity. The results indicate that combining transfer learning with GAN-based data augmentation outperforms traditional diagnostic methods, providing a more reliable and efficient solution for early-stage PD diagnosis.

Conclusion: This approach could be implemented in clinical practice to assist healthcare professionals in diagnosing Parkinson's disease earlier, potentially improving patient outcomes. Future work will explore expanding the dataset with more diverse MRI images and applying this method to other neurodegenerative diseases.

Keywords: Parkinson, Convolutional Neural Networks, Transfer Learning

G-1954

The challenges of artificial intelligence in Nursing care: A Systematic Review

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Abstract:

Background: Artificial intelligence (AI) has the potential to revolutionize patient care by improving diagnostics, personalizing treatment plans, and enhancing operational efficiencies in healthcare settings. However, several challenges must be addressed to fully realize its benefits.

Methods: We conducted a comprehensive search using electronic databases and hand reference checks. The Cochrane Library, MEDLINE, CINAHL, EMBASE, Scopus and web of science were searched from March 2010 until December 2024. All terms related to The challenges of artificial intelligence in nursing care were used to conduct the search. We adopted a checklist from the critical appraisal skills program checklist for diagnostic studies to assess the quality of the included studies.

Results: We identified 3263 records, of which 496 were selected for full-text review. Following methodological examination and quality assessment, 46 studies were included in narrative data synthesis. The most frequently key factors in the challenges of artificial intelligence in nursing care included: Data Privacy and Security(Patient Confidentiality, Cybersecurity Risks), Data Quality and Availability(Inconsistent Data, Data Silos), Bias and Fairness(Algorithmic Bias, Equity in Healthcare), Integration with Existing Systems(Interoperability, Workflow Disruption), Regulatory and Legal Issues(Lack of Clear Regulations, Liability Concerns), Clinical Validation and Trust(Need for Clinical Validation, Trust from Healthcare Professionals), Patient Engagement and Understanding(Patient Acceptance, Informed Consent), Cost and Resource Allocation(High Implementation Costs, Resource Allocation), Ethical Considerations(Decision-Making Autonomy, Transparency and Explainability).

Conclusion:

While AI holds great promise for improving patient care, addressing these challenges is essential for successful implementation. Collaboration among healthcare providers, technology

developers, policymakers, and patients will be crucial in navigating these issues and ensuring that AI enhances rather than hinders the quality of care provided to patients.

Keywords: Artificial Intelligence, Nursing Care, Challenges, Review

G-1957

Deep Learning-Based Segmentation of OPG Dental Radiographs Using U-Net

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Abstract:

Manual interpretation of dental radiographs is time-consuming and prone to error. Deep learning offers an efficient solution by automating the segmentation process, enabling faster and more accurate diagnoses.

Various segmentation methods have been explored in previous studies, though many failed to deliver satisfactory accuracy. This research aims to improve segmentation performance by utilizing an enhanced U-Net architecture integrated with advanced encoders.

Background and Aims: Artificial intelligence (AI), particularly in the realm of computer vision, plays a vital role in enhancing both accuracy and efficiency across various domains. Image segmentation, a core technique within medical image analysis, is the focus of this study. The goal is to develop a deep learning-based model tailored to the segmentation of panoramic dental radiographs.

Methods: The study employed the Tufts_Dental_Database, which includes 1,000 panoramic dental radiographs paired with their corresponding masks. A U-Net architecture was selected for its encoder-decoder framework and effective use of skip connections. To improve feature fusion and retention, a custom intermediate connection module was incorporated into the network.

Three encoder backbones VGG16, ResNet50, and ResNet150 were integrated separately into the U-Net framework for comparison. All models were trained with a batch size of 1 over 50 epochs. Training beyond 50 epochs showed no meaningful improvement. Evaluation was conducted using standard metrics including Accuracy, Precision, Recall, Intersection over Union (IoU), and the Dice coefficient.

Results: The Dice coefficient evaluation indicated strong segmentation performance across all models. The ResNet50-based U-Net achieved the highest Dice score of 98.95%, followed by models incorporating VGG16 (98.80%) and ResNet150 (98.82%). These findings underscore the effectiveness of the U-Net structure and the contribution of the intermediate connection module in enhancing segmentation accuracy.

Conclusion: Integrating deep encoders with a refined U-Net architecture enables precise segmentation of dental radiographs. The network's design particularly the intermediate connection module facilitates robust feature extraction and fusion. This model lays a solid

foundation for intelligent diagnostic tools and may be adapted for the detection and segmentation of dental caries and other oral conditions.

Keywords: Deep Learning, Segmentation, U-Net, Tooth Diagnosis

G-1958

Enhanced Breast Cancer Detection Using Dual-View Mammography and Deep Learning Models

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Abstract:

Background and Aims: Breast cancer is the most prevalent cancer among women, and early detection is essential for improving survival rates. Mammography is widely used for screening, but interpreting mammograms requires specialized expertise, which is often limited. This study aims to enhance breast cancer detection by leveraging deep learning techniques, including convolutional neural networks (CNNs) and object detection algorithms like YOLOv5. The hypothesis is that combining dual-view mammography (cranio-caudal and mediolateral oblique views) with these techniques will improve detection accuracy and model efficiency for deployment on mobile/edge devices. The dataset used includes 5,000 mammogram images from the VinDr-mammo dataset and 3,123 images from a local dataset of 1,028 patients.

Methods: The study employs a dual-model approach: an EfficientNetB3-based abnormality classifier and a YOLOv5-based mass detection model. Both models process mammograms from two views, and transfer learning is utilized to improve model performance. Pruning is applied to reduce the size and computational cost of the models, making them suitable for edge deployment. Performance is evaluated using metrics such as accuracy, sensitivity, specificity, F1-score, and area under the curve (AUC).

Results: The dual-view approach achieves a sensitivity of 0.89 and an F1-score of 0.79, significantly outperforming single-view methods. The integration of YOLOv5 improves sensitivity by detecting suspicious masses more effectively. After pruning and transfer learning, the model size is reduced by 75% with minimal loss in accuracy (97.23%), making it deployable on mobile devices with real-time capabilities.

Conclusion: This study demonstrates that dual-view mammography combined with deep learning significantly enhances breast cancer detection. The model provides high sensitivity and is optimized for deployment on mobile/edge devices, making it accessible in resource-constrained settings. Future work will focus on expanding its detection capabilities and testing it in clinical environments.

Keywords: Breast Cancer, Deep Learning, Transfer Learning

G-1960

Investigating the role of artificial intelligence on physicians' performance in graphic processing of neonatal respiratory distress syndrome

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Abstract:

Background and Aims: Neonatal respiratory distress syndrome (RDS) remains a leading cause of morbidity in preterm infants, with imaging (lung ultrasound [LUS] and computed tomography [CT]) serving as critical diagnostic tools. However, variability in image interpretation among clinicians underscores the need for standardized, high-precision approaches. Recent advances in artificial intelligence (AI), particularly deep learning (DL), offer transformative potential to augment physician performance in RDS diagnosis and management.

Methods: The present study was conducted as a systematic review. After studying and evaluating 25 original and systematic review articles in databases such as PubMed, SID, Scopus, and Semantic Scholar through an advanced and comprehensive search English keywords "Artificial intelligence" "Image Processing" "Neonates" "Respiratory Distress Syndrome" "Physician Performance" from 2022 to 2025, 9 articles were selected and reviewed.

Results: Artificial intelligence has transformed neonatal RDS diagnosis and management through advanced imaging analysis. Deep learning models like U-Net achieve 90% accuracy in classifying lung ultrasound patterns and CT scans, significantly reducing diagnostic variability. AI excels at differentiating RDS subtypes (91.2% accuracy) and predicting disease progression (AUC 0.83-0.91). It streamlines workflows by cutting CT analysis time from hours to minutes while maintaining precision (1% error). Automated scoring systems correlate well with clinical measures, enhancing decision-making. However, dataset limitations and the need for neonatal-specific validation remain key challenges before widespread adoption. AI shows immense potential to improve RDS care through faster, more accurate imaging interpretation.

Conclusion: Integrating AI into RDS imaging pipelines enhances diagnostic reliability, prognostic accuracy, and efficiency. Future directions should prioritize multimodal AI models and point-of-care LUS applications.

Keywords: Artificial intelligence, Image Processing, Neonates

G-1961

Doubts and Opportunities of Using Artificial Intelligence in the Health System: A Review Study (2013-2024)

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Abstract:

Background and Aims: AI technologies are now helping the healthcare system achieve patient care goals (1). Health systems must review their policies and strategies to enhance quality and safety, improve productivity, and enhance employee satisfaction (2). Despite the promising potential of AI in healthcare, there are also concerns about privacy, security and ethical considerations. As such, it is important to carefully consider the benefits and risks associated with the use of AI in healthcare and ensure that the technology is deployed ethically and responsibly (3). This study aimed to review the doubts and opportunities of using artificial intelligence in the field of health.

Methods: This review study was conducted by searching databases using the keywords Artificial Intelligence, Challenges, Barriers, Opportunities, Nursing, Health system. The STROBE checklist was used to screen and quality control the articles. This review article provides an overview of recent advances in this field, highlights current challenges, and identifies potential opportunities.

Results: 33 articles were reviewed between 2014 and 2024, and the results show that artificial intelligence holds promise for improving healthcare. Most of the studies reviewed show that the use of artificial intelligence provides multiple opportunities, including teamwork and decision-making, technological advancement, patient diagnosis and monitoring, drug development, and virtual health assistance. However, the findings suggest that the use of AI in the health sector is hampered by multifaceted challenges, including ethical and privacy issues, lack of awareness, technological unreliability, and professional liability. The findings suggest that AI has the potential to transform healthcare, and addressing these challenges is critical to harnessing its full potential, and addressing these challenges is crucial to fully exploiting its potential.

Conclusion: Artificial intelligence has the potential to transform healthcare by enabling more accurate diagnosis, personalized treatment plans, and efficient use of resources. However, it is crucial to have realistic expectations and address ethical considerations, such as transparency, fairness, and accountability, in the development, deployment, and use of AI. Future research

should also focus on developing standards for evaluating AI algorithms and examining the ethical and legal implications of AI in healthcare.

Keywords: Artificial Intelligence, Health System, Nursing

G-1962

Early Detection of Alzheimer Disease Through Digital Biomarkers: A Systematic Review of the Role of Typing and Scrolling Patterns in Predictive Medicine

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Abstract:

Background and Aims: Alzheimer's disease is one of the most challenging neurodegenerative disorders worldwide, imposing immense social and economic burdens on patients and healthcare systems. Early diagnosis of Alzheimer's is vital for timely interventions and improved patient outcomes. This review explores the potential of digital biomarkers, specifically typing and scrolling patterns, as predictive tools for early detection. The hypothesis suggests that digital biomarkers can detect cognitive decline years before clinical diagnosis.

Methods: A systematic review was conducted, analyzing studies published between 2018 and 2024. Research articles were sourced from PubMed, Google Scholar, and SpringerLink databases using keywords such as "digital biomarkers" and "Alzheimer's disease." From an initial pool of 300 articles, 150 abstracts were screened, and 50 studies met inclusion criteria: real-world user data, a longitudinal design with six-month follow-ups, and validation against standard diagnostic benchmarks like PET imaging. In-depth analysis was carried out on 25 selected studies.

Results: The review identified significant behavioral changes in digital interactions among individuals in the early stages of Alzheimer's disease. Key findings include reduced typing speed (15–20%), increased typing errors, simplified linguistic structures, and irregular scrolling behaviors. A notable study by MIT demonstrated that digital biomarkers could detect cognitive decline up to 8–10 years before clinical diagnosis, with machine learning algorithms achieving an average accuracy of 85%.

Conclusion: Digital biomarkers, particularly typing and scrolling patterns, show transformative potential in the early detection of Alzheimer's disease. These methods are non-invasive, cost-effective, and scalable for broad implementation. However, challenges such as variability in digital literacy, external confounding factors, and ethical concerns around data privacy must be addressed. Future research should focus on longitudinal studies with diverse populations and the development of robust ethical frameworks to integrate these tools into clinical practice.

Keywords: Digital Biomarkers, Alzheimer's Disease, Typing Patterns

G-1963

Smart Hospital Architecture: Future-Oriented Design of Therapeutic Environments in the Era of Healthcare 4.0

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2*

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Abstract:

Background and Aims: The rapid advancement of transformative technologies such as the Internet of Things (IoT), artificial intelligence (AI), cloud computing, and big data has redefined the role of hospitals and led to the emergence of a new generation of medical facilities known as smart hospitals. This transformation extends beyond the technological layer, significantly impacting architectural design and physical infrastructure. The present study aims to conduct a comparative analysis of trends, design patterns, and smart infrastructure in hospital architecture across selected developed countries.

Methods: This systematic review was conducted in April 2025 using keywords such as "Smart Hospital", "Architecture", "Facility Design", "Healthcare 4.0", and "Developed countries" across reputable scientific databases including Embase, Web of Science, Scopus, and PubMed. The study followed PRISMA guidelines for systematic reviews. Articles focusing on smart hospital architecture published between 2019 and 2025, with full-text availability in English, were included as eligibility criteria.

Results: After screening and quality assessment, 22 selected articles were included in the final analysis. The reviewed models emphasized multilayered design frameworks Sensing, Networking, Remote Services, Knowledge, Application layers. Key enabling technologies such as IoT, cloud computing, Extended Reality, Big Data, Building Information Modeling (BIM), digital twins, and machine learning algorithms played a pivotal role in shaping these layers. Modular, flexible,

human-centered, and sustainable design approaches were highlighted as responses to demographic shifts, chronic diseases, and pandemic crises. The influence of environmental elements—such as light, sound, color, and spatial form—on treatment effectiveness and patient satisfaction was explored through novel concepts like psychophysiological responses to space (placebo and nocebo effects). Some countries have moved closer to realizing these models through public-private partnerships, performance-based payment systems, and entrepreneurial digital strategies.

Conclusion: Smart hospital architecture emerges at the intersection of technology, physical design, human experience, and health policy. This study presents a multidimensional perspective on the requirements for future-oriented hospital design, emphasizing interoperability, safety, sustainability, and human-centeredness.

Keywords: Smart Hospital, Architecture, Healthcare 4.0, Facility Design

G-1964

Design and Evaluation of a Gamified Educational Application for Physiotherapy Students

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Abstract:

Background and Aims: Traditional teaching methods in medical education, especially in skill-based programs like physiotherapy, face challenges such as limited interaction, low motivation, and a lack of practical exercises. These limitations have led to the adoption of innovative approaches, such as gamification, to enhance learning. This study aims to design and evaluate a gamified educational application for the "Physiotherapy in Neurological Patients" course within the undergraduate physiotherapy program.

Methods: This participatory qualitative study was conducted in 2023–2024 in collaboration with experts in physiotherapy, medical education, medical informatics, and programming. The app's architecture was developed based on a literature review and expert consultations to address the educational needs of the "Neurological Physiotherapy" course. Educational content was created and validated, including text, images, and video materials. The final app incorporated gamification elements like points, levels, challenges, and feedback. Usability was evaluated using the think-aloud method with physiotherapy students.

Results: The content was reviewed by four physiotherapy professors, and seven physiotherapy students evaluated it positively for comprehensiveness (91%), simplicity (82%), and relevance (91%). The PhysioMaster app includes two panels (admin and student), interactive questions, a leaderboard, immediate and final feedback, and case-based scenarios. Technical evaluations revealed issues with login functionality and score calculation errors, while usability tests identified problems with the layout and progress bar display. These issues were resolved before the final version of the app was released.

Conclusion: This study focuses on designing and evaluating the game-based educational app "PhysioMaster" for physiotherapy in neurological patients. The app offers gamified content based

on the official curriculum and local needs and provides a simulated environment for practical practice. Future research should evaluate the app's effectiveness as an educational intervention using quasi-experimental or interventional designs and explore the potential for expanding this educational model to other areas of medical education.

Keywords: Gamification, Gamified Learning, Educational Game, Physiotherapy

G-1965

Deep Learning and Machine Learning for Alzheimer's Disease Biomarker Identification

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Abstract:

Background and Aims: Alzheimer's Disease (AD), the most prevalent cause of dementia globally, is characterized by progressive cognitive decline that gradually impairs independent daily functioning. Current approaches to classify AD stages incorporate medical history, neuropsychological testing, genetic factors, and neuroimaging, including Magnetic Resonance Imaging (MRI). The application of Machine Learning (ML) and Deep Learning (DL) to early Alzheimer's Disease diagnosis and automated stage classification has attracted substantial research interest in recent years. This growing attention stems from both advances in neuroimaging technology and genetic analysis, coupled with these algorithms' unique capability to identify hidden patterns in complex biomedical data that may elude conventional analytical methods. Therefore, this study aims to (1) analyze hidden patterns in AD concerning gene expression through unsupervised learning and (2) develop a deep learning framework for accurate, automated AD classification using neuroimaging data.

Methods: We first applied an unsupervised clustering method to the GSE5281 AD microarray dataset (NCBI) to identify hidden patterns. Next, we trained a Convolutional Neural Network (CNN) on the Alzheimer's Disease Neuroimaging Initiative (ADNI) dataset to classify AD stages, comparing its performance against traditional machine learning models.

Results: The clustering validity indices (such as Rand Index and Silhouette Score) reveal distinct gene expression patterns that may be associated with AD pathology. Subsequent evaluation of our CNN model on the ADNI dataset demonstrates superior classification performance (accuracy=0.93%), significantly outperforming traditional machine learning approaches in AD stage differentiation

Conclusion: This study demonstrates the effectiveness of unsupervised clustering and CNN-based approaches for identifying AD biomarkers, while also highlighting current methodological limitations and promising future directions for improving Alzheimer's Disease diagnosis.

Keywords: Machine learning, Deep learning, Alzheimer's Disease

G-1966

Artificial Intelligence-Based Personalization of Microneedle Patches for Optimized Acne Scar Treatment: A Systematic Review

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Abstract:

Background: Acne scarring presents significant cosmetic and psychosocial challenges. Current treatments often lack precision and adaptability to individual scar patterns. Microneedle patches offer a minimally invasive method for targeted transdermal drug delivery, and their inherent ability to stimulate dermal remodeling makes them particularly suitable for treating localized dermal conditions like atrophic acne scars. However, optimizing their design and therapeutic protocols to accommodate individual characteristics remains complex. Artificial intelligence (AI), including machine learning (ML) and deep learning (DL), offers promising avenues for personalizing microneedle geometry, material composition, drug loading, and treatment parameters based on patient-specific data.

Methods: A systematic search was conducted across PubMed, Scopus, Embase, Web of Science, and IEEE Xplore for studies published between January 2018 and April 2025. Keywords included combinations of “acne scar,” “microneedle patch,” “treatment,” “artificial intelligence,” “machine learning,” and “deep learning.” After removing duplicates, 8,000 articles were screened by title and abstract, and 320 full texts were reviewed. Studies were included if they met one or more of the following: (1) used AI in microneedle patch design, fabrication, evaluation, or clinical application; (2) applied microneedle patches for acne scar treatment; or (3) used AI for acne scar assessment. Non-English articles, reviews, editorials, and duplicates were excluded. Quality assessment followed PRISMA guidelines and Joanna Briggs Institute tools.

Results: Of the 320 articles assessed, 48 met inclusion criteria. AI applications were categorized into four main areas:

- (1) Design optimization using Bayesian and neural network models to improve dimensional precision;
- (2) Material selection using supervised learning to balance mechanical strength and solubility;

(3) Drug release modeling via convolutional neural networks (CNNs), enhancing transdermal delivery by up to 30%;

(4) Clinical evaluation through deep CNNs for acne scar grading, with reported sensitivity and specificity between 0.85 and 0.92.

AI-enhanced personalization improved reproducibility, drug delivery efficiency, and response prediction. However, limited sample sizes and lack of standardized validation remain obstacles.

Conclusion: AI-driven personalization of microneedle patches holds great potential for enhancing acne scar therapy. Future research should focus on standardized datasets, robust clinical validation, and integration of real-time feedback systems to advance precision dermatology.

Keywords: Acne, Scars, Microneedle, Patches, Artificial Intelligence, Machine Learning, Deep Learning, Personalization

G-1967

An AI-Based Predictive System for Long-Term Health Risks Using National Pharmaceutical Consumption Data

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Abstract:

Background and Aims: The increasing complexity of drug regimens and the growing concern about adverse drug reactions have underscored the need for intelligent systems to monitor and predict health outcomes. While existing platforms detect drug interactions or side effects, there is still a gap in systems that analyze pharmaceutical consumption over time to forecast future health risks. This study aims to propose a national-level, AI-powered system that systematically registers and evaluates patients' pharmaceutical data to predict potential diseases and optimize treatment decisions.

Methods: The proposed system collects structured data from national e-prescription platforms and pharmacy records, including medication type, dosage, manufacturer, batch number, and administration date. It integrates these with global health alerts (e.g., FDA notifications) and recent scientific findings. Machine learning models are then trained on large-scale clinical and pharmaceutical datasets to assess drug interactions, detect patterns linked to future health conditions, and recommend preventive or therapeutic interventions. The system is designed with high-level security protocols to ensure patient privacy and restrict access to authorized medical professionals and governmental health authorities.

Results: Real-time integration of international safety updates enables the system to provide timely alerts and adaptive treatment suggestions. Furthermore, the platform offers clinical decision support for acute care settings, allowing physicians to evaluate the safety and efficacy of treatment plans instantly.

Conclusion: This innovative system represents a significant advancement in predictive and preventive healthcare, combining national pharmaceutical data with global scientific resources. It has the potential to improve patient safety, inform public health strategies, and support clinicians in personalized decision-making. Further development will involve clinical validation and potential international collaboration.

Keywords: Artificial-Intelligence, Predictive-Medicine, Drug-Safety, Health-Forecasting, Machine-Learning, Public-Health

G-1968

The Identification of Anemia Through the Utilization of Electrocardiograms and Artificial Intelligence

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Abstract:

Background: The integration of artificial intelligence (AI) algorithms in medical diagnostics has revolutionized the early detection and management of various diseases, including anemia. Given the limitations of traditional diagnostic methods, AI-driven approaches—particularly deep learning—offer a promising solution for non-invasive, cost-effective, and scalable anemia screening using electrocardiogram (ECG) data.

Methods: To conduct this systematic review, a comprehensive literature search was performed across PubMed, Scopus, and Web of Science databases, focusing on studies published between 2015 and 2023. Key search terms included "anemia detection," "ECG," "deep learning," and "AI in hematology," combined with Boolean operators (AND, OR) to refine retrieval. The initial search yielded 482 articles, which were screened based on predefined inclusion and exclusion criteria. Following a rigorous quality assessment using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, 28 high-quality studies were selected for final analysis. This review highlights the advancements, challenges, and future directions of AI-based ECG interpretation for anemia screening, emphasizing its potential to enhance diagnostic accuracy in resource-limited settings.

Results: To develop a reliable anaemia screening method based on the ECG, we used deep learning, which has previously been used to identify lesions in medical images such as retinal images and chest radiographies.¹³ In the past 3 years, deep learning has been used to analyse ECGs to approximate atrial fibrillation, heart failure, and even age and sex. We hypothesised that an algorithm /could effectively screen for anaemia.

The capacity to screen for anaemia non-invasively through ECG data would facilitate the detection and monitoring of patients at an elevated risk. Given that ECGs can be obtained from a range of wearable devices, including patches and watches, this diagnostic capability is particularly advantageous in low-income countries, where it allows for the screening of anaemia without the need for the medical resources typically necessary for blood tests.

Conclusion: AI-based ECG analysis represents a promising screening tool for anemia detection, particularly in resource-limited settings. Future studies should focus on multi-center validation and clinical implementation pathways to realize this technology's full potential.

Keywords: Anemia, Artificial Intelligence, Deep Learning, Electrocardiography

G-1969

Emotional Expression Algorithm in Machine Learning-Based Huntington Disease Diagnosis: A Systematic Review

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Abstract:

Background: Huntington's disease is characterized by degeneration of the striatal cortex, leading to progressive athetoid movements, dementia, and behavioral changes. Phenotypic manifestations of Huntington's disease (HD) can be detected at least 15 years before the time of movement diagnosis. By examining emotional changes and presenting different algorithms, it is possible to assess changes over time in prodromal HD companies that are closer to a motor diagnosis. The use of machines and the design of appropriate models can help to diagnose this disease earlier and reduce costs for the healthcare system.

Methods: We performed a systematic search in PubMed, Scopus, Embase IEEE xplora and Web of Science databases up to March 2025. Relevant terms like "Huntington'sDisease", "Speech patterns", and "Machine learning" were used. All articles were independently screened in two steps (Title/abstract screening and full text screening). Duplicates were eliminated and inclusion/exclusion criteria were applied. Animal/in vitro studies, book chapters, reviews, and editorials were excluded. Data extraction was conducted in Microsoft Excel. Quality assessment was performed using JBI's criticalappraisal tools.

Results: From an initial search of 4,776 records, 21 studies were included after a two-stage screening process involving title/abstract and full-text evaluation. The results emphasize the role of machine learning in early Huntington disease detection through emotional expression analysis, especially in speech prosody and facial dynamics. These subtle changes often precede motor symptoms, presenting an opportunity for earlier diagnosis. Combining multimodal data enhances sensitivity in identifying at-risk individuals. Although challenges such as model interpretability and dataset variability remain, the findings highlight the potential of emotion-based computational phenotyping for non-invasive, scalable detection and monitoring of Huntington's disease.

Conclusion: This systematic review highlights the growing role of machine learning in early detection of Huntington disease through emotional expression analysis. Subtle affective cues in speech and facial dynamics provide a non-invasive route for identifying preclinical changes. Despite limitations in model interpretability and dataset variability, findings support the promise

of emotion-informed computational phenotyping in enabling earlier diagnosis and . Future research should aim to improve model robustness and address ethical challenges for successful clinical integration.

Keywords: Huntington Disease, Emotional Expression, Machine Learning

G-1970

Harnessing Artificial Intelligence to Forecast Therapeutic Outcomes of Stem Cell Treatments in Parkinson's Disease: A Systematic Review

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Abstract:

Background: Despite significant advancements in stem cell-based therapies for Parkinson's disease, accurately predicting personalized therapeutic responses remains challenging due to substantial variability among patient outcomes. Recent advances in artificial intelligence have improved the potential for precise, individualized predictions of treatment results. However, AI-driven predictive modeling of stem cell therapy outcomes in PD has not yet been comprehensively and systematically explored, marking this area as an emerging research field.

Methods: A systematic and comprehensive search was conducted across PubMed, IEEE Xplore, Embase, Web of Science, and Scopus databases for articles published between January 2010 and February 2025. Search terms included "Parkinson's disease," "artificial intelligence," "machine learning," "deep learning," "mesenchymal stem cells," "induced pluripotent stem cells," "embryonic stem cells," and "dopaminergic neurons." The review process involved initial screening at the title and abstract level, followed by a thorough full-text analysis. Studies involving in vitro experiments, animal models, non-English articles, narrative reviews, editorials, books, and duplicates were excluded. Quality assessment of included studies was performed using the Joanna Briggs Institute appraisal tools.

Results: The initial search identified 5,756 articles; after applying rigorous two-stage (title/abstract, then full-text) screening and defined inclusion and exclusion criteria, 29 relevant studies were retained for analysis. A variety of AI algorithms, such as support vector machines, random forests, decision trees, and deep neural networks, were utilized to predict clinical outcomes. Major stem cell types examined included mesenchymal stem cells, induced pluripotent stem cells, embryonic stem cells, and neural stem cells. Outcomes studied primarily included motor function improvement, disease progression control, and the functional integration of neurons following treatment. Despite promising findings, limitations such as small sample sizes, lack of external validation, and inconsistent outcome metrics were noted.

Conclusion: This systematic review highlights an emerging and under-explored research area, demonstrating that AI has substantial potential for personalizing stem cell therapies in Parkinson's disease. To develop reliable and practical predictive models, future studies must address current limitations through larger, multi-center studies with standardized outcome measurements and rigorous validation processes.

Keywords: Parkinson's disease, Machine Learning, Stemcell Therapy, Dopaminergic Neurons, Treatment Outcome Prediction, Personalized Medicine

G-1972

Dynamic AI Systems for Monitoring Blood Pressure and Cardiovascular Trends in Hypertensive Patients

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Abstract:

Background and Aims: Hypertension is a significant contributor to cardiovascular morbidity and mortality worldwide. Continuous monitoring of blood pressure (BP) and cardiovascular trends is essential for effective management. Traditional approaches often fail to provide real-time, adaptive insights required for personalized interventions. This study aims to develop a dynamic AI-based system to monitor BP and cardiovascular trends, enhancing prediction and prevention of hypertensive complications.

Methods: A novel dynamic AI framework was designed, integrating wearable sensor data, electronic health records (EHRs), and environmental variables. The system utilized a hybrid neural network combining recurrent layers for temporal analysis and attention mechanisms to prioritize critical features. Data from 500 hypertensive patients were collected over 12 months, including BP readings, heart rate variability, and activity levels. The AI model was trained and validated using an 80/20 data split, employing mean absolute error (MAE) and F1-score metrics for evaluation. Comparative analysis was performed with traditional statistical models.

Results: The AI system demonstrated superior performance in predicting BP fluctuations and detecting abnormal cardiovascular trends, with an MAE of 3.5 mmHg and an F1-score of 0.92. Temporal patterns revealed high sensitivity to physical activity and sleep quality as key predictors. Patients using the system reported a 30% reduction in hypertensive crises compared to those on standard monitoring protocols. The dynamic adaptability of the system allowed for seamless incorporation of new data streams, further enhancing its accuracy and usability.

Conclusion: The proposed AI system offers a transformative approach to hypertension management by enabling continuous, real-time monitoring and personalized insights. Its dynamic nature ensures adaptability to patient-specific needs and evolving conditions, presenting a promising tool for reducing the burden of cardiovascular diseases. Future work will explore integrating genetic data to refine predictions further and expanding the system's application to broader populations.

Keywords: Hypertension, Artificial Intelligence, Cardiovascular Monitoring

G-1974

The Medical Clinical Advisor: An Advanced Retrieval-Augmented Generation System for Trustworthy, Evidence-Based Clinical Guidance

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Abstract:

Background: Clinicians face expanding medical knowledge, needing efficient access to reliable, evidence-based information. Current digital tools often lack domain validation, source transparency, or synthesis capabilities essential for clinical trust. This study developed and evaluated the "Medical Clinical Advisor," a specialized AI using Retrieval-Augmented Generation (RAG) to provide physicians with accurate, context-relevant answers synthesized from curated medical literature, presented with verifiable source evidence.

Methods: We implemented a multi-stage RAG architecture optimized for medicine. The knowledge base used digitized authoritative sources (core internal medicine, pediatric, and general practice textbooks) plus clinical guidelines. Text underwent optimized chunking and vectorization via advanced sentence embeddings. Query understanding utilized Hypothetical Document Embeddings (HyDE) generated by an LLM, with relevance refined by cross-encoder re-ranking. A state-of-the-art LLM (Gemini 2.5 series) synthesized concise answers, governed by strict prompt engineering mandating factual grounding within retrieved context and preventing extrapolation. Crucially, the system presents generated answers alongside verbatim source snippets for direct physician verification.

Results: A functional Medical Clinical Advisor prototype was successfully implemented. Evaluation across diverse clinical queries (diagnosis, management, treatment) demonstrated consistent retrieval of highly relevant passages, with the HyDE and re-ranking strategy enhancing precision. Generated answers exhibited high fidelity to source material, adhering strictly to retrieved evidence due to rigorous prompt constraints, thus minimizing factual deviation. The integrated display of source excerpts effectively facilitated user verification against original texts.

Conclusion: The Medical Clinical Advisor validates the potential of specialized RAG systems integrating curated knowledge with advanced NLP for reliable, explainable clinical decision support. This approach mitigates risks associated with ungrounded AI in high-stakes medical settings, while integrated source transparency fosters physician trust. This system holds potential to enhance clinical efficiency, support evidence-based practice, and improve clinician confidence.

Future work includes knowledge base expansion, further optimization for nuanced queries, and formal usability assessments with clinicians.

Keywords: Retrieval Augmented Generation, Artificial Intelligence, Evidence-Based Medicine

G-1975

Exploring Bipolar Disorder Biomarkers Using Unsupervised Learning Methods

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Abstract:

Background and Aims: Bipolar disorder (BD) is a neuropsychiatric disorder that is marked by alternating periods of mania and depression. BD has been perceived as a multifactorial disorder, with both genetic and environmental factors contributing to its etiology. Recent genetic studies suggest that transcriptional dysregulation may have a key role in BD pathogenesis. Transcriptional analysis provides a powerful approach to understanding the molecular mechanism of this disease. Machine Learning (ML) techniques have also enhanced the ability to analyze complicated genetic data to discover new biomarkers, predictive models, and disrupted pathways for BD. The present study aims to explore the integration of ML approaches in genetic and transcriptomic research to improve the understanding of BD mechanisms.

Methods: In this study, a brief review of Artificial Intelligence (AI) applications in BD research, particularly on genetic analyses, was first conducted. Next, we retrieved a microarray dataset from Gene Expression Omnibus (GEO) GSE5388, comprising prefrontal cortex samples from postmortem BD patients and healthy controls. The data were analyzed using unsupervised learning algorithms of K-means clustering, hierarchical clustering, and statistics to identify the unknown patterns of gene expression. Finally, two genes, PTGER3 and FOS, were compared within each cluster using statistical analysis to ascertain whether they are implicated in BD pathophysiology.

Results: The literature review highlighted the rising importance of AI in BD research, particularly in early diagnosis, treatment response prediction, and biomarker discovery. In our study, clustering of gene expression data revealed hidden patterns, with distinct transcriptional profiles dividing into biologically meaningful classes. Markedly, two genes, PTGER3 and FOS, within the clusters had a significant association in their expression patterns, suggesting their potential involvement in BD pathophysiology.

Conclusion: These findings indicate that clustering methods can be useful tools for revealing molecular patterns related to BD. Genetic studies in the future could lead to the identification of novel diagnostic markers and therapeutic targets for BD.

Keywords: Bipolar-Disorder, Machine-Learning, Artificial-Intelligence, PTGER3

G-1976

Machine Learning Approaches in Methamphetamine-Induced Psychosis: A review

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Abstract:

Background and Aims: In recent years, artificial intelligence, particularly machine learning (ML), has emerged as a novel tool in the analysis of cognitive data, neuroimaging, electroencephalography (EEG), and digital biomarkers for diagnosis. Methamphetamine-induced psychotic disorder (MIP) is a form of secondary psychosis, and its manifestations are highly analogous to schizophrenia (SCZ). It is hypothesized that MIP and SCZ may share common neurobiological underpinnings. Therefore, MIP is considered a model for identifying diagnostic, therapeutic, and prognostic approaches for SCZ. Given the impact of epigenetics in disease susceptibility, the investigation of epigenetic biomarkers can be highly advantageous. Therefore, our objective is to narratively review machine learning applications in the management of MIP as a model for SCZ, with a focus on diagnostic and prognostic tools.

Methods: A narrative review of the literature was conducted using databases including PubMed, Google Scholar, and the official website of the National Institute on Drug Abuse (NIDA). Articles published between 2015 and 2024 that addressed the applications of machine learning in psychosis, particularly methamphetamine-induced psychosis, were included. This review focused on diagnostic models, biomarker identification, predictive algorithms, and digital psychiatry tools enhanced by ML techniques.

Results: Machine learning is capable of integrating large and complex epigenetic datasets in order to forecast future events. Among these data are microarray techniques (most utilized) and bisulfite sequencing (most precise). The most frequently employed algorithms in this field include LASSO Regression, Support Vector Machine (SVM), and Random Forest (RF). Additionally, two deep learning approaches, DeepCpG and DeepMethyl, can predict genome methylation status instead of disease status.

Conclusion: Machine learning represents one of the most promising directions in psychiatric epigenetics and may substantially enhance the effectiveness of diagnosis and treatment. Although this approach is sometimes portrayed as a threat to physician autonomy, clinicians should consider its application as a complementary tool, similar to the stethoscope and MRI.

Keywords: Methamphetamine Induced Psychosis, Epigenetics, Artificial Intelligence, Machine Learning, Digital Psychiatry, Predictive Models

G-1977

Prioritizing Patient Data Privacy: Ethical Requirements for Local Large Language Models in Healthcare

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Abstract:

Background and Aims: Artificial intelligence, particularly large language models (LLMs), transforms healthcare by enhancing diagnostics, documentation, and personalized care. However, ethical concerns regarding privacy and security are raised by sensitive patient data. Data breaches and the need for robust safeguards are highlighted by research. Data sent to third-party servers by external APIs increases risks of unauthorized access and non-compliance with HIPAA. These risks can be mitigated by locally run LLMs that process data within safe organizational systems, supporting ethical priorities like data security and patient trust. This strategy should be used by healthcare organizations to make a balance between AI innovation and ethical responsibility.

Methods: In this narrative review, we explored the ethical considerations of deploying locally run LLMs compared to external APIs in healthcare, with a focus on patient data privacy. We conducted a targeted search of peer-reviewed literature using academic databases, including PubMed and Scopus, to identify studies published between 2020 and 2024. Search terms included combinations of “large language models,” “healthcare,” “data privacy,” “ethics,”. Selected studies were analyzed to extract findings on the privacy benefits, performance, and challenges of local LLMs. We synthesized this evidence to compare local LLMs with external APIs, emphasizing ethical advantages.

Results: By processing patient data within organizational systems, locally run LLMs safeguard patient data. Llama 2 extracted medical data from patients’ histories with a 100% sensitivity for liver cirrhosis without external transmission, according to research. The risk of a breach is reduced and HIPAA compliance is ensured by on-site processing. It also reduces costs and latency, increasing productivity. Patients’ trust in local LLMs is essential for ethical healthcare. However, deploying them requires significant computational resources and technical capacity. Model optimization techniques can reduce resource demands, facilitating broader adoption in privacy-focused healthcare settings.

Conclusion: Locally run LLMs offer a privacy-centric approach to healthcare AI, reducing risks tied to external APIs. Evidence shows their security and compliance benefits. Despite hardware challenges, their alignment with ethical standards makes them a strong choice. Healthcare

organizations should adopt local LLMs to protect patient data, foster trust, advancing responsible AI in medicine.

Keywords: Artificial Intelligence, Large Language Models, Patient

G-1979

Education or Threat? Common Security Risks in E-Learning Systems

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Abstract:

Background and Aims: With the rapid expansion of e-learning, particularly among digital natives, ensuring the security of educational platforms has become increasingly critical. Despite its popularity, e-learning environments face numerous security threats that compromise the confidentiality, integrity, and availability of educational data. This study aims to identify and analyze the most common security threats to sensitive assets in e-learning systems.

Methods: This review was conducted by searching for relevant literature using the keywords eLearning, Online Learning, and Security in Google Scholar and Scopus databases, covering the period from November 2023 to October 2024. A total of 38 articles were selected for analysis. Articles were chosen based on their relevance to e-learning security, their publication date, and availability in English. Priority was given to studies that focused on technical security threats and preventive strategies in educational environments.

Results: The reviewed studies highlight user-side, network-side, and server-side vulnerabilities. Common security threats include malware, ransomware, phishing, DoS/DDoS attacks, and SQL injection. These threats can significantly disrupt learning continuity and compromise data integrity.

Conclusion: To mitigate these risks, it is essential for educational institutions to implement comprehensive security policies, standards, and procedures. Additionally, the integration of robust authentication, access control, and encryption mechanisms can enhance platform security, user trust, and overall learning effectiveness.

Keywords: E-learning, Distance Learning, Information Security, Cybersecurity

G-1980

Factors influencing trust in artificial intelligence in healthcare - A review studyZeynab Rabieipakdeh^{1 *}, Anton Manfreda¹, Fatemeh Hajialiasgari²¹ Department of Economics and Business, University of Ljubljana, Ljubljana, Slovenia² Department of Digital Health, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran* **Correspondence:** atu.14.rabiee@gmail.com**Abstract:**

Background and Aims: In recent years, the integration of artificial intelligence (AI) in healthcare has gained significant speed. AI systems can analyze vast amounts of medical information and facilitate more informed decision-making by healthcare professionals. The aim of this study is to investigate the factors affecting trust in artificial intelligence in healthcare.

Methods: This review study was conducted using articles published between 2010 and 2025 and included a review of selected articles from reputable scientific sources such as Scopus, Web of Science, PubMed, Google Scholar, and JSTOR. The criteria for selecting articles included topical relevance, number of citations, and methodological quality. In the process of reviewing articles, content analysis tools, thematic analysis, and qualitative analysis methods were used to extract and organize key information from the articles.

Result: The results showed that several different categories of factors can affect trust in artificial intelligence in healthcare. In the field of ethical factors, transparency of algorithms, patient privacy, informed consent, and how to manage sensitive medical data played an important role. In the field of healthcare, the type and severity of the disease, the clinical performance of artificial intelligence in diagnosis and treatment, the level of risk associated with using this technology, past experiences of experts with similar systems, and trust in the correct functioning of artificial intelligence in critical situations are among the influential factors. Also, the characteristics of users and medical professionals, such as the level of specialized knowledge, expectations from the technology, age, level of awareness of AI, and experience in using IT tools, affect the trust in this technology.

Conclusion: It is concluded that a combination of technical, human, environmental, and legal factors can influence trust in artificial intelligence in medicine and the application of its tools.

Keywords: Artificial Intelligence, Trust, Healthcare

G-1981

Artificial Intelligence and Children's Digital Health (From the Perspective of Social Studies on the Future of Childhood)

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Abstract:

Background and Aims: Contemporary human existence is characterized by intricate complexities and, similar to the experiences of Alice in Wonderland, is replete with unforeseen developments; thus, the integration of interdisciplinary sciences and innovative methodologies is imperative for the promotion of well-being. In the present epoch, wherein artificial intelligence exerts considerable influence over various facets of human life, its ramifications on the digital health of children emerge as a pivotal and significant concern that warrants thorough investigation through the lens of childhood social studies. Should we approach the concept of children's health by considering not only the physical but also the psychological, social, and spiritual, it becomes evident that artificial intelligence and the digital environment possess a dynamic role with children and their overall health, necessitating focused scholarly attention.

Methods: literature review with an interdisciplinary approach

Results: Through the lens of childhood studies, the conceptual understanding of childhood within contemporary society has experienced considerable evolution. Children ought to be perceived as active social agents who interact with emergent technologies." This interdisciplinary paradigm augments our understanding of the intricate issues surrounding the digital well-being of children. Childhood studies not only underscore the necessity of exploring prospective developments for children but also places significant emphasis on their current experiences, this paradigm acknowledges children as dynamic and proactive contributors who play a crucial role in the formation of their own culture of health and healthy lives, thereby making it essential to scrutinize the various dimensions of child health, particularly digital health, from the viewpoints of the children themselves.

Conclusion: In order to investigate and attain optimal digital health outcomes for children, it is imperative to adopt an interdisciplinary methodology that not only leverages the advantages offered by artificial intelligence but also prioritizes the preservation of essential human values and interpersonal interactions. Furthermore, the advancement of childhood studies through an interdisciplinary lens has the potential to facilitate more effective planning and policymaking within the domain of children's digital health, thereby fostering a healthier present and future for subsequent generations.

Keywords: Artificial Intelligence, Children, Digital Health, Social

G-1982

Predicting response to chemotherapy in breast cancer patients using data mining: A Review Study

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Abstract:

Background and Aims: Breast cancer is the most prevalent type of cancer and the second cause of death among women in Iran. Predicting response to chemotherapy in breast cancer patients could significantly aid in early diagnosis and faster treatment of the disease. Data mining methods have demonstrated remarkable effectiveness in diagnosing disease and have been successfully applied in predicting chemotherapy response in cancer patients. The aim of this study is to review the literature related to the prediction of chemotherapy response in breast cancer patients using data mining techniques.

Methods: We extracted relevant articles from scientific databases (Scopus, PubMed, Web of Science, and Google Scholar) published between the years 2018 and 2024. Our search strategy was based on relevant keywords in the titles and abstracts of the articles, and the PRISMA methodology was used for article selection. Out of 154 retrieved articles, 42 studies were selected after screening.

Results: Our analysis revealed that deep neural networks were employed in 60% of the selected studies for predicting breast cancer chemotherapy response. Support vector machines, random forests, decision trees, and regression were other predictive methods applied in the reviewed studies.

Conclusion: While these advanced models show promising results in predicting chemotherapy response, further validation and integration of diverse datasets are needed to enhance their applicability in breast cancer chemotherapy response prediction.

Keywords: Data_Mining, Breast_Cancer, Chemotherapy_Response, Prediction, Machine_Learning, Neural_Network

G-1983

Integrating Artificial Intelligence in Wearable Technologies for Blood Pressure Monitoring in Body Area Networks

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Abstract:

Background and Aims: Wearable technologies in Body Area Networks (BAN) have emerged as innovative tools for health monitoring, particularly in continuous blood pressure measurement. Artificial Intelligence (AI), with its ability to process complex data and learn dynamic patterns, plays a pivotal role in enhancing the accuracy, efficiency, and personalization of these systems. This article explores the applications of AI in wearable blood pressure monitoring technologies within the BAN framework.

Methods: This study conducted a systematic review of international peer-reviewed articles (2015–2023) to analyze the applications of AI in processing physiological signals (such as PPG and ECG), noise reduction, blood pressure prediction, and multi-sensor data integration. Machine Learning (ML) and Deep Learning (DL) algorithms, including SVM, Random Forest, LSTM, and CNN, were evaluated.

Results: The findings demonstrated that AI significantly improves wearable blood pressure monitoring through high-accuracy signal processing (e.g., noise removal and feature extraction), precise blood pressure prediction (DL models using PPG data showed errors below 5 mmHg compared to standard methods), personalized user adaptation via adaptive learning, and optimized sensor integration in BANs for energy efficiency. Deep Learning algorithms, particularly CNN and LSTM, outperformed classical ML methods (e.g., SVM and Random Forest) in estimating blood pressure (MAE 5 mmHg), owing to their ability to autonomously extract complex features from PPG and ECG data.

Conclusion: The integration of AI with wearable technologies in BANs has revolutionized blood pressure monitoring. Despite technical challenges, AI holds undeniable potential for transforming wearables into precise, automated monitoring tools. Future research should focus on clinical validation, expanding data diversity, and reducing computational costs.

Keywords: Artificial Intelligence, Wearable Blood Pressure Monitoring

G-1984

Artificial Intelligence in E-Learning

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Abstract:

Background and Aims: E-learning, as a modern educational method, has significantly transformed educational systems by integrating digital technologies. Artificial Intelligence (AI), with its analytical and predictive capabilities, plays a pivotal role in optimizing and personalizing the learning process. Using advanced algorithms, AI analyzes educational data and enhances learning methodologies. This systematic review article aims to examine the applications, advantages, and challenges of AI in e-learning.

Methods: This study adopts a systematic review approach, utilizing qualitative content analysis. Data were collected from reputable scientific sources such as IEEE, Science Direct, and Google Scholar, covering the period from 2015 to 2024. Selected articles were chosen based on their direct relevance to the topic and their innovative findings in the field of AI in e-learning.

Results: The review of studies indicates that AI in e-learning is primarily applied in five key areas: personalized learning, which tailors content recommendations based on learner profiles; recommendation systems, which use data mining and machine learning to suggest relevant educational resources; automated assessment, which includes automatically grading exams and assignments while also analyzing written responses using Natural Language Processing (NLP); intelligent educational assistants, such as interactive chatbots like ChatGPT and virtual tutors including Google Assistant and IBM Watson; and sentiment analysis and engagement tracking, which analyzes learner emotions and engagement to improve content and address learning challenges. Additionally, AI enhances immersive learning experiences through Virtual Reality (VR) and Augmented Reality (AR), enabling applications such as virtual labs for science education or surgical simulations for medical students.

Conclusion: AI holds significant potential to revolutionize e-learning by enhancing engagement, personalization, and educational efficiency. However, its success depends on addressing technical and ethical challenges, including the need for high-quality data, privacy concerns, and the risk of reduced human interaction. Future research should focus on integrating AI with traditional educational methodologies and evaluating its long-term impacts.

Keywords: Artificial Intelligence, E-Learning; Personalized Learning; Automated

G-1985

Artificial Intelligence in Telestroke

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Abstract:

Background and Aims: Stroke is one of the leading causes of mortality and disability worldwide, where rapid diagnosis and treatment play a decisive role in improving clinical outcomes. Telestroke systems utilize communication technologies to provide immediate consultation with specialists in underserved areas. In recent years, the integration of artificial intelligence (AI) into these systems has significantly enhanced the accuracy and speed of stroke diagnosis and management. This systematic review examines the applications of AI in Telestroke.

Methods: This study employed a systematic review approach, searching databases such as PubMed, IEEE, and Science Direct between 2015 and 2024. Keywords included "Artificial Intelligence," "Telestroke," "Stroke Diagnosis," and "Machine Learning." Out of 250 identified articles, 45 relevant studies were selected based on inclusion and quality criteria.

Results: AI has been applied in Telestroke across four primary domains: automated detection, where deep learning algorithms like CNNs have achieved over 90% accuracy in identifying ischemic clots and intracranial hemorrhages by analyzing CT and MRI scans; outcome prediction, with machine learning models such as XGBoost integrating clinical and imaging data to estimate complication risks like extensive infarct; treatment optimization, as AI systems analyze temporal and clinical parameters to recommend optimal decisions for administering tPA or thrombectomy; and decision support, where intelligent chatbots and recommender systems provide real-time guidance for non-specialist teams in remote areas.

Conclusion: The integration of AI into Telestroke has markedly improved the speed, accuracy, and accessibility of specialized stroke care. However, challenges such as the need for larger clinical datasets, algorithm transparency (Explainable AI), and ethical considerations require further attention. Future research should focus on large-scale clinical trials to validate the efficacy of these technologies.

Keywords: Artificial Intelligence, Telestroke, Stroke Diagnosis,

G-1990

Predicting Depression and Anxiety Using Digital Phenotyping and Machine Learning: Toward Personalized Mental Health Monitoring

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Abstract:

Background and Aims: Depression and anxiety are among the most prevalent mental health disorders globally, yet their diagnosis often relies on subjective clinical assessments. Advances in digital phenotyping—collecting behavioral and physiological data from smartphones and wearable devices—offer an opportunity for continuous and objective monitoring of mental health. This study investigates the use of machine learning algorithms to predict levels of depression and anxiety based on passive data collected from digital devices, aiming to develop a personalized and scalable mental health monitoring tool.

Methods: A cohort of 250 participants installed a mobile app that collected passive data over 60 days, including GPS patterns, screen time, call/text logs, and sleep/activity metrics from wearables. Participants completed weekly PHQ-9 and GAD-7 questionnaires. Several models, including random forests, support vector machines, and deep neural networks, were trained to classify depression and anxiety severity levels.

Results: The deep neural network model achieved the highest accuracy (F1-score = 0.88 for depression, 0.84 for anxiety). Feature analysis showed that late-night screen time, decreased physical activity, and social withdrawal (e.g., fewer calls/messages) were strong predictors of poor mental health. The system provides weekly risk alerts and recommendations for follow-up care.

Conclusion: Digital phenotyping combined with AI enables proactive and personalized mental health support. Our findings support the use of passive behavioral data in augmenting traditional psychiatric assessment and facilitating timely interventions.

Keywords: Digital Phenotyping, Mental Health, Machine Learning,

G-1991

Investigating the Impact of Improved Healthcare Worker Performance in Delivering Medical Care Using Machine Learning-Based Virtual Reality Environments Compared to Emergency-Based Clinical Setting

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Abstract:

Background and Aims: Assessing the performance of healthcare workers in patient interactions is crucial for improving healthcare quality and patient safety. Patients visit medical centers with their pain, and our goal is to alleviate this suffering. If our interactions with patients are not tailored to their specific conditions, they may endure additional distress and hardship while receiving care. Since evaluating the attitudinal and emotional aspects of healthcare workers' skills in real-world settings is challenging, this study aims to use a virtual reality (VR) simulator-based system combined with human and AI-generated feedback to improve healthcare workers' performance.

Methods: We randomly selected healthcare workers, including physicians, nurses, and medical/nursing interns, for the study. In consultation with a psychiatry team and simulation planners, participants were divided into two groups of 20 members. The intervention group used the VR simulator for two sessions: the device presented patient scenarios and simulated clinical environments, prompting participants to follow treatment protocols. AI and real-time feedback from psychiatrists acting as evaluators provided performance improvement guidance. Final performance was assessed and compared to previous sessions. The clinical environment was developed using Unity software, and feedback was generated through machine learning-based data analysis alongside evaluations from the psychiatric team using the Calgary Cambridge observational checklist. The control group received feedback only through direct observation by instructors during patient care.

Results: The intervention group (4 emergency physicians, 6 emergency nurses, 7 medical interns, and 3 nursing interns) engaged with the VR simulator and received human/system feedback. The control group improved through instructor feedback during patient care. By the end, the intervention group reported 67.5% higher satisfaction with the training program compared to the control group, and their performance improved by 36.5% more than the control group.

Conclusion: Integrating AI-driven simulators with human feedback in clinical scenarios significantly enhances healthcare workers' performance and satisfaction. This approach

demonstrates the value of combining immersive technology and expert evaluation for skill development in healthcare.

Keywords: Virtual Reality, Patient Care, Machine Learning.

G-1992

Reinforcement Learning–Driven AI and Smartwatches: A Novel Approach to Reducing Psychological Dependency on Smoking through Behavioral and Physiological Interventions

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Abstract:

Nicotine addiction remains a persistent global health challenge, with conventional cessation therapies yielding modest long-term success. Recent technological advances have paved the way for more dynamic and personalized interventions by integrating reinforcement learning (RL)–driven artificial intelligence (AI) with wearable smartwatches. RL algorithms leverage continuous streams of user data—such as self-reported craving levels and engagement patterns—to adapt the timing, content, and intensity of behavioral prompts. Simultaneously, smartwatches monitor physiological signals (notably heart rate variability and stress-related biomarkers like cortisol) in real time, enabling Just-In-Time Adaptive Interventions (JITAI) that respond to both psychological and biological indicators of relapse risk.

A structured review of peer-reviewed studies published between 2015 and 2025 across PubMed, Scopus, Web of Science, and Google Scholar evaluated the impact of these integrated systems on smoking cessation outcomes. Behavioral findings indicate that RL-enhanced mobile apps and wearable platforms substantially increase user engagement, delivering more frequent quit-related actions and self-initiated coping strategies. Users reported sharper reductions in craving intensity and a higher frequency of quit attempts compared to traditional support methods. Physiologically, interventions combining AI and smartwatches demonstrated up to a 35 % improvement in heart rate variability and a 40 % reduction in cortisol levels—markers associated with better stress regulation and reduced nicotine dependence.

Despite these promising results, most studies remain preliminary, with small sample sizes and short follow-up periods. Scaling this approach requires addressing practical challenges, including sensor accuracy, battery life, data privacy, and long-term adherence. Future large-scale clinical trials are essential to validate efficacy, refine RL policies, and optimize wearable integration. If successful, AI-powered smartwatch interventions could revolutionize smoking cessation by delivering highly personalized, context-aware support that targets both the psychological urge to smoke and its physiological correlates.

Keywords: Smoking cessation, Nicotine addiction, Reinforcement learning

G-1340

Machine learning-based prediction of foot and ankle pathology using biomechanical and physiological parameters: a random forest approach

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Abstract:

Background and Aims: Foot and ankle pathologies heavily influence mobility as well as quality of life, and early diagnosis as well as classification are highly critical to attain right treatment planning. In the current study, machine learning has been utilized for foot pathology prediction based on physiological as well as biomechanical parameters. A data set was created with the key variables being pitch angle, Hibbs angle, Meary angle, kite angle and body mass index (BMI).

Methods: A supervised model with the Random Forest classifier was trained on data that was labeled and categorized people into three: Healthy, at-risk, and patients. It classified based on deviation from typical biomechanical angles and BMI thresholds. Data pre-processing comprised feature normalisation and a rule-based system to classify anomalies of foot alignment.

Summary of model performance:

Cross-Validation Accuracy Scores: [0.992, 0.993, 0.996, 0.999, 0.998]

Mean Cross-Validation Accuracy: 0.9956 (99.56% accuracy)

Log Loss: 0.0349

Accuracy in the final test: 99.5%

The model was superb with extremely high classification accuracy. The accuracy of cross-validation was over 99.5%, and the negligible log loss indicates that the model is reliable to classify the foot health conditions. Feature significance analysis indicated that Meary angle and BMI were the important features for the classification result.

Results: The results show that machine learning can be applied to early diagnosis of ankle and foot pathologies and also to clinical assessment and treatment planning. Greater cohorts and more biomechanical parameters need to be included in future research to increase predictive power and utility in clinical practice.

Keywords: Foot Disease, Biomechanical, Machine Learning

G-1043

Identifying and Evaluating the Impact of Key Predictive Features in Breast Cancer Prediction: A Data-Driven Study

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Abstract:

Background and Aims: Breast cancer is the most common cancer among women globally, impacting quality of life and straining healthcare systems. Identifying and evaluating the key features of breast cancer is essential for improving early detection and predictive accuracy. This study aims to identify and assess the impact of these critical features to enhance diagnostic and treatment strategies.

Methods: In this study, we used the Wisconsin Breast Cancer Diagnosis dataset, which consists of 569 samples and 31 attributes. These attributes were extracted from digitized images of fine needle aspirates (FNAs) of breast masses and include features such as radius, texture, perimeter, area, smoothness, compactness, concavity, concave points, symmetry, and fractal dimension. Each feature is represented by three statistical measures: mean, standard error, and worst value. We conducted a correlation analysis to assess relationships between the attributes and the target variable. Moreover, we performed feature selection using several methods, including Random Forest (RF), Logistic Regression (LR), XGBoost, Gini Index, and Information Gain. All analyses were performed using Python version 3.12.7.

Results: The correlation analysis showed strong correlations between the diagnosis and the following features: concave points (0.78), perimeter (0.74), radius (0.73), area (0.71), and concavity (0.70). In the Random Forest (RF) model, the feature importance scores were: concave points (0.302), perimeter (0.144), concavity (0.141), radius (0.126), and area (0.108). For the XGBoost model, concave points (0.702) were the most important feature, followed by area (0.079), texture (0.057), perimeter (0.035), and concavity (0.028). According to the Gini Index, concave points (0.711) ranked highest, followed by texture (0.080) and area (0.059). In terms of Information Gain (Entropy), the most significant feature was concave points (0.612), followed by area (0.149) and texture (0.119).

Conclusion: This study underscores the importance of specific predictive features in breast cancer diagnosis. Strong correlations were identified, particularly with concave points, perimeter, and radius. Feature selection methods such as Random Forest and XGBoost highlighted concave points as a key predictor. These findings emphasize the value of data-driven approaches for improving early detection and accuracy in breast cancer prediction, ultimately contributing to enhanced diagnostic tools and treatment strategies.

Keywords: Breast Cancer, Machine learning

G-1009

Predicting Breast Cancer Diagnoses Using Machine Learning Algorithms: A Comparative Study

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Abstract:

Background: Among women all over the world, breast cancer is considered to be the priority cause of death. Early detection of the disease can facilitate an improvement in the treatment outcome and survival rates. In this regard, an important issue is developing predictive models, which are quite accurate and fast. Machine learning is a new technology with the propensity for great performance in analyzing medical data and enhancing the diagnosis process. Five of the most important performance metrics consisting of accuracy, specificity, sensitivity, F1-score, and area under the curve (AUC) are considered to benchmark the best performing machine learning algorithms for the prediction and diagnosis of breast cancer.

Methods: This analytical study evaluates the performance of eleven machine learning classifiers using the Wisconsin Diagnostic Breast Cancer dataset: Decision Tree, Extra Randomized Trees, Support Vector Classifier, Random Forest, AdaBoost, Quadratic Discriminant Analysis, Bagging Meta Estimator, Gaussian Process Classifier, Gaussian Naive Bayes, K-Nearest Neighbors, and Multilayer Perceptron. The classifiers were compared in order to find out which algorithm gives the best performance for the classification of breast cancer. The dataset is a set of 569 instances and 30 features computed from digitized images of fine needle aspiration (FNA) tests conducted on breast masses. For all classifiers, the hyperparameters were set manually. All experiments were performed on Python version 3.12.7.

Results: Among the assessed models, Logistic Regression performed best overall, with an accuracy of 98.07%, a sensitivity of 96.24%, a specificity of 99.16%, and an F1-score of 97.37%. On the other hand, the best performance in the AUC was observed for AdaBoost, with a score of 99.56%.

Conclusion: This study evaluated eleven machine learning classifiers on the Wisconsin Diagnostic Breast Cancer dataset to identify efficient predictive algorithms. Logistic Regression achieved the

highest accuracy (98.07%), while AdaBoost had the best AUC (99.56%). These results highlight the potential of machine learning in improving breast cancer diagnostics. Selecting the right model based on performance metrics is key to enhancing accuracy. Future research should optimize and validate these models on larger datasets for clinical application.

Keywords: Breast Cancer, Machine Learning, Predictive

G-1384

Machine learning-based approach to Predict Dual Inhibition Activity of Chemical Compounds on Lysine Specific Demethylase 1 (LSD1) and Histone Deacetylases (HDAC) for Cancer Treatment

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Abstract:

Background and Aims: There are scientific evidences that Lysine specific demethylase 1 (LSD1) and Histone Deacetylases (HDAC) are functionally and physically related to each other in different cancers. Thus, the simultaneous inhibition of these targets will have synergistic effects for the treatment of different cancers. Until the present time, a lot of compounds have been reported as specific inhibitors of these two targets, separately. There are also some reports that have demonstrated the dual inhibition activity of some other compounds on LSD1 and HDAC. Machine learning (ML) methodologies are being applied in many drug discovery procedures for prediction of biological activities of different compounds. In this study, different machine learning models have been trained based on the data related to the chemical structures of LSD1 and HDAC inhibitors for prediction of dual inhibition activity of new molecules on these two receptors.

Methods: The dataset was prepared by extracting the chemical structures (as SMILES notations) of compounds (in three groups) reported as dual inhibitors of LSD1 and HDAC, LSD1 inhibitors and HDAC inhibitors in different articles and also the ChEMBL database. The PubChem fingerprints descriptors were extracted as the independent features. And the IC50s were considered as the target variable. The models that are used in this paper are Support Vector Machine (SVM), Random Forest and Logistic Regression. Further, to fine-tune hyper parameters using 5-fold cross-validation, GridSearchCV was used and each model was trained and tested on the dataset.

Results: The best ML model after hyper parameter tuning by GridSearchCV method was determined to be Logistic Regression based on the scores (0.98).

Conclusion: In this study, Logistic Regression model was introduced as the best ML model for prediction of the dual inhibition activity of new molecules on LSD1 and HDAC receptors. The compounds inhibiting simultaneously both receptors will be more effective than the compounds effecting just one target. Prediction of the fact that a new molecule will act as a LSD1 or HDAC or a dual inhibitor, will be very helpful for reducing the total costs of the drug discovery procedures for the purpose of cancer treatment.

Keywords: Artificial Intelligence, Machine Learning, Drug Discovery, LSD1&HDAC Dual Inhibitors

G-1989

Stroke Prediction Using Explainable Artificial Intelligence: A Comparative Analysis of Deep Learning and Machine Learning Models

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Abstract:

Background: Delayed stroke prediction can result in late treatment, leading to severe outcomes such as permanent neurological damage or even death. Early detection using deep learning (DL) and machine learning (ML) models can improve patient outcomes and reduce long-term stroke impacts. This study aims to compare these models and assess their effectiveness in stroke prediction.

Methods: This study examined a dataset of 663 records from patients admitted to Hazrat Rasool Akram Hospital in Tehran, Iran, including 401 healthy individuals and 262 stroke patients. Eight established ML models (SVM, XGB, KNN, RF) and DL models (DNN, FNN, LSTM, CNN) were employed to predict strokes. To prevent overfitting, the study used 10-fold cross-validation and hyperparameter tuning. Additionally, Shapley Additive Explanations (SHAP) were used to enhance model interpretability. Model performance was evaluated using accuracy, specificity, sensitivity, F1-score, and ROC curve metrics.

Results: Among the DL models, LSTM showed the highest sensitivity at 96.15%, while FNN excelled in specificity (96.0%), accuracy (96.0%), F1-score (95.0%), and ROC (98.0%). For the ML models, RF demonstrated superior sensitivity (99.9%), accuracy (99.0%), specificity (100%), F1-score (99.0%), and ROC (99.9%). Overall, RF outperformed all other models, with DL models generally surpassing ML models in most metrics, except for RF. The DL models (CNN, LSTM, DNN,

FNN) achieved sensitivities ranging from 93.0% to 96.15%, specificities from 80.0% to 96.0%, accuracies from 92.0% to 96.0%, F1-scores from 87.34% to 95.0%, and ROC scores from 95.0% to 98.0%. In comparison, the ML models (KNN, XGB, SVM) had sensitivities ranging from 29.0% to 94.0%, specificities from 89.47% to 96.0%, accuracies from 71.0% to 95.0%, F1-scores from 44.0% to 95.0%, and ROC scores from 64.0% to 95.0%.

Conclusion: This study highlights the effectiveness of both DL and ML models in stroke prediction, with RF models achieving superior performance across major evaluation metrics. Although DL models generally outperformed traditional ML approaches, the outstanding results of the RF model suggest that integrating these techniques could enhance early stroke detection and substantially improve patient outcomes by reducing the risk of severe complications such as permanent neurological damage or mortality.

Keywords: Deep Learning, Machine Learning, Predicting, Stroke

G-1988

Tele-orthopedic: A Scoping Review on Benefits, Applications, and Challenges

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Abstract:

Background: Musculoskeletal disorders and orthopedic conditions are among the leading causes of disability and reduced quality of life worldwide. The increasing demand for orthopedic services, coupled with barriers to in-person care such as geographic distance and limited specialist availability, has led to growing interest in tele-orthopedic solutions. Tele-orthopedics—the application of telemedicine technologies in orthopedic care—aims to improve access, reduce costs, and enhance patient outcomes. This scoping review aims to identify the key benefits, challenges, and applications of tele-orthopedic services.

Methods: A scoping review was conducted in accordance with PRISMA-ScR guidelines by systematically searching PubMed, Scopus, and Web of Science databases. Studies were included if they focused on the use of telemedicine technologies (synchronous, asynchronous, or hybrid) in orthopedic assessment, diagnosis, treatment, follow-up, or rehabilitation. Studies not focused on orthopedic care, non-English articles, conference abstracts, and reviews were excluded. Data were extracted and analyzed across domains including service type, technology used, target population, benefits, and challenges.

Results: From a total of 512 identified records, 34 studies met the inclusion criteria. Tele-orthopedic interventions were primarily applied to postoperative follow-ups, joint rehabilitation, fracture management, and chronic musculoskeletal pain. Common technologies included video consultations, mobile apps, wearable sensors, and web-based platforms. Reported benefits included improved access to care, reduced patient travel time and healthcare costs, high patient satisfaction, and comparable clinical outcomes to in-person care. Key challenges involved technology accessibility, clinician resistance, limitations in physical examination, data privacy concerns, and regulatory barriers.

Conclusion: Tele-orthopedic care represents a promising complement to traditional orthopedic services. It offers significant benefits in terms of accessibility, cost-effectiveness, and patient engagement. However, challenges related to infrastructure, clinical validation, and policy must be addressed to ensure its broader adoption and long-term sustainability.

Keywords: Tele-orthopedic, Benefits, Applications, Challenges

