The **First** ***(TvAI)*** ***Skyroom***
International **Virtual Congress on**
the practical Application of Artificial
Intelligence in **Medical Sciences**

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اولین کنگره بین المللی مجازی
کاربرد هوش مصنوعی در علوم پزشکی

برگزار کننده: معاونت آموزشی و پژوهشی مرکز آموزشی، درمانی و تحقیقاتی امام رضا (ع) تبریز

پخش: استودیو کوید بیمارستان امام رضا (ع) تبریز

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طراحی و چاپ :
شرکت هلدینگ بین المللی رکسان

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The First International Virtual Congress on the practical Application of Artificial Intelligence in Medical Science

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برگزار کننده: معاونت آموزشی و پژوهشی بیمارستان امام رضا (ع)
با همکاری کار گروه مرجعیت علمی و آینده نگاری دانشگاه علوم پزشکی تبریز

شیوه هاي نوین آموزشي از موضوعات داغ و بحث برانگیز در حوزه علوم پزشکي مي باشد. این مرکز مفتخر است با شروع بحران کوید در جهان، پیشرو در گسترش آموزش هاي مجازي بوده به گونه اي که تاکنون سه کنگره مجازي در حوزه ي آموزش پزشکی و ایمنی بیمار، پزشکي و ارولوژي در استودیو کوید این مرکز برگزار گردیده است و به امید خداوند اولین کنگره بین المللي مجازي کاربرد هوش مصنوعي در علوم پزشکي نیز از تاریخ ۱۳ الي ۱۷ بهمن ماه ۱۴۰۳ در استودیو کوید این مرکز برگزار خواهد شد.

کنگره بین‌المللی هوش مصنوعی در علوم پزشکی نه تنها فرصتی برای تبادل اطلاعات و آشنایی با آخرین فناوری‌های روز است، بلکه امکان ایجاد شبکه های ارتباطی بین محققان و متخصصان حوزه‌های مختلف را فراهم می‌آورد. همچنین، بحث و تبادل نظر در مورد چالش های عملیاتی و اخلاقی هوش مصنوعی در حوزه پزشکی نیز از دیگر اهداف مهم این رویداد به شمار می‌رود.

هوش مصنوعی در تشخیص، پیشگیری و درمان بیماری‌ها نقش کلیدی ایفا می‌کند و استفاده از آن می‌تواند به بهبود کیفیت خدمات درمانی و کاهش هزینه‌های درمانی بیانجامد. هوش مصنوعی به ویژه در درمان بیماری‌های پیچیده مانند سرطان، می‌تواند به بهبود نتایج درمان کمک کند. ایران در حال حاضر رتبه چهاردهم جهان در تولید مقالات علمی هوش مصنوعی را داراست و باید از این ظرفیت علمی به نحو مطلوب بهره بگیرد. این کنگره با با مشارکت اساتید برجسته‌ای از کشورهایی چون استرالیا، آمریکا، فنلاند و سنگاپور برگزار خواهد شد.

دکتر مجتبی محمدزاده لامع
رئیس کنگره

Innovative educational methods are among the hot and controversial topics in the field of medical sciences. This center is proud to have been a pioneer in expanding virtual education since the onset of the global COVID–19 crisis. To date, three virtual congresses have been successfully held in the fields of medical education and patient safety,
medicine, and urology at the COVID Studio of this center. With the grace of God, the First International Virtual Congress on the Application of Artificial Intelligence in Medical Sciences is scheduled to be held from February 1 to February 5, 2025, at the COVID Studio.

The International Congress on Artificial Intelligence in Medical Sciences is not only an opportunity to exchange knowledge and explore the latest
technologies but also a platform to build connections among researchers and specialists from various fields. Additionally, one of the key goals of this event is to discuss and address the practical and ethical challenges of using artificial intelligence in medicine.

Artificial intelligence plays a pivotal role in the diagnosis, prevention, and treatment of diseases. Its utilization can significantly improve the quality of healthcare services while reducing medical costs. AI, particularly in
addressing complex diseases such as cancer, has the potential to enhance treatment outcomes. Currently, Iran ranked 14th globally in the production of scientific articles on artificial intelligence, underscoring the necessity of leveraging this scientific capacity effectively.

This congress will feature the participation of distinguished experts from countries including Australia,USA, Finland, and Singapore fostering international collaboration and knowledge exchange.

Dr. Mojtaba Mohammadzadeh Lame
President of the congress

خدا را شاکریم که اولین کنگره بین المللی مجازی کاربرد هوش مصنوعی در علوم پزشکی را توسط معاونت آموزشی و پژوهشی بیمارستان امام رضا (ع) تبریز برگزار می نماییم.

کنگره بین‌المللی هوش مصنوعی در علوم پزشکی، با توجه به افزایش نیاز به بکارگیری فناوری‌های نوین در حوزه سلامت و درمان، در تاریخ ۱۳ تا ۱۷ بهمن ماه به صورت مجازی در مرکز آموزشی و درمانی امام رضا (ع) تبریز برگزار خواهد شد. این رویداد علمی و پژوهشی که به مدت پنج روز به طول خواهد انجامید، فرصت مناسبی برای ارائه و تبادل آخرین دستاوردها، تحقیقات و تجربیات متخصصان و پژوهشگران در زمینه هوش مصنوعی و کاربردهای آن در علوم پزشکی فراهم می‌سازد.

بطور کلی، هوش مصنوعی به کامپیوتر ها این امکان را می دهد که همانند انسان ها فکر کنند، استدلال کنند و به حل مسائل بپردازند. در ذیل به مهم ترین قابلیت های هوش مصنوعی در پزشکی اشاره می شود: بهینه سازی دوره‌ی بیماری از غربالگری و تشخیص تا درمان و مراقبت‌های بعدی، مراقبت آگاهانه از بیمار، کاهش خطا، کاهش هزینه های مراقبت، افزایش تعامل پزشک و بیمار، تصمیم گیری دقیق تر در عملکردهای درمانی و بالینی، ایجاد بیمارستان‌ها با کمک ربات، تصویربرداری و تشخیص پزشکی، مدیریت منابع و داده‌های بیمارستانی، جراحی به کمک ربات، نظارت بر بیماری‌های مزمن، بازرسی کیفیت بصری تجهیزات پزشکی. گفتنی است، هوش مصنوعی در پزشکی با وجود تمامی مزایایی که دارد ممکن است مشکلات و معایبی را نیز به همراه داشته باشد. یکی از مهم‌ترین این معایب، بالا بودن هزینه پیاده‌سازی و نصب زیرساخت‌ها و تجهیزاتی است که در این زمینه مورد نیاز هستند. همین مسئله نیز ممکن است سبب انصراف مسئولین مراکز درمانی از این تکنولوژی شود. از دیگر معایب مهمی که هوش مصنوعی ممکن است در پزشکی داشته باشد، پیچیدگی پیاده سازی زیرساخت‌ها است. در بسیاری از موارد، برای این که این زیرساخت‌ها به درستی پیاده سازی شوند نیاز به چندین کارشناس خبره و با تجربه وجود دارد. حفظ حریم خصوصی و امنیت داده‌ها، احتمال بروز سوگیری در الگوریتم های هوش مصنوعی، جمع‌آوری داده ها و خطر بیکاری ناشی از تکنولوژی از جمله چالش ها و نگرانی های کاربرد هوش مصنوعی در علم پزشکی می باشد. در پایان امید است با استفاده از هوش مصنوعی در پزشکی به کاهش هزینه‌های بیمارستانی و مراکز درمانی نیز کمک شایانی شود.

دکتر حسن سلیمان پور
دبیر علمی کنگره

We are pleased to announce the First International Virtual Congress on the practical Application of Artificial Intelligence in Medical Sciences, organized by the Deputy of Educational and Research unit of Imam Reza General Hospital, Tabriz, Iran. This congress focuses on the use of artificial intelligence in medical sciences, highlighting the growing need for modern technologies in healthcare. It will be held online from February 1 to 5, hosted by Imam Reza General Hospital, Tabriz, Iran. The five-day event offers a great opportunity for experts and researchers to share their latest findings, studies, and experiences related to artificial intelligence and its use in medical fields. Artificial intelligence enables computers to think, reason, and solve problems like humans. Below are the most important capabilities of artificial intelligence in medicine:Optimization of the screen and diagnosis to treatment of the disease and follow-up care, patient care, Reduction of errors, Reduction of healthcare costs, Increased interaction between doctors and patients, More accurate decision-making in therapeutic and clinical functions, Creation of hospitals with the help of robots, Imaging and medical diagnosis, Management of hospital resources and data, Robotic-assisted surgery, Monitoring of chronic diseases, and Visual quality inspections of medical equipment.

It is important to acknowledge that despite artificial intelligence's many benefits in health, there may also be potential issues and drawbacks linked to its use. One of the most significant drawbacks is the high cost of implementing and installing the necessary infrastructure and equipment. This issue may deter healthcare center officials from adopting this technology. Other significant disadvantages that artificial intelligence may present in medicine include the complexity of implementing th infrastructure. In many cases, to ensure that this infrastructure is established correctly, several expert and experienced specialists are required. Issues such as maintaining privacy and data security, the potential for bias in artificial intelligence algorithms, data collection, and the risk of unemployment caused by technology are among the challenges and concerns regarding using artificial intelligence in the medical sciences. In conclusion, it is hoped that using artificial intelligence in medicine will significantly contribute to reducing the costs of hospitals and healthcare centers.

Prof. Hassan Soleimanpour
Scientific Secretary of the congress

به نمایندگی از کمیته اجرایی اولین کنگره مجازی بین‌المللی کاربرد هوش مصنوعی در علوم پزشکی، مایه افتخار و مسرت است که به گرمی از حضور مجازی شما پژوهشگران، متخصصان، دانشجویان و علاقه‌مندان حوزه هوش مصنوعی و علوم پزشکی در این رویداد علمی بی‌سابقه استقبال نمایم. برگزاری این کنگره در «تبریز، شهر اولین‌ها»، نشان از اهمیت و جایگاه ویژه‌ی این شهر در پذیرش و به‌کارگیری فناوری‌های نوین دارد و امیدواریم که این رویداد، گامی مؤثر در جهت توسعه و پیشرفت کاربرد هوش مصنوعی در عرصه سلامت باشد. امروزه، هوش مصنوعی به عنوان یکی از مهم‌ترین و تأثیرگذارترین فناوری‌های قرن بیست و یکم، در حال تغییر و تحول بنیادین در صنایع مختلف، از جمله حوزه سلامت و پزشکی است. قابلیت‌های بی نظیر هوش مصنوعی در تجزیه و تحلیل داده‌های عظیم، تشخیص الگوها، یادگیری ماشین و اتوماسیون فرآیندها، افق‌های جدیدی را برای بهبود تشخیص، درمان و پیشگیری بیماری‌ها گشوده است.

این کنگره مجازی، با هدف گرد هم آوردن متخصصان، پژوهشگران، دانشجویان و علاقه‌مندان از سراسر جهان، بستر مناسبی را برای به اشتراک گذاری آخرین دستاوردهای علمی و تبادل تجربیات در زمینه کاربرد هوش مصنوعی در علوم پزشکی فراهم می‌آورد. برنامه علمی کنگره، شامل سخنرانی‌های کلیدی توسط برجسته ترین متخصصان بین‌المللی، ارائه مقالات علمی، کارگاه‌های آموزشی و جلسات بحث و گفتگو می‌باشد. کمیته اجرایی کنگره، تمام تلاش خود را به کار گرفته است تا این رویداد علمی به بهترین شکل ممکن برگزار شود. ما اطمینان داریم که این کنگره، نقش مهمی در پیشرفت و توسعه کاربرد هوش مصنوعی در علوم پزشکی ایفا خواهد کرد.

بی‌صبرانه منتظر دیدار مجازی شما در این رویداد علمی هستیم.

دکتر علیرضا معتمدی
دبیر اجرایی کنگره

On behalf of the Executive Committee of the First International Virtual Congress on the Practical Application of Artificial Intelligence in Medical Sciences, it is my great honor and pleasure to warmly welcome the virtual presence of researchers, professionals, students, and enthusiasts in the field of artificial intelligence and medical sciences to this unprecedented scientific event. Hosting this congress in Tabriz, the City of Firsts, underscores the significance and unique position of this city in embracing and utilizing modern technologies. We hope that this event will serve as a significant step forward in promoting and advancing the application of artificial intelligence in healthcare. Today, artificial intelligence, as one of the most important and impactful technologies of the 21st century, is fundamentally transforming various industries, including the field of health and medicine. The unparalleled capabilities of artificial intelligence in analyzing massive datasets, pattern recognition, machine learning, and process automation have opened new horizons for improving the diagnosis, treatment, and prevention of diseases. This virtual congress aims to bring together experts, researchers, students, and enthusiasts from around the world, providing an excellent platform for sharing the latest scientific achievements and exchanging experiences in the application of artificial intelligence in medical sciences. The scientific program of the congress includes keynote speeches by leading international experts, presentation of scientific papers, educational worshops, and discussion sessions. The Executive Committee of the congress has made every effort to ensure that this scientific event is organized in the best possible manner. We are confident that this congress will play an important role in advancing and developing the use of artificial intelligence in medical sciences.

We eagerly look forward to your virtual participation in this scientific event.

Sincerely, Secretary of the Executive Committee of the First International Virtual Congress on the Practical Application of Artificial Intelligence in Medical Sciences

Dr. Alireza Motamedi
Executive Secretary of the congress

کمیته علمی

دکتر مجتبی محمدزاده لامع، رئیس کنگره: بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
دکتر حسن سلیمان پور، دبیر علمی کنگره: بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
دکتر علیرضا معتمدی، دبیر اجرایی: دانشگاه علوم پزشکی تبریز، ایران
دکتر بهروز مینائی: دبیر ستاد توسعه فناوری های هوش مصنوعی و رباتیک ریاست جمهوری، دانشگاه علم و صنعت ایران، تهران، ایران
دکتر محمد شهرام معین: پژوهشگاه ارتباطات و فناوری اطلاعات، انجمن سیستم های هوشمند ایران، تهران، ایران
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دکتر محمد بهشتی: دانشگاه میسوری، ایالات متحده آمریکا
دکتر عبدالحسن کاظمی: دانشگاه علوم پزشکی تبریز، ایران
دکتر محمد رضا مومن زاده: دانشگاه علوم پزشکی هوشمند، تهران، ایران
دکتر یهان یوسف زاده: دانشگاه علوم پزشکی هوشمند، تهران، ایران
دکتر بابک ثابت: دانشگاه علوم پزشکی شهید بهشتی، تهران، ایران
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دکتر سمیه سلطانی: دانشگاه علوم پزشکی تبریز، ایران
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دکتر لاله خدایی: دانشگاه علوم پزشکی تبریز، ایران
دکتر سعید پیرمرادی: دانشگاه علوم پزشکی تبریز، ایران
دکتر جلیل قویدل نیچران: دانشگاه شهید مدنی آذربایجان، تبریز، ایران
دکتر فرزین مدرس خیابانی: دانشگاه آزاد اسلامی تبریز، ایران
دکتر عطا الله جدیری: دانشگاه علوم پزشکی تبریز، ایران
دکتر میلاد عبدالله زاده: دانشگاه فناوری و طراحی سنگاپور، سنگاپور
دکتر مهداد اسماعیلی: دانشگاه فنلاند، فنلاند
دکتر سما رهنمایان:
۱. مرکز تحقیقات علوم اعصاب، دانشگاه علوم پزشکی تبریز، ایران
۲. معاونت آموزشی و پژوهشی، بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
مهندس صنوبر نادریان: کمیته تحقیقات و فناوری دانشجویی، دانشگاه علوم پزشکی تبریز، ایران

Prof. Jiao Fuyong: Shaanxi Provincial People's Hospital,European Center for Traditional Chinese Medicine .International Exchange Center of the Shanghai Cooperation Organization Hospital Cooperation Union. Chairman ,The World Proactive Medicine Committee, Vice Chairman ,The World Artificial Consciousness Association

Scientific Committee

Dr. Mojtaba Mohammadzadeh Lame, President of the congress: Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
Prof. Hassan Soleimanpour, Scientific secretary of the congress: Deputy of Education and Research, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
Dr. Alireza Motamedi, Executive Secretary of the congress: Tabriz University of Medical Sciences, Tabriz, Iran
Prof. Behrouz Minaei: Secretary of the Presidential Headquarters for Artificial Intelligence and Robotics Development, University of Science and Technology, Tehran, Iran
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Dr. Saeed Pirmoradi: Tabriz University of Medical Sciences, Tabriz, Iran
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Dr. Milad Abdollahzadeh: Singapore University, Singapore
Dr. Mahdad Esmaili: University of Eastern Finland, Finland
Dr. Sama Rahnemayan:
1. Neuroscience research center, Tabriz University of Medical Science, Tabriz, Iran
2.Deputy of Education and Research, Imam Reza General Hospital, Tabriz University of Medical Science, Tabriz, Iran
Senobar Naderian: Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
Prof. Jiao Fuyong: Shaanxi Provincial People's Hospital,European Center for Traditional Chinese Medicine .International Exchange Center of the Shanghai Cooperation Organization Hospital Cooperation Union. Chairman ,The World Proactive Medicine Committee, Vice Chairman ,The World Artificial Consciousness Association

کمیته اجرائی

دکتر علیرضا معتمدی: دانشگاه علوم پزشکی تبریز، ایران
دکتر فاطمه علیپور یگانه: معاونت آموزشی و پژوهشی بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
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دکتر طناز نوین بهادر: معاونت آموزشی و پژوهشی بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
دکتر سما رهنمایان:
۱. مرکز تحقیقات علوم اعصاب، دانشگاه علوم پزشکی تبریز، ایران
۲. معاونت آموزشی و پژوهشی، بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
دکتر مهدی زحمتیار: دانشگاه علوم پزشکی تبریز، ایران
دکتر فرزان اسدی راد: دانشگاه علوم پزشکی تبریز، ایران
دکتر امیرپویان طبیبی: مدیر دبیرخانه اجرائی کنگره،مدیر عامل هلدینگ بین المللی رکسان، دانشگاه علوم پزشکی اصفهان، ایران
پروانه موحد: معاونت آموزشی و پژوهشی بیمارستان امام رضا (ع)، دانشگاه علوم پزشکی تبریز، ایران
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فرشید رادمرد: مسئول اجرایی هلدینگ بین المللی رکسان
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خلاصه مقالات سخنرانی

Oral Abstracts

نقشه راه و سند ملی توسعه هوش مصنوعی کشور

محمدشهرام معین

هوش مصنوعی به عنوان یک فناوری تحول ساز و تأثیر گذار در ابعاد مختلف حکمرانی دولت ها، کسب و کار سازمانها و امور جاری و زندگی اجتماعی و شخصی افراد در کشورهای مختلف مطرح شده و با سرعت فزاینده و به شکل روزافزونی در حال گسترش است. این فناوری دارای مزایای بسیاری در تمام ابعاد فوق الذکر بوده که از مهمترین آنها می توان به افزایش بهره وری، صرفه جوئی در زمان و هزینه و نوآوری اشاره نمود. در مقابل، هوش مصنوعی می تواند به شکل نامناسبی مورد استفاده قرار گرفته و باعث ایجاد خسارات جبران ناپذیری گردد، منجمله خدشه دار نمودن حریم خصوصی، سودهی غرض ورزانه افکار عمومی، تعارض به امنیت سازمانی و ملی و تخریب فرهنگ و اخلاق اجتماعی.
به همین دلیل دولت ها و سازمان های مختلفی در طی سال های اخیر اقدام به شناخت دقیق هوش مصنوعی و برنامه ریزی، تدوین اسناد، دستورالعمل ها و نقشه راه های توسعه آن نموده اند تا ضمن بهره برداری از مزایای آن، مانع بروز مشکلات و خسارات ناشی از استفاده نادرست آن بشوند. دولت ایران نیز از این قاعده مستثنی نبوده و لذا فعالیت های مختلفی در این زمینه از حدود ۵ سال پیش انجام داده است، از این بین می توان به تدوین پیش نویس سند فناوری هوش مصنوعی در معاونت علمی ریاست جمهوری، تدوین نقشه راه توسعه ملی هوش مصنوعی در پژوهشگاه ارتباطات و فناوری اطلاعات، تدوین سند ملی هوش مصنوعی در شورایعالی انقلاب فرهنگی و طرح ملی هوش مصنوعی در مجلس شورای اسلامی اشاره کرد.
در این سخنرانی در صدد معرفی نقشه راه توسعه ملی هوش مصنوعی تدوین شده در پژوهشگاه ارتباطات و فناوری اطلاعات و سند ملی هوش مصنوعی مصوب شورایعالی انقلاب فرهنگی و روند اجرای آنها بوده و اشاره ای نیز به بقیه اسناد مرتبط در سطح ملی خواهیم نمود.
کلیدواژه: هوش مصنوعی، نقشه راه، سند ملی، توسعه ملی

The National AI Development Roadmap and Strategic Document Research

Mohammad–Shahram Moin

Artificial intelligence (AI) has emerged as a transformative and influential technology in various dimensions of governance, business organizations, daily affairs, and the social and personal lives of individuals in different countries. It is expanding rapidly and increasingly. This technology offers numerous advantages across all mentioned dimensions, with the most significant benefits including increased productivity, time and cost savings, and innovation. On the other hand, AI can be misused, leading to irreparable damages, such as violating privacy, manipulating public opinion for biased purposes, compromising organizational and national security, and undermining social culture and ethics.

For this reason, governments and various organizations in recent years have undertaken efforts to deeply understand AI and have engaged in planning, drafting documents, guidelines, and development roadmaps to leverage its benefits while preventing the problems and damages caused by its misuse. The Iranian government has also been no exception, and various activities have been carried out in this field over the past five years. These include the drafting of the AI Technology Document by the Vice Presidency for Science and Technology, the preparation of the National AI Development Roadmap by the ICT Research Institute, the formulation of the National AI Document by the Supreme Council of the Cultural Revolution, and the National AI Project in the Islamic Consultative Assembly (Parliament).

In this presentation, we aim to introduce the National AI Development Roadmap drafted by the ICT Research Institute, the National AI Document approved by the Supreme Council of the Cultural Revolution, and their implementation processes, while also referencing other related documents at the national level.

Keywords: AI, Roadmap, National Document, National Development

ICT Research Institute, Tehran, Iran

The Future of Artificial Intelligence in Healthcare

Behrouz Minaei[1], Mohammad Shahram Moin[2], Hossein Shahsavarani[3], Babak Sabet[4], Mohammadreza Momenzadeh[5], Yohan Yusefzadeh[6], Mustafa Ghaderzadeh[7], Abdolhassan Kazemi[8]

Artificial Intelligence (AI) stands poised to revolutionize healthcare delivery, promising to transform everything from clinical decision-making to patient care management. As healthcare systems worldwide grapple with increasing demands and resource constraints, AI technologies offer potential solutions to enhance efficiency, accuracy, and accessibility of medical services. Deep learning algorithms have demonstrated remarkable capabilities in medical imaging analysis, often matching or exceeding human expert performance in detecting conditions like cancer and cardiovascular disease. Meanwhile, natural language processing is enabling the automation of administrative tasks and improving electronic health record systems, allowing healthcare providers to spend more time with patients.

Looking ahead, AI is expected to play a crucial role in personalized medicine, analyzing vast amounts of patient data to tailor treatment plans to individual genetic profiles and medical histories. Predictive analytics powered by AI could help identify at-risk patients before conditions become severe, enabling preventive interventions and reducing hospitalization rates. In surgical settings, AI-assisted robotics are becoming more sophisticated, promising greater precision and consistency in complex procedures. However, significant challenges remain, including concerns about data privacy, algorithmic bias, regulatory compliance, and the need for human oversight. The integration of AI into healthcare also raises important ethical questions about the balance between automation and human judgment in medical decision-making.

As these technologies continue to evolve, successful implementation will require careful consideration of both technical capabilities and human factors, ensuring that AI serves as a tool to augment rather than replace healthcare professionals. The future of AI in healthcare lies not just in technological advancement, but in creating systems that enhance the human elements of medical care while improving outcomes and accessibility for patients worldwide.

Keywords: Artificial Intelligence, Healthcare, clinical decision-making, Deep learning, natural language processing

1. University of Science and Technology, Tehran, Iran
2.ICT Research Institute, Tehran, Iran
3. Shahid Beheshti University, Tehran, Iran
4. Shahid Beheshti University of Medical Sciences, Tehran, Iran
5,6, Smart University of Medical Sciences, Tehran, Iran
7. Urmia University of Medical Sciences, Urmia, Iran
8. Medical Philosophy and History Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

هوش مصنوعی و آینده طراحی زیستی

حسین شاهسورانی

تلاقی زیست‌شناسی و فناوری در سال‌های اخیر منجر به مفهوم جدیدی از طراحی زیستی به عنوان یک گرایش نوظهور شده است که به دنبال یافتن راه‌حل‌های خلاقانه برای پیچیده‌ترین چالش‌های جهان با ورودی از قلمرو بیولوژیکی است. غضروف های احیا کننده فتوسنتزی، چسب مشتق شده از صدف، تا حیوانات کایمریک، و نوزادان ویرایش CRISPR شده متال هایی آشنا از حیطه بیودیزاین می باشند. نظر بر این است که طراحی زیستی به زودی زندگی انسان را متحول می کند، جایی که فرآیندهای الهام گرفته از بیولوژی و مواد زیستی برای پایداری و نوآوری به کار گرفته می شوند هم اکنون ادغام هوش مصنوعی (AI) در طراحی زیستی ما را قادر می سازد تا سیستم های بیولوژیکی را مهندسی کنیم و انتظار می رود، پیشرفت های انقلابی در بیوتکنولوژی، علوم دارویی و مهندسی ژنتیک به ارمغان بیاورد که راه را برای طراحی زیستی برای حرکت فراتر از تقلید صرف به سمت ایجاد مواد زنده جدید هموار خواهد کرد.
اگرچه خطرات قابل توجهی از سوء استفاده از این توانایی های تکنیکال در سطح جهانی وجود دارد، اما یه هر حال رویکردهای طراحی زیستی به کمک هوش مصنوعی بر روی داده‌های بیولوژیکی آموزش داده می‌شوند و همیشه برای ارائه بینش، پیش‌بینی و طرح‌های جدید مرتبط با سیستم‌های بیولوژیکی مختلف طراحی و توسعه می‌یابند و در نتیجه پیشرفت‌ها در یافتن درمان‌های جدید را تسهیل می‌کنند. که انتظار می رود تأثیر این موارد در جنبه های گسترده تر علوم زیستی و صنایع مرتبط مانند کشاورزی، پزشکی و انرژی زیستی قابل توجه باشد. البته در کنار این پیشرفت ها، باید توجه داشت که مقررات آینده‌نگرانه که از هرگونه سوء استفاده از کاربرد هوش مصنوعی در طراحی زیستی جلوگیری می‌کند باید در نظر گرفته شوند، تا اطمینان حاصل شود، که مزایای این فناوری‌ها می‌تواند به صورت ایمن و حفاظت شده بدون ایجاد سیستم های بیولوژیکی خطرناک، محقق شوند و هدف مطالعه حاضر نیز، تبیین جامع استراتژی‌های نوآورانه مختلف استفاده از هوش مصنوعی در بهبود طراحی بیولوژیکی از دیدگاه‌های مختلف سیاست، امنیت زیستی، عدم تحمیل هزینه، توسعه اخلاقی و پرهیز ازآسیب رساندن به طبیعت است
.کلمات کلیدی: طراحی زیستی، هوش مصنوعی، ویرایش ژنوم، مهندسی سیستم بیولوژیکی

دانشگاه شهید بهشتی، تهران، ایران

Artificial Intelligence and Future of Biodesign

Hosein Shahsavarani

The intersection of biology and technology in recent years has led to a new concept of bio–design as an emerging trend that seeks to find creative solutions to the world's most complex challenges with input from the biological realm. From photosynthetic regenerative cartilage, mussel–derived glue, to chimeric animal, and CRISPR edited babies, biodesign is revolutionizing human life soon where bioinspired processes and biomaterials are harnessed for sustainability and innovation. The integration of artificial intelligence (AI) to biodesign enable us to engineer biological systems and it is expected to bring revolutionary advancements in biotechnology, pharmaceutical sciences and genetic engineering that paved the way for biodesign to move beyond mere imitation to the creation of new living materials though it pose significant risks of misuse globally. AI assisted approaches are trained on biological data and are always designed and developed to offer insights, predictions, and novel designs related to various biological systems, thereby facilitating advancements in the finding of new therapeutics. Their influence is expected to be substantial across the broader aspects of life sciences and related industries such as agriculture, medicine, and bioenergy. Moreover, it must be noted that prospective regulations that prevent any misuses of AI application in bio–design must be considered in order to ensure that the benefits of these technologies can be realized safely and securely without making any dangerous biological system. Present study aims to comprehensively explain different innovative strategies of using AI in enhancement of biological design from various points of views of policy, biosecurity, and cost without significantly harming nature.
Keywords: biodesign, artificial intelligence, genome editing, biological system engineering

Shahid Beheshti University, Tehran, Iran

کار بست هوش مصنوعی در ارتقای نظم سلامت

دکتر بهروز مینائی

هوش مصنوعی به عنوان یک فناوری تحول ساز و تأثیر گذار در ابعاد مختلف حکمرانی دولت ها، کسب و کار سازمانها و امور جاری و زندگی اجتماعی و شخصی افراد در کشورهای مختلف مطرح شده و با سرعت فزاینده و به شکل روزافزونی در حال گسترش است. این فناوری دارای مزایای بسیاری در تمام ابعاد فوق الذکر بوده که از مهمترین آنها می توان به افزایش بهره وری، صرفه جوئی در زمان و هزینه و نوآوری اشاره نمود. در مقابل، هوش مصنوعی می تواند به شکل نامناسبی مورد استفاده قرار گرفته و باعث ایجاد خسارات جبران ناپذیری گردد، منجمله خدشه دار نمودن حریم خصوصی، سودهی غرض ورزانه افکار عمومی، تعارض به امنیت سازمانی و ملی و تخریب فرهنگ و اخلاق اجتماعی.
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کلیدواژه: هوش مصنوعی، نقشه راه، سند ملی، توسعه ملی

دانشگاه علم و صنعت،تهران، ایران

هوش مصنوعی، سینتتیک بیولوژی و تحقق ماشین های زنده

عبدالحسن کاظمی

عناوین سینیتیک بیولوژی Synthetic biology، میمیک بیولوژی Mimic biology، آرتیفیشال بیولوژیArtificial biology و ویرچوال بیولوژی Virtual biology در واقع ناظر به تحقق «طبیعت ثانوی» Second nature و یا تلاش برای خلق مجدد طبیعت هستند که چهارچوب اَبَرروند اساسی در حوزه علوم زیستی و پزشکی را با تکیه به هوش مصنوعی شکل می دهد و با سنتز صناعی یا دستکاری ژنومی؛ یک ژنوم کمینه Minimal genome به عنوان «شاسی زیستی» Biological chassis و سپس «سلول شاسي» Cell chassis؛ يك سلول پايه دلخواه برای مقاصد تعریف شده معین را به وجود می آورد. «شاسی زیستی» قابلیت تلفیق با هوش مصنوعی برای پیدایش (تولید؟، ایجاد؟، ابداع؟ خلق؟ یا...) برای ماشین های زنده Alive machine را محقق می نماید که تکمیل و ارتقا این پله هاي اولیه (شاسي زيستي، شاسي سلولي)، در نهایت به پله نهایی يعني انسان هوموسایبر (Homosyber human (Techniqueno species, منتهی می شود. انسان هوموسایبر می تواند فقط متکی به هوش مصنوعی باشد و یا هم افزایی هوش مصنوعی در کنار هوش بیولوزیک خود را داشته باشد و به این ترتیب نسل انسان هوموساپینس Homo sapiens که محصول روندهای تکامل طبیعی، گزینش طبیعی و فشارهای تکاملی در اشل میلیاردها سال تکامل گونه های زنده می باشد، به انسان هوموسایبر یا تکنو ساپین Sapien Techno مبدل مي شود که در تحقق و بطن خود؛ البته مفهوم ترانس هیومنیزیم Trans Humanism را در پی دارد و به عینیت دوپینگ ژنتیکی، بساز بفروشی ژنتیکی، انتخاب صفت، طراحي نوزاد دارای توانایی های مغزی تقویت شده با هوش مصنوعی و ... هم می انجامد، ضمن آنکه هوش مصنوعی انسان هوموساپینس، مفهوم اندام بیونیک را هم دارد.
عینیت مفاهیم فوق بصورت مصداقی و تحقق ماشین های زنده به نوبه خود، مرز میان ماشین غیر زنده، روبوت و انسان فاعل ارادی مختار آزاد را از بین می برد بویژه آنکه ماشین های زنده، دارای هویتDignity بوده و شهروند تلقي خواهند شد و لذا در کنار کرامت انسانHuman dignity موضوع کرامت ماشین Machine dignity و صد البته به تبع آن بحث اخلاق ماشین Machine Ethics و ارزش ها و هنجارهای اخلاقی مربوط به تعامل Interaction، انسان و جامعه بشری با جامعه ماشین های زنده دارای هویت و کرامت مطرح خواهد شد. مجموعه موارد فوق به تغییر ساختار و مفاهیم اساسی مربوط به تمدن بشری، فرهنگ، جامعه، ارزش های اخلاقی، مفهوم حُسن و قُبح هنجاري و اخلاقي، گونه پرستی Speciesism انسان منجر شده و ضرورت جدّی تامل و تدقیق بیشتر و عمیق تر در باب و تلقی از انسان به معنای غایت خلقت را مطرح خواهد کرد، که این تامل هم به منزله الزام به تجدید نظر در همه مفاهیم مانوس در سابقه تمدنی جوامع انسانی را پیش خواهد آورد، همچنانکه در حیطه گونه های غیر انسانی موجودات زنده، پیدایش گونه های شیمر، میکروارگانیسم های فاقد سابقه حضور در زنجیره حیات و اکولوژی و چرخه های زیستی (و احیاناً تقویت شده با هوش مصنوعی)، توازن جدید و عرصه های ناشناخته در بیولوژی را پیش خواهد آورد که از اساسی ترین موارد قابل تامل آن، نحوه ارتباطات و تعاملات فاقد سابقه زیستی و اکولوژیکی این «طبیعت ثانوی» (طبیعت جدید) بر خوردار از هوش مصنوعی، با همدیگر و هکذا با « طبیعت اولیه» یا طبیعت موجود می باشد و در این میان البته امکان و یا عدم امکان همزیستی Symbiosis مابین این دو عرصه محل مناقشه و مجادله می باشد زیرا استقرار آپارتاید بیولوژیک Biological apartheid، راه حل رهگشایی برای غوامض این عرصه تلقی نمی شود.
کلیدواژه: سینتتیک بیولوژی ، طبیعت ثانوی، هوش مصنوعی، آپارتاید زیستی، کرامت ماشین

دانشگاه علوم پزشکی تبریز، ایران

Synthetic biology, Artificial intelligence, Alive machine

Abdolhassan Kazemi

The subjects like Synthetic biology, Mimic biology, Artificial biology, and Virtual biology actually refer to the realization of “second nature, new nature” or the attempt to recreate nature.
Forms the basic super–framework in the field of life and medicine sciences and with synthetic synthesis or genomic manipulation; A minimal genome called the “Biological chassis” and then the “Cell chassis”; the back cell creates the desired or ideal base for specific defined purposes.
“Bio–chassis” realizes the ability to integrate with artificial intelligence for the emergence (production?, assembly?, creation? or...) for living machines that complete and improve these initial steps (bio–chassis, cellular chassis) Finally, it leads to the final step, Homosyber human. Homocyber human can have the synergy of artificial intelligence along with his biological intelligence, and in this way, the generation of Homo sapiens, which is the product of natural evolution processes, natural selection and evolutionary pressures in the billions of years of evolution of living species, will become Homocyber human or Techno Sapien, which in its realization and heart; of course, leads to Trans Humanism. Albeit, transhumanism also leads to the objectification of genetic doping, making genetic sales, selecting traits, designing babies with brain abilities enhanced by artificial intelligence, etc.
These initial steps (bio–chassis, cellular chassis) eventually lead to the final step, the Homosyber human (Techniqueno species), which is the descendant of Homo sapiens, the product of natural evolutionary processes, natural selection, and evolutionary pressures over species evolution during billions years. Is alive, transforms into a homosyber human being who in his realization and belly; of course, the concept of Trans Humanism follows and also leads to the objectivity of genetic doping, genetic fabrication, trait selection, infant design, and so on.
The objectivity of the above concepts, of course, leads to the realization of live machines, which in turn blurs the line between the non–living machine, the robot, and the human free agent, especially since living machines have a Dignity identity and are considered citizens. Therefore, along with human dignity, human dignity is the subject of machine dignity and of course, consequently, the discussion of machine ethics and the values and moral norms related to the interaction of human and human society with the society of living machines with identity and dignity.
The combination of the above ideas will lead to a change in the structure and basic concepts related to human civilization, culture, society, education, moral and legal values, the concept of normative and moral virtues and ugliness, idolatry and the perception of human beings as the end of creation. All familiar concepts in the history of civilization will advance human societies, as in the case of non–human species of living organisms, the emergence of chimer species, microorganisms (and possibly reinforced with artificial intelligence), with no history of vacuolar life chain and biological cycles, new equilibrium and unknown areas in biology.
One of the most important issues to consider is the manner of communication and interaction without the biological and ecological background of this “secondary nature or new nature” that has artificial intelligence, with each other and with the “primary nature” or existing nature, and in the meantime, of course, the possibility or impossibility Symbiosis is a point of contention between these two areas, because the establishment of “Biological apartheid” is not considered a solution to the dilemma of this area.
Keywords: Synthetic biology, Secondary nature, Artificial intelligence, Biological apartheid, Machine dignity

Tabriz University of Medical Sciences,Tabriz, Iran

تئوری هوش مصنوعی و نمودار و تحلیل شبکه در سرطان

طاهاصمدسلطانی

نظریه گراف و شبکه (Graph and Network Theory) ابزارهای قدرتمندی برای درک پیچیدگی سرطان ارائه می‌دهند. با مدل‌سازی ژن‌ها، پروتئین‌هاو تعاملات آن‌ها به‌عنوان گره‌ها (Nodes) و، می‌توانیم ببینیم سرطان چگونه سیستم‌های زیستی را مختل می‌کند و راه‌های مقابله با این اختلالات را بررسی کنیم.
برای مثال، این دیدگاه به ما کمک می‌کند تا گروه‌های معیوب ژن‌ها که به‌عنوان شبکه‌های هم‌بیان ژنی (Gene Co-expression Networks) شناخته می‌شوند، شناسایی کنیم، مسیرهای حرکت انرژی در سلول‌های سرطانی را از طریق شبکه‌های متابولیکی (Metabolic Networks) بررسی کنیم، و مسیرهای ارتباطی مختل‌شده (Signaling Pathways) را که منجر به رشد کنترل‌نشده می‌شوند، کشف کنیم. با استفاده از داده‌ها و ابزارهایی نظیر The Cancer Genome Atlas (TCGA) و پایگاه داده STRING، این مدل‌های شبکه‌ای دیدگاه شفاف‌تری از فرآیندهای پیشرفت سرطان ارائه می‌دهند.
یکی از مفاهیم مهم در این حوزه، "موتیف‌ها" (Motifs) هستند. این الگوهای کوچک و تکرارشونده در شبکه‌ها، در موارد زیادی توسط سرطان بازسازی می‌شوند تا رشد سریع‌تر یا مقاومت در برابر درمان را ممکن سازند. شناسایی این تغییرات می‌تواند ما را به سمت روش‌های جدید درمان هدایت کند. به‌عنوان مثال، تحلیل کوتاه‌ترین مسیرها در این شبکه‌ها می‌تواند مسیرهای کلیدی ارتباطی در سرطان را مشخص کند و به ما نشان دهد که مداخلات در کدام نقاط تأثیر بیشتری خواهد داشت.
هوش مصنوعی (Artificial Intelligence – AI) و یادگیری ماشین (Machine Learning – ML) نقش کلیدی در این فرآیند ایفا می‌کنند. آن‌ها به ما کمک می‌کنند تا داده‌های پیچیده را تحلیل کنیم، پیش‌بینی کنیم که تغییرات ژنتیکی چگونه بر سرطان تأثیر می‌گذارد و راهبردهای درمانی شخصی‌سازی‌شده توسعه دهیم. ابزارهایی نظیر شبکه‌های عصبی گرافی (Graph Neural Networks) و یادگیری عمیق (Deep Learning) امکان بررسی این شبکه‌ها را با جزئیات و دقت فوق‌العاده‌ای فراهم می‌کنند.
در نهایت، این ارائه نشان می‌دهد که ترکیب نظریه شبکه، زیست‌شناسی (Biology) و هوش مصنوعی، راه‌های نوینی برای درمان سرطان و بهبود نتایج بیماران ارائه می‌دهد.

AI & Graph theory and network analysis in cancer

Taha Samad-Soltani

Graph and network theory provide powerful ways to understand the complexity of cancer. By visualizing genes, proteins, and their interactions as nodes and connections, we can see how cancer disrupts biological systems and explore ways to address these disruptions. For instance, this perspective helps us identify faulty groups of genes—what we call gene co-expression networks—trace how energy moves within cancer cells through metabolic networks, and uncover broken communication pathways (signaling pathways) that lead to uncontrolled growth. Using tools and data from platforms like The Cancer Genome Atlas (TCGA) and the STRING Database, these network models give us a clearer picture of how cancer develops. One important concept in this field is 'motifs.' These are small, repeating patterns in networks, and cancer often rewires them to grow faster or resist treatments. Spotting these changes can help us focus on new approaches to treatment. For example, analyzing shortest paths in these networks can highlight key communication routes in cancer, showing us where interventions might have the biggest impact. Artificial intelligence (AI) and machine learning (ML) play a key role in this process. They help us analyze complex datasets, predict how genetic changes influence cancer, and develop personalized treatment strategies. Tools like graph neural networks and deep learning allow us to explore these networks in remarkable detail and precision. Ultimately, this presentation shows how the combination of network theory, biology, and AI offers new ways to approach cancer treatment and improve outcomes for patients.

Tabriz University of Medical Sciences, Tabriz, Iran

هوش مصنوعی در تشخیص سرطان های شایع در زنان

محمد ایوب زاده

هوش مصنوعی (AI) در حال تحول تشخیص سرطان‌های شایع در زنان، از جمله سرطان‌های پستان، دهانه رحم، تخمدان، آندومتر و ریه است. با بهبود تحلیل تصاویر، پیش‌بینی خطر و ادغام داده‌های بیومارکرها، هوش مصنوعی دقت و کارایی تشخیص را افزایش می‌دهد. در سرطان پستان، ابزارهایی مانند iCAD's ProFound AI ماموگرافی‌ها و نمونه‌های بیوپسی را تحلیل می‌کنند، در حالی که مدل‌های پیش‌بینی، خطرات ژنتیکی و سبک زندگی را ارزیابی می‌کنند. در سرطان دهانه رحم، هوش مصنوعی تحلیل پاپ اسمیر را خودکار کرده و داده‌های HPV را برای غربالگری بهتر ادغام می‌کند. در سرطان تخمدان، طبقه‌بندی سونوگرافی و کشف بیومارکرها با استفاده از هوش مصنوعی بهبود یافته است. برای سرطان آندومتر، هوش مصنوعی MRI و داده‌های بیوپسی را ارزیابی می‌کند، در حالی که در سرطان ریه، تحلیل سی‌تی اسکن و پیش‌بینی خطر با کمک هوش مصنوعی انجام می‌شود.

با وجود پتانسیل بالا، هوش مصنوعی با چالش‌هایی مانند نگرانی‌های حریم خصوصی داده‌ها، سوگیری در داده‌های آموزشی و مقاومت در برابر ادغام بالینی مواجه است. موانع نظارتی و ماهیت «جعبه سیاه» برخی الگوریتم‌ها نیز مانع پذیرش آنها می‌شوند. چشم انداز آینده شامل ادغام چندوجهی داده‌های تصویربرداری، ژنومیک و سوابق الکترونیک سلامت، برنامه‌های غربالگری شخصی‌شده و تشخیص زودهنگام با استفاده از بیوپسی است. چارچوب‌های مشارکتی و هوش مصنوعی قابل تفسیر (XAI) به ایجاد اعتماد و بهبود شفافیت مدل‌ها کمک می‌کنند.

در نتیجه، هوش مصنوعی فرصت‌های بی‌سابقه‌ای برای تشخیص دقیق و زودهنگام سرطان در زنان فراهم می‌کند و راه را برای مراقبت‌های شخصی‌شده و عدالت در مراقبت هموار می‌سازد. رفع چالش‌ها با پیشرفت تحقیقات در این حوزه، تحقق کامل پتانسیل هوش مصنوعی را در حوزه تشخیص سرطان‌های شایع زنان تضمین خواهد کرد.

Artificial Intelligence in diagnosis of common cancers in women

Mohammad Ayyoubzadeh

Artificial intelligence (AI) is transforming the diagnosis of common cancers in women, including breast, cervical, ovarian, endometrial, and lung cancers. By improving image analysis, risk prediction, and integrating biomarker data, AI is increasing the accuracy and efficiency of diagnosis. In breast cancer, tools like iCAD's ProFound AI analyze mammograms and biopsy specimens, while predictive models assess genetic and lifestyle risks. In cervical cancer, AI is automating Pap smear analysis and integrating HPV data for better screening. In ovarian cancer, ultrasound classification and biomarker discovery have been improved using AI. For endometrial cancer, AI is evaluating MRI and biopsy data, while in lung cancer, CT scan analysis and risk prediction are done with the help of AI. Despite its high potential, AI faces challenges such as data privacy concerns, bias in training data, and resistance to clinical integration. Regulatory barriers and the "black box" nature of some algorithms also hinder their adoption. Future prospects include multimodal integration of imaging, genomics, and electronic health record data, personalized screening programs, and early detection using biopsy. Collaborative frameworks and interpretable artificial intelligence (XAI) help build trust and improve the transparency of models. As a result, AI offers unprecedented opportunities for accurate and early detection of cancer in women, paving the way for personalized care and equity in care. Addressing these challenges as research advances in this area will ensure the full realization of AI's potential in the diagnosis of common female cancers.

Tehran University of Medical Sciences,Tehran, Iran

قدرت مدل های زبان بزرگ در مراقبت از سرطان

محمد بهشتی

مدل‌های زبانی بزرگ پیشرفتی قابل توجه در حوزه هوش مصنوعی به شمار می‌روند و توان بالقوه‌ای برای تحول در مراقبت و پژوهش سرطان دارند. این مدل‌ها که بر اساس مجموعه داده‌های گسترده و متنوع آموزش دیده‌اند، در تولید متن، خلاصه‌سازی و ترجمه زبان عملکرد برجسته‌ای دارند و به راحتی در حوزه پزشکی قابل تطبیق هستند. در تحقیقات سرطان، این مدل‌ها مقالات زیست‌پزشکی را تحلیل کرده، روندها را شناسایی و کاندیداهای مناسب برای آزمایشات بالینی را پیدا می‌کنند و سرعت کشفیات را افزایش می‌دهند. در مراقبت از بیماران، این مدل‌ها با تهیه یادداشت‌های پیشرفت، خلاصه‌سازی تشخیص‌ها و پشتیبانی از تصمیم‌گیری بالینی بهبود قابل توجهی ایجاد می‌کنند. علاوه بر این، مدل‌های زبانی بزرگ در کشف و توسعه داروها با پیش‌بینی تعاملات بین داروها و اهداف زیستی و کمک به توسعه درمان‌های شخصی‌سازی‌شده نقش مهمی ایفا می‌کنند.

با این حال، اجرای مدل‌های زبانی بزرگ در حوزه سرطان با چالش‌هایی مواجه است. نیاز به منابع محاسباتی گسترده و آموزش مجدد دوره‌ای برای به‌روز ماندن با تحقیقات سریع‌الرشد می‌تواند بودجه سازمان‌ها، به ویژه سازمان‌های کوچک‌تر، را تحت فشار قرار دهد. نگرانی‌های اخلاقی نیز از جمله نقض احتمالی حریم خصوصی داده‌ها، تولید اطلاعات نادرست (توهمات) و سوگیری‌های موجود در مدل‌ها که ممکن است بر دقت بالینی تأثیر بگذارند، وجود دارند. پرداختن به این مسائل برای استفاده مطمئن و عادلانه از مدل‌های زبانی بزرگ در مراقبت سرطان حیاتی است.

با وجود چالش‌ها، مدل‌های زبانی بزرگ پتانسیل چشمگیری برای تحول در مراقبت سرطان دارند و می‌توانند فرآیندها را ساده‌تر، دسترسی را بهبود و نوآوری‌ها را در مراقبت از بیماران، کشف دارو و ثبت سرطان تقویت کنند.

دانشگاه میسوری، ایالات متحده آمریکا

Power of Large Language Models in cancer care

Mohammad Beheshti

Large Language Models (LLMs) represent a significant advancement in artificial intelligence, offering transformative potential in cancer care and research. Trained on vast and diverse datasets, LLMs excel in text generation, summarization, and language translation, making them adaptable to the medical field. In cancer research, they analyze biomedical literature, uncover trends, and identify clinical trial candidates, accelerating discoveries. Patient care is enhanced through applications like drafting progress notes, summarizing diagnoses, and supporting clinical decision-making. Additionally, LLMs facilitate drug discovery by predicting drug-target interactions and assisting in personalized treatment development. However, implementing LLMs in oncology presents challenges. The need for extensive computational resources and periodic retraining to stay current with rapidly evolving research can strain budgets, particularly for smaller institutions. Ethical concerns arise from potential data privacy breaches, hallucinations, and embedded biases that may affect clinical accuracy. Addressing these issues is crucial to ensure reliable and equitable use of LLMs in cancer care. Despite challenges, LLMs demonstrate remarkable potential to revolutionize cancer care by streamlining processes, improving accessibility, and fostering innovations across patient care, drug discovery, and cancer registries.

University of Missouri, USA

کاربرد هوش مصنوعی در تصاویر پاتولوژی

سعید پیرمرادی

هوش مصنوعی به عنوان یک ابزار تحول‌آفرین در پاتولوژی دیجیتال نقش بسزایی ایفا می‌کند و امکان تحلیل سریع‌تر و دقیق‌تر نمونه‌های پاتولوژی را فراهم می‌آورد. با استفاده از الگوریتم‌های یادگیری عمیق و شبکه‌های عصبی، هوش مصنوعی قادر است تصاویر میکروسکوپی را به‌صورت خودکار آنالیز کرده و ناهنجاری‌ها، مانند سلول‌های سرطانی، را با دقت بالا شناسایی کند. این فناوری نه تنها بهره‌وری پاتولوژیست‌ها را افزایش می‌دهد، بلکه از طریق کاهش خطای انسانی و ارائه تشخیص‌های دقیق‌تر، تأثیر مثبتی بر فرآیند درمان بیماران دارد. همچنین، هوش مصنوعی با توانایی پردازش حجم عظیمی از داده‌های تصویری، امکان کشف الگوها و بینش‌های جدید را فراهم می‌کند که می‌تواند به تحقیقات و نوآوری‌های بیشتر در حوزه‌های مرتبط کمک کند. این سخنرانی به بررسی نقش هوش مصنوعی در تحول پاتولوژی دیجیتال، چالش‌های موجود و چشم‌انداز آینده این فناوری خواهد پرداخت.

Application of Artificial Intelligence in Pathology

Saeed Pirmoradi

Artificial intelligence plays a transformative role in digital pathology, enabling faster and more accurate analysis of pathology samples. By leveraging deep learning algorithms and neural networks, AI can automatically analyze microscopic images and detect abnormalities, such as cancerous cells, with high precision. This technology not only enhances the efficiency of pathologists but also reduces human error and provides more accurate diagnoses, positively impacting patient treatment processes. Moreover, AI's ability to process vast amounts of imaging data facilitates the discovery of new patterns and insights, driving further research and innovation in related fields. This speech will explore the role of AI in transforming digital pathology, discuss current challenges, and highlight the future prospects of this groundbreaking technology.

Tabriz University of Medical Sciences, Tabriz, Iran

یادگیری خود نظارتی در تصاویر پزشکی

جلیل قویدل نیچران

یادگیری خودنظارتی (Self-Supervised Learning) یکی از رویکردهای نوین هوش مصنوعی و یادگیری ماشین است که در تحلیل تصاویر پزشکی نیز جایگاه ویژه‌ای پیدا کرده است. این روش برای غلبه بر یکی از چالش‌های اساسی در این حوزه، یعنی کمبود داده‌های برچسب‌دار و هزینه‌های بالای زمانی و مالی فرآیند برچسب‌گذاری دستی، طراحی شده است. یادگیری خودنظارتی با تعریف وظایف خودکار و بهره‌گیری از داده‌های بدون برچسب، امکان استخراج ویژگی‌های پنهان و درک ساختارهای پیچیده داده‌ها را فراهم می‌سازد. این قابلیت نه تنها باعث کاهش نیاز به داده‌های برچسب‌دار می‌شود، بلکه کیفیت و کارایی الگوریتم‌های یادگیری ماشین را در وظایف مختلفی مانند تشخیص بیماری‌ها، قطعه‌بندی تصاویر پزشکی و کشف ناهنجاری‌ها بهبود می‌بخشد.
در این ارائه، ابتدا اصول یادگیری خودنظارتی مورد بررسی قرار گرفته و سپس کاربردهای عملی آن در تحلیل تصاویر پزشکی ارائه خواهد شد. علاوه بر این، پیشرفت‌های اخیر در این حوزه و تأثیر آن‌ها بر بهبود عملکرد مدل‌های یادگیری ماشین، همراه با چالش‌ها و محدودیت‌های موجود، مورد بحث قرار خواهد گرفت. در پایان، به چشم‌انداز آینده یادگیری خودنظارتی در پزشکی پرداخته و نشان داده می‌شود که چگونه این رویکرد می‌تواند به تشخیص دقیق‌تر، تصمیم‌گیری سریع‌تر و بهبود کیفیت خدمات پزشکی کمک کند.

دانشگاه شهید مدنی آذربایجان، تبریز، ایران

Self–Supervised Learning in Medical Images

Jalil Ghavidel Neycharan

Self–Supervised Learning (SSL) is an advanced paradigm in artificial intelligence and machine learning that has established itself as a pivotal approach in medical image analysis. This framework is specifically designed to address one of the most significant challenges in the domain: the limited availability of labeled datasets and the substantial time and cost requirements of manual annotation. By formulating pretext tasks and exploiting unlabeled data, SSL facilitates the learning of latent representations and complex data structures. This approach not only reduces dependency on labeled datasets but also improves the performance and generalization of machine learning models in tasks such as disease classification, medical image segmentation, and anomaly detection. This presentation will delve into the foundational concepts of SSL and its methodologies, followed by an exploration of its applications in medical image processing. Furthermore, recent advancements in SSL techniques and their role in optimizing the performance of machine learning architectures will be discussed, alongside the inherent challenges and limitations of the approach. Finally, the future outlook of SSL in healthcare will be examined, demonstrating its potential to enable more precise diagnostic models, accelerate clinical decision–making, and enhance the overall quality of healthcare systems.

Azarbaijan Shahid Madani University, Tabriz, Iran

الگوریتم های فرا ابتکاری پیشرفته مبتنی بر هوش مصنوعی در پردازش تصاویر پزشکی

فرزین مدرس خیابانی

در سال هاي اخير مكانيسم¬هاي پردازش تصوير به طور وسيعي در حوزه¬هاي مختلف از جمله حوزه پزشکی به منظور بهبود و تسريع در شناسايي به موقع و درمان بيماري¬ها و وضعيت هايي همچون تومورهاي سرطاني ريه و پستان و غيره كه در آن ها زمان، فاكتور مهمي در تشخيص بيماري است، به كار گرفته شده است. همچنين از آنجا كه در سرطان، تشخيص معتبر و صحيح آن هم در كوتاهترين زمان ممكن داراي اهميت است. مكانيسم هاي پردازش تصوير، به عنوان روش هايي ساده و غيرتهاجمي براي شناسايي سلول هاي سرطاني مي باشند كه تشخيص اوليه را سرعت بخشيده و در نهايت شانس زنده ماندن بيماران سرطاني را افزايش مي دهند. در فرآيند پردازش تصوير، پس از گرفتن تصوير مورد نظر، مرحله پيش پردازش، انجام شود. در مرحله پيش پردازش بهبود تصوير انجام ميشود. بهبود تصویر در کل به منظور آسان سازی تفسیر بینائی و درک تصویر به کار برده می شود. بهبود تصویر یکی از موضوعات اصلی در تصاویر با کیفیت بالا می باشد. هدف اصلی بهبود تصاویر پزشکی، نه تنها بهبود تفسیرپذیری یا درک اطلاعات تصاویر پزشکی برای آسیب‌شناسی یا راهنمایی مداخلات پزشکی، بلکه فراهم سازی یک ورودی بهتر برای ماشین و استفاده ی موثرتر در تکنیک¬ها و کاربردهای پردازش تصویر است. برای این منظور از الگوریتم های فرا ابتکاری، جهت خنثی سازی بهتر نقش انسانی و افزایش سطح اثربخشی برای تولید نتایج مطلوب در جهت بهبود تصویر توسعه یافته خوهیم پرداخت. لذا الگوریتم های فرا ابتکاری مختلف که الگوریتم های هوش جمعی و موفق در حل مسائل بهینه¬سازی هستند، در حوزه¬ی بهبود تصاویر پزشکی استفاده شده است. برای بهبود تصاویر پزشکی روش¬های مختلفی از جمله بهبود کنتراست تصویر ارائه خواهد شد.

دانشگاه آزاد اسلامی تبریز، ایران

علم سنجی هوش مصنوعی در جهان

حسن سلیمان پور

این تحقیق که به روش مطالعاتی کتابخانه‌ای و در چارچوب علم‌سنجی توصیفی-کاربردی انجام شده، به بررسی فعالیت‌های اخیر در زمینه رتبه‌بندی دانشگاه‌ها در حوزه هوش مصنوعی پرداخته است. در این راستا، نهادهای مختلفی در سطح جهانی از جمله شاخص هوش مصنوعی انسان‌محور دانشگاه استنفورد (HAI)، موسسه AI rankings، سیستم رتبه‌بندی آموزش EduRank، پایگاه WOS ، سیستم رتبه‌بندی جهانی QS و سیستم رتبه‌بندی SCImago فعالیت داشته‌اند. بر طبق گزارش سال ۲۰۲۴ شاخص هوش مصنوعی استنفورد، در سال ۲۰۲۲ تعداد ۲۳۰ هزار مقاله در مجلات تخصصی هوش مصنوعی منتشر شده، در حالی که تعداد مقالات ارائه شده در کنفرانس‌ها به ۴۲ هزار مقاله رسیده است. از سال ۲۰۱۵، تعداد مقالات منتشر شده در زمینه هوش مصنوعی در مجلات و کنفرانس‌ها به طور قابل توجهی افزایش یافته است. پایگاه داده‌ای به نام Nature Index، که توسط Nature Research جمع‌آوری شده، شامل مقالات علمی منتشر شده در ۸۲ مجله برجسته است. این پایگاه داده به صورت ماهانه به‌روز می‌شود و اطلاعات مربوط به تحقیقات را فراهم می‌کند. در سال ۲۰۲۰، Nature Index اطلاعاتی درباره ۱۰۰ موسسه پیشرو، ۲۵ موسسه در حال توسعه، ۱۰۰ موسسه آکادمیک برتر، ۱۰ موسسه برجسته در زمینه مراقبت‌های بهداشتی، ۱۰ سازمان غیردولتی برتر، ۱۰ نهاد دولتی برجسته، ۵ شرکت برتر، ۱۰۰ سازمان تحقیقاتی برتر، ۲۵ سازمان تحقیقاتی در حال توسعه و ۲۵ کشور پیشرو در زمینه هوش مصنوعی را منتشر کرده است که از پایگاه داده Dimensions به دست آمده است. بر اساس داده‌های منتشر شده توسط پایگاه داده Dimensions، در فاصله سال‌های ۲۰۱۵ تا ۲۰۱۹، چین با ثبت ۳۱۸ هزار و ۵۳۴ مقاله علمی، در صدر فهرست ۲۵ کشور پیشرو در زمینه هوش مصنوعی قرار گرفته است. ایران نیز با انتشار ۳۰ هزار و ۲۲۱ مقاله، در رتبه سیزدهم این فهرست جای گرفته و به عنوان پیشتاز منطقه خاورمیانه در تولید علمی در این حوزه شناخته شده است. با این حال، برای بهبود وضعیت استنادی، افزایش همکاری‌های بین‌المللی و پیشرفت‌های علمی، نیاز به تلاش‌های بیشتری در این زمینه احساس می‌شود. طبق اطلاعات منتشر شده توسط پایگاه نمایه‌سازی وب آو ساینس، در دوره‌ای بیست ساله، بیشترین مقالات علمی در حوزه هوش مصنوعی از سوی دانشگاه تهران، دانشگاه تبریز و دانشگاه صنعتی امیرکبیر به ثبت رسیده است.

Scientometric Analysis of Global Artificial Intelligence

Hassan Soleimanpour

This investigation was carried out using a descriptive–applied scientometric approach, employing bibliographic methodologies. Various global ranking bodies, including Stanford University)s Human–Centered Artificial Intelligence Index (HAI), the Web of Science (WOS) database, SCImago, AI Rankings Institute, EduRank, and the QS World Ranking System have evaluated universities based on their contributions to the field of artificial intelligence. The 2024 report from the Stanford Artificial Intelligence Index indicates that approximately 230,000 articles were published in AI–related journals in 2022, with conference papers numbering around 42,000. Both journal articles and conference publications in artificial intelligence have seen a consistent increase since 2015. The Nature Index, curated by Nature Research, includes 82 premier scientific journals and updates its data monthly. The 2020 edition of the Nature Index provided detailed rankings including the top 25 emerging institutions, top 10 non–governmental organizations, top 100 overall institutions, top 10 healthcare providers, top 100 academic bodies, top 100 research entities, top 5 corporations, top 25 nations, top 25 rising research organizations, and top 10 governmental bodies specializing in artificial intelligence, as per the Dimensions database. From 2015 to 2019, China led the Dimensions database's list of top 25 countries in artificial intelligence with 318,534 publications, while Iran ranked 13th with 30,221 publications. Iran also stands out as the leading Middle Eastern country in terms of AI scholarly output. However, it faces challenges in enhancing its international collaborations, citation impact, and overall scientific advancement. According to the Web of Science database over the past two decades, significant contributions to AI research have come from the University of Tehran, the University of Tabriz, and the Amirkabir University of Technology.

Emergency and Trauma Care Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

مقدمه ای بر کاربردهای هوش مصنوعی در داروسازی

سمیه سلطانی

ادغام هوش مصنوعی (AI) در داروسازی روش‌های توسعه داروها و ارائه خدمات داروسازی را عمیقا دگرگون کرده و فرصت‌های جدیدی را در هر مرحله از آموزش داروسازان تا کشف، تولید و تجویز دارو فراهم آورده است. این سخنرانی تأثیر تحول‌آفرین هوش مصنوعی را در تمام مراحل زنجیره داروسازی بررسی خواهد کرد و کاربردهای آن را در هر فاز روشن خواهد ساخت. در کشف دارو، هوش مصنوعی با استفاده از الگوریتم‌های یادگیری ماشین، شناسایی ترکیبات نوآورانه را ممکن و تسریع می‌کند. تحقیقات نشان می‌دهد که هوش مصنوعی می‌تواند زمان کشف داروهای جدید را تا ۵۰ درصد کاهش دهد و هزینه‌های توسعه را تا ۳۰ درصد کاهش دهد. با تحلیل سریع داده‌های متنوع و بزرگ، هوش مصنوعی به شناسایی کاندیداهای دارویی امیدوارکننده کمک می‌کند و فرآیند توسعه دارو را بهینه می‌سازد. در مراحل پیش‌بالینی و بالینی، توانایی هوش مصنوعی در بهبود تحلیل داده‌ها، پیش‌بینی نتایج و شبیه‌سازی پاسخ‌های بیماران منجر به کارآیی بیشتر در آزمایشات بالینی می‌شود. پلتفرم‌های مبتنی بر هوش مصنوعی می‌توانند داده‌های آزمایش بالینی را تا ۶۰ درصد سریع‌تر از روش‌های سنتی پردازش کنند، که این امر به تسریع فرآیند تصمیم‌گیری و کاهش زمان ورود دارو به بازار کمک می‌کند.

در تولید دارو، هوش مصنوعی فرآیندهای تولید را بهینه‌سازی کرده و با اتوماسیون کنترل کیفیت، نظارت و مدیریت زنجیره تأمین، به صرفه‌جویی‌های قابل توجهی در هزینه‌ها منجر می‌شود. پیش‌بینی‌ها نشان می‌دهند که هوش مصنوعی می‌تواند تا ۱۰ میلیارد دلار در سال هزینه های صنعت داروسازی را کاهش داده و کارآیی تولید را افزایش دهد. در مرحله تجویز، هوش مصنوعی با اتوماسیون تأیید نسخه، شناسایی تداخلات دارویی و ارائه توصیه‌های شخصی‌سازی‌شده دارویی، به بهبود ایمنی بیماران و کارآیی عملیات کمک می‌کند. بهره گیری از هوش مصنوعی میتواند خطاهای دارویی را تا ۵۰ درصد کاهش داده و ایمنی بیماران را به طور قابل توجهی ارتقاء دهند.

علیرغم مزایای قابل توجه، چالش‌هایی برای پذیرش و کابرد هوش مصنوعی در داروسازی وجود دارد. یکی از موانع اصلی، کمبود داروسازان آشنا به مبانی هوش مصنوعی است که مانع استفاده مؤثر از این فناوری‌ها می‌شود. همچنین نگرانی‌هایی در مورد حریم خصوصی داده‌ها، امنیت و ملاحظات اخلاقی هوش مصنوعی وجود دارد که باید مورد توجه قرار گیرند. با پیشرفت هوش مصنوعی، چارچوب‌های نظارتی و دستورالعمل‌های اخلاقی برای استفاده مسئولانه و شفاف این فناوری‌ها ضروری خواهد بود.

در پایان این سخنرانی، شرکت‌کنندگان درک جامع‌تری از چگونگی تحول زیست بوم داروسازی با هوش مصنوعی به دست خواهند آورد. آن‌ها همچنین از پتانسیل هوش مصنوعی برای بهبود مراحل مختلف کشف، تولید، توزیع و دارودرمانی بیماران آگاه شده و با چالش‌ها و فرصت‌های آینده این حوزه آشنا خواهند شد.

An introduction to the application of AI in Pharmacy

Somaieh Soltani

The integration of Artificial Intelligence (AI) in pharmacy is profoundly reshaping the way pharmaceutical services are delivered, creating new opportunities at every stage, from education and drug discovery to dispensing. This speech will explore the transformative impact of AI across the entire pharmaceutical pipeline, shedding light on its applications at each phase. In drug discovery, AI accelerates the identification of novel compounds by utilizing machine learning algorithms and predictive modeling. Studies show that AI can reduce the time it takes to discover new drugs by up to 50%, and cut development costs by as much as 30%. By analyzing vast datasets, AI helps to pinpoint promising drug candidates, thus optimizing the drug development process. During preclinical and clinical trials, AI's ability to enhance data analysis, predict outcomes, and simulate patient responses has resulted in more efficient trials. AI-driven platforms can process clinical trial data 60% faster than traditional methods, expediting decision-making and reducing the overall time to market. In pharmaceutical manufacturing, AI optimizes production processes, automating quality control, monitoring, and supply chain management, leading to significant cost savings. It is estimated that AI can save the pharmaceutical industry up to $10 billion annually by improving manufacturing efficiency and reducing waste. At the dispensing stage, AI contributes to patient safety and operational efficiency by automating prescription verification, flagging potential drug interactions, and providing personalized medication recommendations. AI systems have been shown to reduce medication errors by up to 50%, greatly enhancing patient safety. However, despite these advantages, there are several challenges to the widespread adoption of AI in pharmacy. One major barrier is the lack of AI literacy among pharmacists, which hampers the effective utilization of these technologies. Additionally, concerns around data privacy, security, and the ethical implications of AI in healthcare remain critical issues to address. As AI continues to evolve, regulatory frameworks and ethical guidelines will be essential in ensuring that AI technologies are used responsibly and transparently. By the end of this presentation, attendees will gain a comprehensive understanding of how AI is poised to revolutionize the pharmaceutical industry. They will also appreciate the potential of AI to improve pharmaceutical practices, patient care, and operational efficiency, along with the future challenges and opportunities that lie ahead in this rapidly evolving field.

Tabriz university of medical sciences, Tabriz, Iran

Success and Challenges of Artificial Intelligence in Drug

Taravat Ghafourian

Although the use of computational modeling in several drug discovery disciplines predates the current popularization of Artificial Intelligence (AI) by several decades, AI has only very recently grown in its capacity to enable wider accessibility of drug discovery to smaller, minimally funded entities. The pharmaceutical industry and academic institutions are embracing the implementation of AI in various stages of drug development, from target identification to formulation design and clinical trials. Efficient utilization of AI and generative AI can provide a winning edge within the competitive market of the pharmaceutical industry. AI is anticipated to be the new game-changer within the drug discovery field, with several AI-designed drugs developed by Exscientia, Insilico Medicine, and BenevolentAI entering clinical trials since 2022. Some of these drugs have been made possible through algorithms for protein structure prediction and de novo design of the ligand. Within the ADME/tox field, similar complex machine-learning algorithms are being used and may well grow in the future, for example, by incorporating biological data into AI models for personalized dosing (precision medicine). This presentation will provide examples of successful applications of AI in drug discovery, including design and optimization of chemical libraries, protein structure prediction, network pharmacology, virtual screening, ADME/tox prediction, biomarker discovery for personalized medicine, formulation optimization, and prediction of patient response to pharmacotherapy. In addition, limitations will be discussed. The strength of AI relies on the availability of high-quality data, which has been facilitated through technological advancements in high-throughput experimentations and efforts in the past few decades in establishing longitudinal clinical data. Limitations persist in the availability of high-quality biomedical and clinical data, requiring investments in data acquisition and data curation. The prediction quality of AI models, including their accuracy, generalizability, reliability, and interpretabilty, is a mjor consideration, especially when used for regulatory purposes (e.g., FDA submissions) and clinical decision-making. As datasets improve and AI algorithms become more transparent, their potential use will expand in the future.

University of Florida, USA

تصویربرداری پزشکی پیشرفته با هوش مصنوعی: کاربردهای یادگیری عمیق در توموگرافی انسجام نوری

محمد رشیدی

هوش مصنوعی (AI) راه‌حل‌های نوآورانه‌ای برای چالش‌های دیرینه در تشخیص بالینی ارائه می‌دهد. یکی از کاربردهای حیاتی آن تصویربرداری میکروواسکولاری پوست است که نقش کلیدی در سلامت قلبی‌عروقی و تنظیم حرارت بدن دارد. آنژیوگرافی با توموگرافی همبستگی نوری (OCTA)، یک تکنیک تصویربرداری غیرتهاجمی است که با تجزیه و تحلیل اسکن‌های مکرر از لایه‌های یکسان بافت، نقشه‌های جریان خون را بازسازی می‌کند. با این حال، روش‌های سنتی OCTA نیاز به اسکن‌های متوالی متعدد دارند که منجر به زمان‌های طولانی تصویربرداری و آرتیفکت‌های حرکتی می‌شود که می‌توانند کیفیت تصویر را کاهش دهند.

در این سخنرانی، نشان خواهیم داد که چگونه مدل‌های هوش مصنوعی مبتنی بر یادگیری عمیق، تصویربرداری OCTA را با بهبود سرعت و دقت، متحول می‌کنند. رویکرد ما، شبکه‌های عصبی کانولوشنی (CNN) را با بلوک‌های فشرده‌سازی و تحریک (Squeeze-and-Excitation) ترکیب می‌کند تا استخراج ویژگی‌ها را بهبود بخشد، زمان تصویربرداری را به طور قابل توجهی کاهش دهد و در عین حال جزئیات میکروواسکولار را حفظ کند. علاوه بر این، ما شبکه‌های عصبی کانولوشنی سه‌بعدی (۳D CNN) را معرفی می‌کنیم که از زمینه فضایی در لایه‌های مختلف تصویربرداری استفاده می‌کنند و محدودیت‌های روش‌های سنتی مبتنی بر ۲D را برطرف می‌کنند. این تکنیک، از دست دادن اطلاعات را به حداقل می‌رساند، وفاداری تصویر را افزایش می‌دهد و قابلیت کاربرد بالینی را بهبود می‌بخشد.

با ادغام هوش مصنوعی در تصویربرداری میکروواسکولاری، ما تکنیک‌های تشخیصی سریع‌تر، دقیق‌تر و مقاوم در برابر حرکت را امکان‌پذیر می‌سازیم که در نهایت مراقبت از بیماران در زمینه سلامت قلبی‌عروقی و پوست را ارتقا می‌دهد. این ارائه به بررسی این پیشرفت‌های مبتنی بر هوش مصنوعی و پتانسیل آن‌ها برای کاربردهای بالینی واقعی خواهد پرداخت.

دانشگاه آدلاید، استرالیا

Advanced Medical Imaging with Artificial Intelligence: Deep Learning Applications in Optical Coherence TomographyDiscovery

Mohammad Rashidi

Artificial Intelligence (AI) is transforming medical imaging, offering innovative solutions to long-standing challenges in clinical diagnostics. A critical application is skin microvasculature imaging, which plays a key role in cardiovascular health and thermoregulation. Optical coherence tomography angiography (OCTA), a non-invasive imaging technique, reconstructs blood flow maps by analyzing repeated scans of the same tissue layer. However, conventional OCTA methods require multiple sequential scans, leading to long acquisition times and motion artifacts, which can degrade image quality. In this talk, I will present how deep learning-based AI models are revolutionizing OCTA imaging by improving both speed and accuracy. Our approach integrates convolutional neural networks (CNNs) with squeeze-and-excitation blocks to enhance feature extraction, significantly reducing acquisition time while preserving microvascular details. Additionally, we introduce 3D CNNs, which leverage spatial context across multiple imaging layers, overcoming limitations of traditional 2D-based methods. This technique minimizes information loss, enhances image fidelity, and improves clinical applicability. By integrating AI into microvascular imaging, we enable faster, more accurate, and motion-robust diagnostic techniques, ultimately enhancing patient care in cardiovascular and dermatological health. This presentation will explore these AI-driven advance-ments and their potential for real-world clinical applications.

University of Adelaide, Australia

کاربرد هوش مصنوعی در فارماکوگنوزی

لاله خدایی، سمیه سلطانی

گیاهان دارویی از دیرباز بخش مهمی از درمان بوده اند و نقش حیاتی در پیشگیری و درمان انواع بیماری‌ها ایفا می‌کنند. همچنین گیاهان دارویی منبع مهمی از ترکیبات پیشرو برای تهیه دارو ها می باشند. می توان با استفاده از مدل‌های مبتنی بر یادگیری ماشین (ML) و یادگیری عمیق (DL)و زبان های برنامه ای بزرگ مؤثرترین ترکیبات گیاهی را شناسایی کرد، فرآیندهای استخراج و کروماتوگرافی را بهینه‌سازی کرد و حتی مکانیسم‌های اثر این گیاهان و یا کاربردهای درمانی آنها را پیش‌بینی کرد.
هوش مصنوعی همچنین می‌تواند در ارزیابی سمیت، عوارض جانبی و تعاملات احتمالی بین داروهای گیاهی و داروهای شیمیایی کمک کند. این قدرت پیش‌بینی نه تنها به شناسایی کاندیداهای دارویی جدید کمک می‌کند بلکه در بهبود سیستم‌های تحویل این ترکیبات طبیعی نیز نقش دارد. علاوه بر مدل‌سازی برای پیش‌بینی پدیده های مرتبط با گیاهان دارویی، هوش مصنوعی می‌تواند در شناسایی الگوها نیز مفید باشد و ارتباطات مهمی بین گونه‌های گیاهی، ویژگی‌های شیمیایی آن‌ها و شرایط بهینه کشت و برداشت پیدا کند. این فناوری همچنین می‌تواند در حفاظت از گونه‌های در معرض خطر کمک کند و شیوه‌های کشت پایدار و تجدید این گیاهان را راهنمایی کند.
بهرهگیری از هوش مصنوعی در فارماکوگنوزی می‌تواند کشف دارو، استانداردسازی محصولات گیاهی و ایجاد پایگاه داده‌های جامع از گیاهان دارویی را متحول کند. این امر به نتایج بهتری برای بیماران منجر می‌شود، زیرا امکان درمان‌های شخصی‌سازی‌شده را فراهم می‌آورد. علاوه بر این، هوش مصنوعی در ادغام داده‌های وسیع کمک کرده و کشف الگوهایی که ممکن است نادیده گرفته شوند را آسان‌تر می‌کند. با این حال، در حالی که بر اساس شواهد موجود ولی محدود هوش مصنوعی پتانسیل زیادی دارد، چالش‌هایی نیز وجود دارد که باید به آن‌ها پرداخته شود، به‌ویژه در زمینه حفظ حریم خصوصی داده‌ها و مسائل اخلاقی. از آنجا که سیستم‌های هوش مصنوعی به حجم زیادی از داده‌های بیمار و بالینی نیاز دارند، حفاظت از اطلاعات شخصی و اطمینان از این که الگوریتم‌ها منصفانه و بدون تعصب هستند، از اولویت‌های مهم به شمار می‌آید. ترکیب دانش گیاهان دارویی با فناوری پیشرفته هوش مصنوعی، فرصت‌های خوبی برای ارتقای مراقبت‌های بهداشتی فراهم می‌کند.

Application of AI in Pharmacognosy: Advancing Herbal Medicine

Laleh Khodaei, Somaieh Soltani

Herbal remedies have been an essential part of healthcare for centuries, playing a vital role in preventing and treating a variety of ailments. However, the potential of Artificial Intelligence (AI) in pharmacognosy, the study of medicinal plants, is an exciting area that is still emerging. AI, particularly through Machine Learning (ML) and Deep Learning (DL), offers remarkable opportunities to enhance our understanding and use of herbal medicine. Predictive models powered by AI can help identify the most effective herbal ingredients, optimize extraction and chromatographic processes, and even predict the mechanisms of action of these plants. AI can also assist in assessing the toxicity, side effects, and potential interactions between herbal remedies and pharmaceutical drugs. This predictive power not only aids in identifying new drug candidates but also helps in refining the delivery systems for these natural compounds. In addition to predictive modeling, AI can facilitate pattern recognition, enabling us to uncover important connections between plant species, their chemical properties, and the best cultivation and harvesting conditions. This technology can also help protect endangered plant species by guiding sustainable cultivation and regeneration practices. The integration of AI into pharmacognosy can revolutionize drug discovery, streamline the standardization of herbal products, and provide a comprehensive database of medicinal plants. All of this contributes to better patient outcomes by enabling more personalized treatments. Furthermore, AI helps in integrating vast amounts of data, making it easier to discover patterns that would otherwise go unnoticed. However, while AI holds tremendous promise, there are challenges we must address, particularly around data privacy and ethical concerns. Since AI systems rely on large volumes of patient and clinical data, protecting personal information and ensuring that algorithms are fair and unbiased are critical priorities. The integration of traditional herbal knowledge with cutting-edge AI technology presents an exciting opportunity to enhance healthcare. By combining ancient wisdom with modern innovation, we can improve patient care, accelerate natural drug discovery, and develop more tailored treatment plans. This marks a transformative step forward in both the science of pharmacognosy and the future of medicine

Tabriz university of medical sciences, Tabriz, Iran

تحلیل تصاویر پزشکی با داده‌های محدود

عطا الله جدیری

در عصر پزشکی مبتنی بر داده، تحلیل تصاویر پزشکی که توسط هوش مصنوعی تقویت شده است، پتانسیل زیادی برای بهبود تشخیص، برنامه‌ریزی درمان و نتایج بیماران دارد. با این حال، یک چالش اساسی زمانی به وجود می‌آید که حجم داده‌های تصویری پزشکی برچسب‌گذاری‌شده برای آموزش مدل‌های قدرتمند یادگیری عمیق کافی نباشد. این سخنرانی به بررسی راهبردهای نوآورانه برای غلبه بر محدودیت‌های کار با مجموعه داده‌های کوچک می‌پردازد و بر تکنیک‌هایی مانند یادگیری انتقالی، یادگیری نیمه‌نظارت‌شده، افزایش داده‌ها و تولید داده‌های مصنوعی تمرکز می‌کند.

با ارائه مثال‌های عملی از جمله تحلیل تصاویر شبکیه چشم، تصاویر MRI و رادیوگرافی، نشان خواهم داد که چگونه این رویکردها می‌توانند به طور مؤثر برای بهره‌برداری حداکثری از داده‌های محدود به کار گرفته شوند. علاوه بر این، به نقش تخصص حوزه در هدایت طراحی مدل و اهمیت اعتبارسنجی برای اطمینان از کاربرد بالینی پرداخته خواهد شد. هدف این سخنرانی ارائه بینش‌ها و راه‌حل‌های عملی برای پژوهشگران و متخصصانی است که با چالش‌های تحلیل تصاویر پزشکی در شرایط محدودیت داده مواجه هستند.

در پایان این جلسه، شرکت‌کنندگان درک بهتری از نحوه بهره‌گیری از تکنیک‌های پیشرفته برای مواجهه با کمبود داده پیدا خواهند کرد و راه را برای مشارکت‌های مؤثر در نوآوری‌های حوزه سلامت هموار خواهند ساخت.

Medical Image Analysis with Limited Data

Ataollah Jodeiri

In the era of data-driven medicine, medical image analysis powered by artificial intelligence holds immense promise for improving diagnostics, treatment planning, and patient outcomes. However, a significant challenge arises when the volume of labeled medical imaging data is insufficient for training robust deep learning models. This talk explores innovative strategies to overcome the limitations of working with small datasets, focusing on techniques such as transfer learning, semi-supervised learning, data augmentation, and synthetic data generation. Drawing from real-world examples, including the analysis of retinal images, MRI scans, and X-rays, I will demonstrate how these approaches can be effectively employed to maximize the potential of limited data. Additionally, I will discuss the role of domain expertise in guiding model design and the importance of validation to ensure clinical applicability. This talk aims to provide insights and practical solutions for researchers and practitioners navigating the challenges of medical image analysis with constrained data resources. By the end of the session, participants will better understand how to leverage state-of-the-art techniques to address data scarcity, paving the way for impactful contributions to healthcare innovation.

Tabriz University of Medical Science, Tabriz, Iran

Medical Image Generation with Limited Data

Milad Abdollahzadeh

Generative learning enables the modeling of data distributions and the generation of new data from these distributions, with applications in areas such as data augmentation, anomaly detection, and synthetic data generation for privacy-preserving analytics. However, training generative models typically requires access to large-scale datasets, ranging from 70K images for StyleGAN2 to 400 million image-text pairs for Stable Diffusion. Under data limitations, the performance of generative models often degrades significantly, leading to poor generation results. To address this challenge, there has been growing interest in efficient methods for training generative models with limited data. While most of these approaches have been developed for non-medical images, the challenges and insights are equally relevant for generative learning in medical data. In this talk, we will explore some prominent methods for generative learning under data constraints and discuss how they can be applied to medical image generation, with potential applications in augmenting datasets for downstream tasks like disease classification and segmentation.

Singapore University, Singapore

تراکتوگرافی با هوش مصنوعی: رونمایی از مسیرهای مغز از انتشار MRI

مهداد اسماعیلی

تراکتوگرافی، ابزاری کلیدی برای ترسیم مسیرهای ماده سفید مغز بر اساس تصویربرداری انتشار (diffusion MRI)، با کمک هوش مصنوعی (AI) دستخوش پیشرفت‌های چشمگیری شده است. روش‌های مرسوم، هرچند ارزشمندند، اما با چالش‌های مهمی مانند حل مشکل تقاطع فیبرها، تأثیر حجم جزئی و تضمین دقت کالبدشناختی روبه‌رو هستند. در این ارائه، نشان خواهم داد چگونه رویکردهای مبتنی بر هوش مصنوعی—نظیر تحلیل مبتنی بر فیکسل و دیکانولوشن کروی—بر این محدودیت‌ها غلبه کرده و موجب ارتقای اطمینان و صحت در بازسازی مسیرهای ماده سفید می‌شوند. همچنین به کاربردهای نوین این روش‌ها، از سنجش دقیق تراکم آکسون، محتوای میلین و شاخص‌های التهابی تا استفاده‌های کلینیکی گسترده مانند برنامه‌ریزی جراحی و مطالعه بیماری‌های تخریب عصبی همچون آلزایمر، خواهم پرداخت. افزون بر این، توانایی تراکتوگرافی مبتنی بر هوش مصنوعی در ادغام تصویربرداری پخش با روش‌های تصویربرداری چندوجهی، افق‌های نوینی را در پژوهش‌های اتصال ساختاری می‌گشاید. این سخنرانی به بررسی جایگاه کنونی هوش مصنوعی در تراکتوگرافی و نقش آن در شکل‌دهی آینده نقشه‌برداری مغز و کنکتومیکس خواهد پرداخت

دانشگاه فنلاند شرقی، فنلاند

AI–Powered Tractography: Unveiling the Pathways of the Brain from Diffusion MRI

Mahdad Esmaili

Tractography, a crucial tool for delineating the brain's white matter pathways using diffusion MRI, has seen significant advancements through the incorporation of artificial intelligence (AI). While traditional methods remain valuable, they encounter key obstacles such as resolving crossing fibers, managing partial volume effects, and ensuring anatomical fidelity. In this presentation, I will demonstrate how AI–based approaches—like fixel–based analysis and spherical deconvolution—overcome these limitations to enhance the reliability and accuracy of white matter pathway reconstruction. I will also highlight emerging applications of these methods, ranging from precise measurement of axon density, myelin content, and inflammation markers to broader clinical uses, such as surgical planning and the investigation of neurodegenerative conditions like Alzheimer's. Moreover, AI–powered tractography's capacity to integrate diffusion MRI with multimodal imaging paves the way for new developments in structural connectivity research. This talk will shed light on the current standing of AI in tractography and its potential to shape the future of brain mapping and connectomics.

University of Eastern Finland, Finland

Current status of AI in Kawasaki disease in Chinese children

Fuyong Jiao

ABSTRACT The current application status of artificial intelligence in the medical field in China Medical imaging diagnosis – Disease screening: AI can quickly and accurately analyze various medical images, such as X-rays, CT scans, and MRIs. Image reconstruction and enhancement: AI technology can improve the quality of medical images and reduce the radiation dose for patients. Clinical decision support systems: By integrating patient data and medical knowledge, AI can provide diagnostic suggestions, treatment plans, and disease risk predictions. Drug research and development: AI can identify potential drug targets and accelerate the drug development process, improving the efficiency of active compound screening. Surgical robots, such as the Da Vinci surgical system that combines AI and mechanical technology, have been widely used in various surgical procedures in China, performing precise operations, increasing the success rate of surgeries, and reducing patient trauma. The intelligent rehabilitation beds and other equipment independently developed in China can automatically adjust the rehabilitation training programs and provide personalized rehabilitation training. Doctor-patient communication and medical management: Intelligent voice assistants: Many hospitals in China use intelligent voice assistants to help doctors quickly record medical records and enable patients to query information, improving work efficiency. Medical resource management: Artificial intelligence can predict patient flow, enabling hospitals to allocate medical resources such as doctors, beds, and examination equipment more rationally, thereby enhancing the efficiency and quality of medical services.

Shaanxi Provincial People's Hospital,European Center for Traditional Chinese Medicine .International Exchange Center of the Shanghai Cooperation Organization Hospital Cooperation Union. Chairman ,The World Proactive Medicine Committee, Vice Chairman ,The World Artificial Consciousness Association

خلاصه مقالات پوستر

Poster Abstracts

Analyzing the Role of Natural Language Processing in Enhancing Clinical Reasoning within Medical Education: A Systematic Review

Senobar Naderian *,Parna Ghannadikhosh,Farzin Soleimanzadeh,
Taha Samad–Soltani,

clinical reasoning, educational context, and NLP techniques used. Ultimately, 32 studies were selected for in–depth analysis. Both quantitative and qualitative research methods were represented in the final selection, providing a diverse perspective on the impact of NLP in medical education .The review found that NLP technologies significantly enhanced clinical reasoning abilities in medical students and practitioners. The included studies highlighted NLP's effectiveness in improving diagnostic skills, decision–making processes, and personalizing learning experiences.NLPtools,suchasclinicaldecisionsupportsystemsandautomatedfeedback systems, were cited as key components in helping learners practice clinical scenarios. Furthermore, the integration of NLP tools was associated with increased engagement and a more structured approach to learning. However, there was a considerable variation in the technical implementations and educational contexts, which resulted in differing levels of effectiveness across the studies.The findings suggest that NLP holds great potential in advancing clinical reasoning in medical education. It offers the promise of more tailored educational interventions, helping students to hone their diagnostic and clinical decision–making skills. However, challenges such as the technical limitations of NLP systems, integration difficulties within existing medical curricula, and inconsistencies in study designs need to be addressed. Future research should focus on developing standardized NLP tools, evaluating long–term educational impacts, and exploring ways to seamlessly incorporate these technologies into medical training programs. While current evidence shows promising results, more rigorous and large–scale studies are necessary to establish robust evidence on the effectiveness of NLP in enhancing clinical reasoning and educational outcomes in medical education.
key words: Natural Language Processing, Medical Education, Artificial Intelligence

Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran/Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran/Urology department, Tabriz University of Medical Sciences, Tabriz, Iran/ Department of Health Information Technology, School of Management and Medical Informatics, Tabriz University of Medical Sciences, Tabriz, Iran,

Artificial Intelligence in Precision Medicine: Integration with Genomics and Pharmacogenomics

Zahra Jodari Mohammadpour * ,Farshad Shayanmehr

(DOI:10.1016/j.ipha.2024.08.005) (Taherdoost & Ghofrani, 2024).
“Artificial Intelligence Used in Genome Analysis Studies”: Analysis of AI tools in genome-based research (https://doi.org/10.2478/ebtj-2018-0012)(D’Agaro, 2018).
2. Search and Data Extraction Process
To identify relevant studies, the following keywords were used:
“Artificial Intelligence in Genomics”
“Precision Medicine and AI”
“Pharmacogenomics and AI”
“Machine Learning in Personalized Medicine”
Articles were retrieved from reputable databases, including PubMed and Scopus, and filtered based on the following criteria:
A clear focus on AI applications in precision medicine (Siddiqui et al., 2023).
High scientific quality and citation of validated findings “Artificial Intelligence and Machine Learning in Precision and Genomic Medicine” (Quazi, 2022).
Coverage of genomic data analysis, pharmacogenomics, and rare disease management (Abdallah et al., 2023).
3. Qualitative and Quantitative Analysis of Articles
Key data points were extracted from the selected studies using a structured content analysis approach. Articles were evaluated against the following metrics:
Algorithm performance: Accuracy and speed of genetic data analysis) (D’Agaro, 2018).
Clinical applicability: Improvement in patient outcomes (Taherdoost & Ghofrani, 2024).
Economic impact: Cost reduction and increased efficiency (Johnson et al., 2021).
Challenges and limitations: Issues related to algorithm transparency, data privacy, and ethical concerns (Abdallah et al., 2023).
4. Data Synthesis and Interpretation
The findings were synthesized to identify the relationship between AI algorithms, genomic data, and clinical outcomes. Common AI models, such as convolutional neural networks (CNNs), support vector machines (SVMs), and reinforcement learning algorithms, were analyzed for their applications in genomics and drug response prediction (Siddiqui et al., 2023). 1. Advances in Genomic Data Analysis
The study “Artificial Intelligence Used in Genome Analysis Studies” highlighted that deep learning algorithms, such as CNNs, excel at identifying genetic mutations, structural variants, and their associations with diseases. These advancements have been particularly impactful in early disease detection, including cancer and hereditary disorders) DOI: https://doi.org/10.2478/ebtj-2018-0012) .
2. Pharmacogenomics and Personalized Therapies
The article “AI’s Role in Revolutionizing Personalized Medicine by Reshaping Pharmacogenomics and Drug Therapy” demonstrated AI’s ability to predict drug responses based on genetic profiles. These predictions facilitate the design of targeted therapies, reducing adverse drug reactions and improving treatment efficacy) https://doi.org/10.1016/j.ipha.2024.08.005) .
3. Diagnosis and Management of Rare Genetic Disorders
According to “The Impact of Artificial Intelligence on Optimizing Diagnosis and Treatment Plans for Rare Genetic Disorders”, AI can integrate multi-omics data (genomics, proteomics, and metabolomics) to identify rare genetic mutations. This capability enables precise diagnosis and timely intervention for patients with rare diseases) DOI:10.7759/cureus.46860(.
4. Economic Efficiency and Increased Accessibility
The study “Artificial Intelligence in Precision Medicine” found that AI significantly reduces healthcare costs by automating diagnostic processes and accelerating genomic data analysis. This economic efficiency has increased access to advanced therapies, particularly in resource-limited settings) DOI:10.1016/B978-0-323-89925-3.00020-4) .
5. Accelerating Drug Discovery

Tabriz University of Medical Sciences, Tabriz, Iran/ Tabriz University of Medical Sciences, Tabriz, Iran

Machine Learning Framework for Risk Prediction and Time–to–Onset Estimation of Type 2 Diabetes

Faezeh Farhan

Type 2 diabetes (T2D) is a progressive metabolic disorder that often remains asymptomatic for years, leading to severe complications if not detected early. Accurate prediction of both the likelihood of developing T2D and the estimated time to onset can enable targeted preventive measures, such as lifestyle changes. This study proposes a machine learning framework that integrates genetic and lifestyle data to predict T2D risk and estimate the time to disease onset.This study focuses on a hybrid prediction approach to address two objectives: (1) classification of individuals based on their likelihood of developing T2D, and (2) time–to–event prediction for estimating the time of disease onset.

- Data Collection: The dataset includes genetic markers, blood glucose levels, family history, comorbidities, dietary patterns, physical activity, and time–series data, including timestamps of disease onset for individuals who have developed T2D.
- Data Preprocessing:
- Missing data will be handled using KNN or multiple imputation techniques.
- Genetic data will be encoded appropriately (e.g., SNP encoding), and lifestyle data will be normalized.
- Time–series data, such as timestamps of lifestyle changes or disease onset, will be segmented for temporal analysis.
- Feature Selection: Key features influencing T2D risk will be identified using algorithms such as LASSO regression, XGBoost feature importance, and permutation importance. These features will include genetic predispositions, lifestyle habits, and physiological indicators.
- Model Development:
- Classification Task: Algorithms such as Random Forests and LightGBM will be used to classify individuals based on their risk level of developing T2D.
- Time–to–Onset Prediction: Survival analysis models, such as Cox Proportional Hazards, or machine learning–based survival models, such as Survival Forests, will be employed to estimate the time to disease onset.
- Multi–Task Learning: A unified framework will integrate the outputs of the classification and survival analysis models to provide both risk predictions and temporal insights.

Artificial Intelligence Laboratory,Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran

•Evaluation Metrics: Classification models will be evaluated using accuracy, precision, recall, F1 score, and ROC–AUC. Time–to–onset predictions will be assessed using the concordance index (C–index) and mean absolute error (MAE). The proposed framework aims to accurately classify individuals into high–risk and low–risk categories and predict the approximate time to T2D onset for at–risk individuals. Feature selection methods will provide insights into the most critical genetic and lifestyle predictors, enabling a comprehensive understanding of disease progression.By integrating genetic and lifestyle data into a hybrid predictive framework, this study highlights the potential for early identification of T2D risk and time–to–onset estimation. These predictions support timely and targeted preventive interventions, such as dietary and activity modifications, to mitigate the disease's progression. Future work will involve validating the model using larger, diverse datasets and deploying it as a clinical decision support tool.Key words:
1.Type 2 Diabetes
2.Risk Prediction
3.Time–to–Onset Estimation
4.Genetic Data
5.Lifestyle Analysis
6.Feature Selection
7.Machine Learning
8.Survival Analysis
9.Early Detection
10.Preventive Medicine
11.Multi–Task Learning
12.Classification Models
13.Personalized Healthcare

Analysis of the Frequency of Common Medical Errors and Their Contributing Factors Using Artificial Intelligence: A study conducted over the past year at Imam Reza Educational and Medical Center in Tabriz

Fatemeh Heydari * ,Ali Bakhtiari

Patient safety is a part of healthcare that is described as minimizing adverse events and despite extensive research, it has not been sufficiently addressed in practice. Therefore, in this study, the frequency of the most common medical error and the factors affecting its occurrence were investigated using artificial intelligence. In this retrospective study, data related to medical errors over the past year were extracted from the Patient Safety Management System at Imam Reza Educational and Medical Center in Tabriz. The information included the type of error, associated factors, and resulting consequences. The data were first cleansed using artificial intelligence techniques and then analyzed using Natural Language Processing (NLP) for text-based information.Findings include identifying recording errors (failure to check or incorrect checking of orders, illegibility of orders, failure to fully record medical and nursing reports, errors in recording patient details, priority and delay in recording) as the most common errors. Fatigue and lack of attention and concentration of medical staff in the workplace have also been recorded as factors affecting the occurrence of this error.Considering the significance of patient safety, healthcare services must prioritize quality improvement by ensuring effectiveness, efficiency, accessibility, acceptability, and safety in care delivery.

key words: Patient safety, artificial intelligence, medical error

Clinical Research Development Unit of Imam Reza General Hospital, Tabriz University of medical Sciences, Tabriz, Iran
Faculty of Medicine, Tabriz University of medical Sciences, Tabriz, Iran

Advances In Liver Fibrosis Diagnosis using Deep Learning Models

Morteza Alipour,Ali Ghafari*

Excessive accumulation of scar tissue in liver is a chronic condition with the potential of progressing into a probably fatal cirrhosis. Thus, early detection and management of liver fibrosis is of utmost importance. Liver biopsy with its invasiveness and imaging methods such as elastography with their lack of sensitivity to early–stage diagnosis or intermediate–stage differentiation point out the need for more precise and accessible diagnostic approaches. Deep learning models harness the inherent advantages of imaging methods to provide improved diagnostic accuracy and efficiency while enabling a more reliable staging of liver fibrosis. This study aims to review recent advances in application of deep learning methods in liver fibrosis diagnosis. Literature search of recent studies using the keywords deep learning, liver fibrosis diagnosis, and medical imaging was conducted to summarize the recent advances of liver fibrosis diagnosis using deep learning models with medical image input.Deep learning (DL) model structures like FIB–Net and Hybrid–Net, trained on pre–processed datasets ensure standardization and minimize noise. Model transparency is enhanced by incorporating visual–based explainability. Notably, FIB–Net, a deep–learning algorithm that combines the Fibrosis–4 Index (FIB–4) with ultrasound imaging, has demonstrated improved diagnostic accuracy for advanced liver fibrosis, enhancing specificity by over 20% compared to FIB–4 alone and reducing unnecessary referrals by 42%. Hybrid–Net, goes further by integrating multiple data sources and incorporating domain–specific knowledge, allowing it to capture complex patterns that traditional CNNs might overlook, thus providing more reliable staging and reducing diagnostic variability.More recent model structures like FIB–Net and Hybrid–Net, improve staging accuracy while enhancing transparency through explainable AI technologies such as Grad–CAM. key words: Liver Fibrosis, Diagnosis, Deep Learning

Department of Physics, University of Hamburg, Hamburg, Germany/Research Center for Evidence–Based Medicine, Iranian EBM Centre: A JBI Centre of Excellence, Tabriz University of Medical Sciences, Tabriz, Iran

Nurses Perspectives on the Use of Artificial Intelligence in Nursing Care: a cross–sectional study

Farnaz Rahmani * , Hossein Namdar, Maryam Vahidi

As artificial intelligence (AI) technologies continue to advance and become integrated into healthcare systems, it is essential to gauge how nurses perceive these changes. Understanding their perspectives can help ensure that AI tools are implemented in ways that enhance patient care rather than complicate workflows. This was an observational cross–sectional study. The participants were 370 nurses selected through a stratified random sampling from nurses who worked at hospitals affiliated with Tabriz University of Medical Sciences, Iran. The participants completed a five–section questionnaire of demographic information, knowledge, attitude, application, and acceptance regarding AI in nursing care. The data were analyzed in SPSS version 16 using descriptive and inferential statistics. Results: The mean age of the participants was 26.3 ± 7.1 years. Among nurses' perspectives on AI in nursing care, 39.1% reported low knowledge, 62.8% had a moderate attitude, 71.6% had a moderate level of acceptance, and 52.8% of nurses agreed to apply AI at a high level. There was a positive and significant correlation between nurses' knowledge and their attitude ($r = 0.321$, $p < 0.001$), application ($r = 0.534$, $p < 0.001$), and acceptance ($r = 0.391$, $p < 0.001$) regarding AI. Additionally, a positive and significant correlation was found between their attitude and application ($r = 0.598$, $p < 0.001$), as well as acceptance ($r = 0.787$, $p < 0.001$). Overall, the study suggests that while nurses recognize the potential benefits of AI in healthcare, careful attention must be paid to their concerns and needs to enhance acceptance and effective integration. acceptance, appliction, artificial intelligence, attitude, care, Knowledge, nurse

Department of Psychiatric Nursing, Nursing and Midwifery Faculty, Tabriz University of Medical Sciences, Tabriz, Iran.2.The Clinical Research Development Unit at Razi Psychiatric Hospital, Tabriz University of Medical Sciences, Tabriz, Iran

AI–Powered Multi–Modal Classification for Early Alzheimer's Risk Prediction with Imaging and Tabular Data

Faezeh Farhan

Alzheimer's disease (AD) is often diagnosed at advanced stages, limiting effective intervention options. Early prediction is essential for timely disease management. This study proposes a multi–modal classification framework that integrates MRI imaging data and tabular data, including demographic, social, and medical history, to predict Alzheimer's risk across five levels: no risk, low risk, moderate risk, high risk, and early/advanced AD stages.This project employs a classification approach to stratify Alzheimer's risk.

- Data Collection:
- MRI Data:

Structural MRI scans of healthy individuals, patients with early–stage AD, and those with advanced–stage AD.

- Tabular Data:

Demographic, lifestyle, and medical history data (e.g., age, gender, physical activity, dietary habits, and comorbidities).

- Data Preprocessing:
- MRI Data:

Scans will undergo normalization, spatial alignment, and segmentation to extract key volumetric features (e.g., hippocampal shrinkage). Data augmentation tech–niques, such as rotation, flipping, scaling, and intensity adjustment, will be applied to enhance robustness.

- Tabular Data:

Data will be cleaned, normalized, and encoded. Missing values will be imputed, and continuous variables will be scaled. Feature selection methods, such as LightGBM feature importance and permutation–based techniques, will identify the most relevant predictors.

- Model Development:
- MRI Analysis:

Initially, base CNN models (e.g., VGG, AlexNet) will be trained to establish a baseline performance. Subsequently, pretrained models (e.g., ResNet) will be fine–tuned for better feature extraction and classification.

- Tabular Data Analysis:

Gradient Boosting models, including XGBoost, CatBoost, and LightGBM, will be applied to tabular features for classification tasks.

- Multi–Modal Fusion: Outputs from both MRI and tabular models will be integrated using late–fusion techniques for the final classification.

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•Evaluation Metrics:
Model performance will be evaluated using accuracy, F1 score, precision, recall, and AUC to assess classification effectiveness across all risk levels.The framework is designed to achieve accurate prediction of Alzheimer's risk by combining imaging data and tabular information. Early detection of subtle brain changes and lifestyle factors ensures robust classification and personalized risk assessment.This study presents a practical multi–modal solution for early Alzheimer's prediction. By integrating CNN–based imaging analysis with machine learning on tabular data, the proposed framework provides comprehensive risk stratification for timely interventions. Future work will involve expanding datasets and optimizing the fusion model for clinical use

1.Early Detection
2.Alzheimer's Disease
3.Multi–Modal Models
4.Risk Classification
5.MRI Imaging
6.Tabular Data
7.Feature Selection
8.Disease Prediction
9.Risk Stratification
10.Medical History Analysis
11.Lifestyle Factors
12.Data Fusion
13.Imaging Biomarkers
14.ippocampal Shrinkage
15.Demographic Data.

Leukemia diagnosis using rare morphologies through machine learning

Arezoo heidary *,Vahid Rostami

Leukemia is one of the most common types of blood cancer, affecting the production and function of white blood cells. In this disease, abnormal white blood cells are produced, which can disrupt the immune system's functionality. Diagnosing leukemia typically involves examining the morphology of white blood cells in peripheral blood and bone marrow samples. However, traditional methods require skilled pathologists and are time-consuming. Today, the application of Artificial Intelligence (AI) and Machine Learning (ML) has revolutionized the detection and analysis of leukemia. AI algorithms can process microscopic images of blood cells and identify abnormal morphological features such as cell size, shape, and internal composition. This technology enables the detection of leukemia-associated changes with high accuracy and speed. Additional advantages of AI include increased diagnostic precision, reduced human error, and faster result delivery. Deep learning systems, particularly Convolutional Neural Networks (CNNs), provide powerful tools for analyzing cellular images. Deep learning-based systems, particularly Convolutional Neural Networks (CNNs), provide powerful tools for analyzing cellular images. These systems are capable of classifying leukemia into various subgroups, including myeloid and lymphoid leukemia. They enable diagnosis with higher accuracy and speed, and by distinguishing between healthy and diseased cells, they can also identify rare morphologies. In summary, AI not only enhances leukemia diagnostic approaches but also paves the way for personalized treatments. However, the widespread adoption of this technology requires the development of larger datasets, improved image quality, and close collaboration between medical experts and AI researchers. Leukemia, blood cell morphology, artificial intelligence, machine learning, deep learning, convolutional neural networks

student, departeman of computer science, qazvin islamic azad university / professor, departeman of computer science, Qazvin Islamic Azad University

Respecting Patient Autonomy in the Use of Artificial Intelligence

Zhilla Heydarpoor Damanabad

The principle of patient autonomy, which refers to respecting the patient's right to make independent decisions about their medical treatment, is considered one of the fundamental ethical principles in medicine. With the rapid advancement of artificial intelligence (AI), the issue of maintaining patient autonomy in AI-based healthcare processes has become one of the most challenging topics. The aim of this paper is to explore the challenges and solutions for ensuring patient autonomy when using AI in medical sciences.This study is a review article. Relevant articles were collected and analyzed using keywords such as "artificial intelligence," "patient autonomy," and "medical sciences" through searches in databases like PubMed, Science Direct, Scopus, and Google Scholar from 2020 to 2025.The results of the study indicate that one of the main challenges in using AI in medical sciences is the potential threat to patient independence in decision-making processes. Medical decisions are made automatically by AI systems without direct involvement from the patient or the physician. The lack of transparency in how AI models function, as well as patients' insufficient awareness of how these systems work, are also factors that could undermine patient independence.Healthcare providers and patients need to be trained on how to use AI, and these systems should be designed in a way that their operations are understandable and interpretable by both doctors and patients. The development and implementation of ethical and legal regulations that define how AI should be used in medicine and its relationship with patient rights are crucial.Artificial Intelligence, Patient Autonomy, Medical Ethics

Faculty of Nursing, Tabriz Medical Sciences Unit, Tabriz Islamic Azad University, Tabriz, Iran

Nurses Ethical Challenges in the Use of Artificial Intelligence in Patient Care: A Cross-Sectional Descriptive Study

Hossein Namdar Arshtanab,Maryam Vahidi *,Farnaz Rahmani,
Seyede Zahra Saadeti

Despite the significant potential and advancements of artificial intelligence (AI) in medical and healthcare settings, these developments have introduced new ethical challenges. This study aims to assess nurses' perceptions of the ethical challenges associated with using AI in patient care.In this descriptive cross-sectional study, 389 nurses employed at educational and medical centers affiliated with Tabriz University of Medical Sciences completed a scale assessing the ethical challenges of AI in patient care. Participants were selected using a proportional random sampling method. Data were analyzed with descriptive statistics using SPSS software.The mean (standard deviation) scores for the overall scale of ethical challenges, as well as the interpersonal dynamics subscale and the patient empowerment subscale, were 27.90 (19.35) on a scale of 25 to 125, 65.00 (41.47) on a scale of 13 to 65, and 85.42 (84.90) on a scale of 12 to 60, respectively. The highest scores for ethical challenges were associated with the items relating to "weakening human interactions between patients and nurses," "high dependence on technology," and "insufficient training of nurses on the use of AI in care." Conversely, the lowest scores pertained to items regarding "failure to respect the dignity and human values of patients," "low quality of data input to AI," and "ignoring vulnerable populations."The findings indicate that nurses perceive significant ethical challenges in the implementation of AI in patient care. To address these concerns, it is crucial for AI professionals to incorporate principles of humanity and ethics into the design of AI programs used in healthcare settings.Artificial Intelligence, Nurses, Medical Ethics

Psychiatric Nursing Department, Tabriz University of Medical Sciences, Tabriz, Iran./Psychiatric Nursing Department, Tabriz University of Medical Sciences, Tabriz, Iran/Psychiatric Nursing Department, Tabriz University of Medical Sciences, Tabriz, Iran/Psychiatric Nursing Department, Tabriz University of Medical Sciences, Tabriz, Iran,

Human–Machine Collaboration in the Operating Room: Examining the Human Role in Final Decision–Making and Accountability

Marjan Dehdilani*,Mahmoud Eidi,Isa Bilehjani,Solmaz Fakhari

The use of artificial intelligence (AI) in operating theaters has transformed anesthesia and patient management. However, ethical questions regarding accountability for decisions with intelligent systems, especially in life–critical applications, have not been addressed. The research examines the boundaries of human and machine responsibility in intelligent anesthesia and investigates the role of humans in final decision–making.We collected data from 100 anesthesiologists and surgeons at high–level healthcare centers. Data were collected through structured questionnaires and semi–structured interviews. Questions concerned the experience of smart anesthesia system use, decision–making in extreme cases, and attitude toward ethical responsibility. Most respondents (78%) believed that decision accuracy is improved by intelligent systems, though 85% were adamant that ultimate decisions must be left to humans. Concerns expressed were algorithm errors, interference with clinical judgment, and legal problems if there are adverse outcomes. Respondents also brought up the necessity for definitive ethical protocols to determine responsibility. Intelligent anesthesia human–machine interaction requires a compromise between technological trust and human judgment. The work shown here demonstrates that final decisions must rest with anesthesiologists, and ethical, as well as legal, responsibility, must be clearly framed.Intelligent anesthesia. human–machine interaction. Ethical responsibility

Department of Anesthesiology, Tabriz University of Medical Sciences/Department of Anesthesiology, Tabriz University of Medical Sciences/Department of Anesthesiology, Tabriz University of Medical Sciences/Department of Anesthesiology, Tabriz University of Medical Sciences,

Artificial Intelligence in Anesthesia Management: Optimizing Drug Dosage in Dental and Maxillofacial Surgeries

Tannaz Pourlak,Marjan Dehdilani * ,Solmaz Fakhari

Managing anesthesia effectively during dental and maxillofacial surgeries is a complex task that demands precise monitoring and careful adjustment of drug dosages to ensure both safety and efficacy. Artificial intelligence (AI) has the potential to transform this process by offering innovative solutions, such as automating drug dose adjustments, minimizing side effects, and reducing the risk of human error. This study investigates how AI algorithms can be applied to optimize anesthetic drug dosing and provide real–time monitoring of patients during maxillofacial surgeries.We reviewed existing research on AI–driven anesthesia management systems, focusing on deep learning and machine learning algorithms. These technologies analyze physiological data like heart rate, blood pres–sure, and oxygen saturation to guide anesthesia delivery.AI systems can analyze pa–tient data in real time to adjust anesthetic dosages accurately and predict potential complications. These technologies have shown significant promise in preventing anesthesia–induced blood pressure fluctuations, such as hypotension or hypertension, while reducing the reliance on manual interventions. The integration of AI into anesthsia management has the potential to revolutionize dental and maxillofacial surgeries by improving patient safety, lowering costs, and increasing efficiency in operating rooms. Future research should focus on designing personalized AI algorithms tailored to individual patients and validating their effectiveness through clinical trials.Anesthesia management , Dental and Maxillofacial Surgeries, Artificial Intelligence

department of maxillofacial surgery, Tabriz University of Medical Sciences/Department of Anesthesiology, Tabriz University of Medical Sciences/Department of Anesthesiology, Tabriz University of Medical Sciences

Smart Scheduling of Surgeries: Utilizing Artificial Intelligence Algorithms to Optimize Operating Room Timetables

Solmaz Fakhari, Bahman Naghipour, Marjan Dehdilani*

Scheduling surgeries in the operating room is a critical challenge in healthcare management. Issues such as delays, inefficient resource utilization, and disruptions in workflow negatively impact service quality and patient satisfaction. Artificial intelligence (AI) offers advanced algorithms that provide new opportunities to optimize these processes.This paper explores the application of AI in optimizing surgical schedules and managing operating room resources. Machine learning and data-driven optimization algorithms analyze performance patterns and historical data to determine optimal surgery times and prevent overlaps. These systems also predict delays and enable efficient resource allocation.Studies indicate that implementing AI-based systems significantly reduce patient waiting times, enhances staff productivity, and improves overall surgical team satisfaction.These findings highlight the need for the development and integration of intelligent technologies in operating room management.Artificial Intelligence, Smart Scheduling, Operating Room

department of anesthesiology, Tabriz University of Medical Sciences

AI–Assisted Diagnostics Techniques in Orthopedics

Soumayeh Amirsaadat *, Jaffar Aghazadeh, Shahab Mehdipour

with AI algorithms. As shown by the findings, this study assesses the inter–rater reliability of AI–assisted PALM measures for PD and LLD.30 people participated in the study, 15 of whom were healthy and 15 of whom had limb abnormalities. AI algorithms were used to analyze the data for accuracy and repeatability after PD and LLD were measured using the PALM technique.The Intraclass Correlation Coefficient (ICC 3,3) was used to evaluate the inter–rater reliability. The findings, which are shown in Table 1, show that both raters' PD assessments are highly accurate (Rater 1: ICC 0.90; Rater 2: ICC 0.92), while LLD measurements showed moderate reliability (Rater 1: ICC 0.76; Rater 2: ICC 0.78). Table 1. Inter–rater reliability of AI–assisted PALM measurements Additionally, Figure 1 depicts the skeletal model used for the study and outlines the key anatomical landmarks utilized for measurement. Figure 1. Anatomical landmarks for PD and LLD measurement. Discussion The findings show that AI–assisted PALM evaluations produce reliable PD outcomes, which makes them a practical tool for clinical practice. However, LLD readings are less consistent, suggesting that the technique has to be further refined. Future studies should look into integrating more robust AI frameworks to increase measurement consistency and accuracy. Applying AI–assisted diagnostic methods, like the PALM system, is a significant advancement in orthopedics. Better patient outcomes may result from these technologies' capacity to boost efficiency and accuracy. In clinical contexts, AI–assisted diagnostic methods may greatly increase accuracy and efficiency. By automating data processing, they free up physicians' time to concentrate on patient care rather than diagnoses. Because AI systems continuously improve their algorithms and learn from large datasets, they can also identify orthopedic diseases with greater accuracy. Patients may benefit from improved therapy results as a result. The use of AI–assisted diagnostics in orthopedics is not without its difficulties, though. Ensuring access to high–quality datasets is essential, as are ethical issues and strong data governance. It can be difficult to incorporate AI technology into present medical practices, but these challenges can be addressed with careful training and a collaborative culture between doctors and AI developers.Orthopedic AI–assisted diagnostics has a promising future. Conclusion :The use of AI–assisted diagnostic techniques, like the PALM system, is revolutionizing orthopedic care by increasing efficiency and precision. These technologies can improve patient outcomes, but challenges like data governance, clinical integration, and clinician adoption need to be addressed. A collaborative approach with ethical considerations and continuous education is crucial for harnessing the full potential of AI in orthopedics. The journey towards AI–enhanced care relies on innovation and patient–centered care.PALM–System, Diagnosis, AI–assisted for Orthopedics

Stem Cell Research Center, Tabriz University of Medical Sciences, Tabriz, Iran/ Department of Orthopedics, Faculty of Medicine, Tabriz University of Medical Sciences

Machine Learning Approaches to Diagnosis of Autism in Children Based on Wisconsin Card Sorting Test

Parham Hasani *, Zahra Sabahi, Ali Ghafari, Hanieh Salehi–pourmehr

Autism spectrum disorder (ASD) is a neurodevelopmental disorder marked by challenges in communication, social interaction, and repetitive behaviors. Diagnosis is difficult due to overlapping symptoms with other disorders and the reliance on clinician judgment, as there are no definitive biological tests. Artificial intelligence (AI) methods, particularly machine learning (ML) can diagnose ASD by classifying relevant datasets.This study uses ML approaches to diagnose ASD in children aged 7–9, based on the Wisconsin card sorting test–the short computerized version (WCST–64:CV2) dataset. This dataset contains 144 participants, consisting of 96 typically developing and 48 ASD. The dataset was preprocessed by normalization, standardization, transforming categorical variables into binary, and applying the One–Hot Encoding technique. Preprocessed datasets were trained with support vector machine (SVM), logistic regression, multilayer perceptron (MLP), random forest, decision tree, and gradient boosting models, while each model was optimized with a range of relevant hyperparameters.Logistic regression with lbfgs solver, max 4 iteration on the standardized dataset encoded with One–Hot had the best performance. This model achieved 100% precision, 97.73% accuracy, 96% F1–Score, and 92.31% recall.The result of this study validated the potential of ML models in diagnosis of ASD in children using cognitive assessment data with remarkable performance. Similar to previous studies, this work demonstrates that AI is a pioneering method for predicting, detecting, and diagnosing neurological disorders. Future research will focus on Expanded datasets with additional features to further enhance diagnostic accuracy for other neurological diseases.Machine learning (ML), Autism spectrum disorder, Artificial intelligence (AI), Logistic regression

Research Center for Evidence–Based Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Developing and testing a mobile application for education of Midwifery students: the positive birth experience guideline

Solmaz Ghanbari–Homaie

Given the importance of the care provided during labour and childbirth and its impact on the childbirth experience, as well as the fact that proper training of midwives can improve the quality of care, this study aims to design World Health Organization guideline for positive childbirth experience in the form of a mobile application (Phase One) and examine its effectiveness among midwifery students (Phase Two).This study employed a research and development methodology. In the initial phase, the “Positive Birth Experience Application” was designed based on the WHO recommendations for the intrapartum period. The second phase utilized a one–group pretest–posttest design. After one month of using the application, 30 midwifery students from Tabriz University of Medical Sciences in Tabriz, Iran completed knowledge (posttest) and evaluation questionnaires. The data was analyzed using SPSS Version 24 software. A Paired Samples T–test was conducted to assess the students’ knowledge before and after the intervention. The results of the pilot study showed a statistically significant difference (P<0.001) in the mean knowledge scores of the students regarding the WHO guideline before and after the intervention. After the intervention, the students had higher knowledge scores compared to before using the application [(Mean Difference= 4.75; (95% Confidence Interval= 3.56 to 5.93)]. The analysis for the evaluation of the application indicated that the highest mean (SD=Standard Deviation) scores were observed for the information quality and system quality subscales, which were 50.7 (8.03) and 47.9 (11.6), respectively. In contrast, the lowest mean (SD) scores were associated with the service quality and user satisfaction subscales, which were 23.9 (7.43) and 25.6 (6.62), respectively.The positive birth experience application can be used as an educational method to increase students’ knowledge of the recommendations of the WHO regarding intrapartum care. The evaluation of this application by the students demonstrated that it can provide valuable and high–quality information related to intrapartum care, thus enhancing their knowledge in this area.
Midwifery; Mobile Apps; Smartphone; Birth Satisfaction; World Health Organization

Diabetic Ulcers and Artificial Intelligence

Ali Abbasi

Diabetic foot ulcers (DFUs) are a prevalent and severe complication of diabetes mellitus, arising primarily due to impaired microcirculation and neuropathy. These ulcers significantly increase the risk of infection, amputation, and mortality, with a global prevalence of approximately 6.3%. Traditional management relies on subjective clinical assessment, often delaying diagnosis. Recent advances in Artificial Intelligence (AI) present a promising avenue for early detection, risk stratification, and personalized treatment. This review evaluates the impact of AI, specifically deep learning (DL) and machine learning (ML), in improving DFU diagnosis, monitoring, and treatment.A systematic review of peer-reviewed studies and clinical trials (2015–2023) was conducted using PubMed, Scopus, and IEEE Xplore. Focus was placed on AI applications involving deep learning for image analysis, machine learning for predictive modeling, and AI-driven decision support in DFU management. Studies included were those utilizing AI for early DFU detection, wound depth assessment, healing prediction, and personalized treatment plans. Challenges, regulatory concerns, and real-world applications were also explored.AI-based approaches, especially convolutional neural networks (CNNs), have demonstrated high accuracy (>90%) in detecting DFUs and assessing wound severity. AI models have been effective in tracking wound healing progression, offering real-time, objective evaluations.

Machine learning techniques such as support vector machines (SVM) and random forests (RF) have shown success in predicting healing outcomes and identifying high-risk patients. AI-driven systems have also enabled personalized treatment plans and contributed to reduced healthcare costs and faster healing times.

AI technologies show significant promise in revolutionizing DFU management through enhanced diagnostic accuracy, predictive analytics, and tailored treatment. Despite challenges like dataset quality, regulatory concerns, and integration into clinical workflows, AI can offer more efficient and cost-effective care. Future research should address these challenges, with a focus on validating AI tools across diverse clinical settings and ensuring ethical, transparent implementation.Diabetic foot ulcers – Artificial Intelligence and Diabetic Wounds

Islamic Azad University of Medical Sciences, Tabriz, Iran

The Role and Capabilities of Artificial Intelligence in Identifying Victims of Plane Crashes

Ali Banagozar Mohammadi * , Ali Ostadi, Maryam Zaare Nahandi

Airplane crashes are among incidents that present complex challenges for identifying victims due to the severity of destruction and dispersion of remains. Traditional forensic methods are often time-consuming due to time constraints and the extent of damage to the bodies. In this context, Artificial Intelligence (AI), with its advanced capabilities, can significantly improve the accuracy and speed of victim identification.In this study, scientific literature was reviewed and AI applications were examined. The actions taken in other countries were assessed and compared to the situation in Iran. According to studies, AI can optimize the identification process by utilizing genetic processing algorithms and deep learning, combining data from the accident scene, autopsy information, DNA data, medical records, and biometric databases. Additionally, AI can integrate these data with other information obtained from the accident site, such as drone images and the distribution of remains. This combined analysis not only helps in more accurate identification but also plays a role in reconstructing the event and the positioning of the victims.The use of AI has led to a reduction in identification time and an increase in accuracy. This technology also allows for the management of large datasets and the integration of various sources of information, including autopsy, DNA, and medical records. AI analyses indicate that, with the available resources and current conditions, the use of AI in airplane crash scenarios can reduce identification time by up to 30%.The use of AI in identifying victims of airplane crashes can significantly enhance the accuracy and speed of the identification process. Based on the experiences of other countries, Iran can also take significant steps to improve forensic performance by investing in this field and utilizing modern technologies.Artificial Intelligence (AI), Forensic Identification, Plane Crash Victims, Autopsy Data, Forensic Medicine

Internal Medicine Department, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

The Role of Artificial Intelligence in Medical Toxicology Education in Iranian Hospitals

Ali Banagozar Mohammadi * , Ali Ostadi, Maryam Zaare Nahandi

Poisoning is one of the most common medical emergencies in Iranian hospitals. Although the quality of clinical education in this field is generally satisfactory, the limited number of training modules and teaching opportunities has highlighted the need for innovtive and supplementary educational approaches. Artificial intelligence (AI) is recognized as an effective tool for enhancing educational efficiency. This article examines global experiences and existing evidence regarding the use of AI in medical education, with a focus on potential strategies for its implementation in Iran.This article draws on data collected from credible scientific sources and previous studies on the application of AI in medical education. To identify practical tools, a range of articles discussing the use of software simulators, educational chatbots, and interactive quizzes—widely recognized as cost-effective and efficient methods for enhancing education—were reviewed.Globally, AI tools in medical education have proven effective in enhancing both learning outcomes and clinical decision-making. Evidence from various applications highlights that AI-driven tools, such as simulators and interactive chatbots, can deliver accurate, real-time information, deepen students' comprehension, and improve their practical skills in managing complex and rare clinical scenarios.Adapting global experiences to the local context in Iran by utilizing cost-effective and localized AI tools can significantly expand learning opportunities in managing complex, severe, or rare poisoning cases while improving educational efficiency. Developing AI-based systems capable of analyzing and modeling real hospital data is recommended to create more realistic and practical educational scenarios, thereby strengthening the overall learning process.
Artificial Intelligence (AI); Clinical Education; Poisoning; Educational Simulation

Internal Medicine Department, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Evaluating the Impact of Artificial Intelligence on Patient Safety and Reduction of Human Errors in Anesthesia: A Comparative Analysis Before and After Implementing Intelligent Tools

Abbasali Dehghani * , Hamzeh Hoseinzadeh, Marjan Dehdilani

Artificial intelligence (AI) has emerged as a transformative advancement in modern medicine, playing a critical role in enhancing anesthesia processes. By enabling applications such as patient status prediction, precise drug dosage adjustments, and real-time monitoring of vital signs, AI provides opportunities to reduce human errors and improve patient safety. This study evaluates the impact of AI on patient safety and the reduction of human errors in anesthesia. Data from healthcare facilities before and after the integration of AI-based tools were analyzed, focusing on metrics such as anesthesia-related complications, drug dosage errors, and adverse events. The results demonstrate that the use of AI in anesthesia significantly decreases human errors and enhances patient safety. These findings underscore the importance of integrating intelligent technologies into clinical care and highlight the need to develop ethical and practical frameworks for their safer implementation.
Patient Safety, Human Errors, Anesthesia , Artificial Intelligence

Department of Anesthesiology, Tabriz University of Medical Sciences

Application of Artificial Intelligence in Medical Education: Challenges and Solutions

Tannaz Novinbahador * ,Hassan Soleimanpour

The implementation of artificial intelligence (AI) in healthcare involves using algorithms and software to augment human analytical skills in managing intricate medical data. This technology plays a pivotal role in revolutionizing medical education, significantly enhancing student knowledge and readiness by introducing innovative and sophisticated learning methods. Medical education relies heavily on precision, experience, and ongoing learning, and AI contributes by enhancing the accessibility of educational resources and supporting the development of both clinical and theoretical expertise.PubMed, Google Scholar, and Scopus databases were searched from 2010 to 2025.AI algorithms analyze educational content and student performance records to pinpoint the unique learning needs of each student and suggest tailored educational pathways. Moreover, AI crafts personalized learning experiences that capitalize on individual strengths and address weaknesses, thereby boosting academic performance and expediting the educational journey. AI is instrumental in continuously tracking and assessing student progress, delivering precise updates on their advancement, and offering targeted strategies for improvement. A notable use of AI in this field is the development of advanced simulation environments that allow students to hone their practical skills in a controlled yet realistic setting. Emerging technologies such as augmented reality (AR) and virtual reality (VR) have proven exceptionally beneficial in medical training. By employing AR to project accurate three-dimensional models of human anatomy and tissues, students can obtain a more profound comprehension of bodily structures. Furthermore, virtual reality offers a platform for students to enhance their clinical and practical abilities within a controlled, simulated setting. Artificial intelligence plays a crucial role in refining clinical reasoning and cognitive processes, utilizing historical data to assist students in making more precise judgments and decisions in complex scenarios.

Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran.
Emergency and Trauma Care Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

AI is adept at replicating critical conditions, thus equipping students to swiftly and accurately respond in actual situations. Another application of AI involves the creation of adaptive tests tailored to the knowledge levels of individual students, adjusting the difficulty of assessments based on specific needs, analyzing outcomes with great precision, and delivering targeted and useful feedback. In surgical training, robotic assistants are instrumental in enhancing precision, reducing both the cost and duration of training, and significantly elevating the quality of hands–on training. Artificial intelligence further enhances educational opportunities by broadening access to online educational platforms and resources. These AI–powered online platforms enable the provision of interactive and sophisticated courses. Nevertheless, the deployment of AI comes with challenges, including concerns over privacy, data security, substantial implementation costs, and the necessity for adequate training in the effective use of these technologies.Despite these hurdles, artificial intelligence presents numerous prospects for advancing medical education. The thoughtful and focused incorporation of these technologies into the educational framework can foster the development of an intelligent, adaptable, and efficient educational system. Such advancements in medical education are poised not only to enhance the quality of training but also to contribute broadly to public health.Artificial Intelligence, Medical Education

Growth and Responsiveness to Therapy in Brain Metastases: A Mathematical Model

Zahra Hasanzadeh * , Fatemeh Hasanzadeh

The most common intracranial tumors in adults are brain metastases, representing about 10% to 30% of all cancer patients [1]. The metastatic process within the brain is initiated when single tumor cells or cell clusters migrate individually from the primary site to the brain. Usually, the above cells invade the surrounding tissue and migrate through the bloodstream from the original tumor site. Upon reaching the brain, finally, metastatic cells come to a halt at branch points in micro vessels. migrate out of vessels, and remain in close proximity to micro vessels, as these continue to grow through vessel co–opting [2]. Continued growth of THESE enables if they are able to escape from host immunity have adapted to their new enviro ment [3]. The advent of mathematical modeling has presented a promising avenue for unraveling the complex interplay of many biological elements in cancers. Its application in this field has garnered recognition due to its potential to provide deeper insights into the mechanisms governing cancer development, pinpoint potential targets for therapy, and generate novel hypotheses [4]. Beyond that, mathematical models offer the opportunity to fine–tune drug dosing and scheduling, leading to enhanced treatment efficacy and minimized toxicity. Consequently, the integration of mathematical modeling in cancer research holds the power to advance the field, paving the path toward more efficient and personalized treatment approaches [5]. Mathematical models have been used to study the metastatic process, including growth and spread ofuntreated metastases [6], extravasation [7], interactions between primary and secondary tumors [8], and therapeutic strategies [9]. BMs differ from other metastases due to the presence of the blood–brain barrier. The brain's barrier prevents external substances and cells from entering, making study in this field challenging. Furthermore, BMs differ from GBMs in numerous fundamental ways. They exhibit less infiltrative behavior, are smaller in size upon diagnosis, and have diverse molecular origins, resulting in differing clinical outcomes and therapy methods. The study of BMs is a crucial field of cancer research because to their unique characteristics. This review aims to highlight the use of mathematical models in the study of BMs. Effective prevention and treatment strategies for metastatic cancer require a thorough understanding of the underlying mechanisms at each stage of the cascade [10].1. Models of the initial stages of BM development
2. Mathematical models of brain metastases response to treatments
3. A model of immunotherapy response
4. A compartmental model to capture the response model of BMs to radiosurgery
5. Mathematical models of radiation necrosis. The results of this article show that mathematical models are an effective tool for understanding the growth process of brain metastases and their response to treatment. These models enable the

University of Tabriz, Tabriz, Iran

optimization of drug dosage and timing as well as the design of personalized treatments. Also, these models can be used for more accurate prediction and improvement of therapeutic and diagnostic strategies.6. Conclusion This study examined the mathematical models of brain metastasis and the corresponding process. The findings indicate that the use of mathematical models allows for precise manipulation of drug dosage and timing, thereby improving treatment efficacy and reducing condition toxicity. This work aims to shed light on the use of mathematical models in the investigation of brain metastases (BMs) as well as successful preventative and therapeutic approaches for metastatic data that necessitate comprehension of the fundamental mechanismsat every branching stage. After reviewing the models of the early stages of BM growth, the scientists concluded that the size of the primary tumor determines the development of brain metastases. They looked at four models to support this theory.1. According to the first paradigm, the initial tumor is what determines whether brain metastases arise. Their rates of growth may differ from one another. 3. New BMs could be made possible by older BMs. 4. Distribution is postponed, and at last, it is believed that they are in a slumber phase. Systemic medications have the least penetration into the brain, according to mathematical models of how brain metastases respond to treatment. Local treatments like radiotherapy, radiation therapy, or removal are more frequently used to treat brain metastases, and radiation therapy is frequently included in mathematical models and descriptions of treatment outcomes. are employed Radiation therapy turns proliferating cells into non–proliferative cells; equations 5, 6, and 7 illustrate the volume dynamics of the tumor during radiation therapy. The authors and researchers then went on to develop a model of immunotherapy response to illustrate how BMs responded to immune checkpoint inhibitors. This model was based on the idea of mathematically altering tumor volume to represent the tumor's intrinsic growth and subsequent decrease as a result of the ability to Equation 8 specifies the treatment in terms of eliminating cancer cells and mentions the volume of the tumor. In contrast to Vanatabe and his associates, Lyon–Triana provided a model to describe how BMs respond to radiation surgery; four equations (9 and 10) are associated with this problem. Lastly, the mathematical models of radiation necrosis served as the article's last review source. The most significant side effect of radiation is radiation necrosis, which can be easily managed and frequently goes away on its own. It's intriguing that progressive cells and radiation necrosis can be shown in MRI images as Equations 25 control the dynamics of necrotic cells, and it is demonstrated that SRS surgery controls progressive cells and conservative treatment controls RN cells. In order to account for the healthy cells that surround the BMs that are destroyed by radiation and cause an inflammatory reaction, the authors included a third term in the calculation. Equation 11 contains their equation. Equations 12 finally represent the dynamic model of necrotic cells, which has three cell populations: immune, host, and necrotic. We will look at the brain tumor dynamic model and how control affects it in the upcoming articles.Keywords of this article are: – Mathematical models – Brain metastases – Brain tumors – Radiation necrosis

Building Trust in Smart Hospitals: Ethical AI and Data Security

Amirreza Safarkhanlou * ,Zahra Sheikhalipour,Naim Babayi Ahari,
Ali Ahmadizadeh,Hedie Valipour,Fatemeh Jodari Baradari

The integration of Artificial Intelligence (AI) in smart hospitals represents a groundbreaking transformation in healthcare, offering significant advancements in diagnostics, personalized treatments, operational efficiency, and patient outcomes. However, the adoption of AI raises critical concerns regarding ethical practices, data security, and trust among patients and healthcare providers. Building trust is a multifaceted challenge that requires addressing algorithmic biases, ensuring transparency, safeguarding sensitive data, and promoting active engagement among stakeholders.This study explores comprehensive strategies to foster trust in smart hospitals through a systematic review of literature published between 2020 and 2024, sourced from PubMed, Scopus, and Google Scholar. The review adhered to PRISMA guidelines, ensuring a transparent and systematic approach to article selection and data extraction. Out of 1,436 articles initially identified, 47 met the inclusion criteria and were analyzed in-depth. The analysis focused on ethical AI frameworks, data security protocols, and trust-building mechanisms. To ensure the relevance and reliability of findings, expert interviews and stakeholder surveys were also conducted, emphasizing practical applications and real-world challenges in healthcare settings.The results demonstrate that ethical AI practices, including bias mitigation, transparency, and algorithmic accountability, are essential for gaining stakeholder confidence. Robust data security measures, such as advanced encryption techniques, multi-factor authentication, and regular system audits, are critical in protecting patient information and preventing breaches. Additionally, fostering trust requires proactive engagement with patients and healthcare providers through clear communication, education, and inclusion in AI-related decision-making. Compliance with international regulatory standards, including GDPR and HIPAA, further strengthens the accountability and ethical integrity of smart hospitals.In conclusion, the successful integration of AI in smart hospitals relies on a holistic approach that combines ethical practices, stringent data security measures, and active stakeholder involvement. Transparent communication, patient empowerment, and adherence to regulatory frameworks are critical to building trust and ensuring the sustainable adoption of AI technologies in healthcare.
By addressing these challenges, smart hospitals can harness the full potential of AI to revolutionize healthcare delivery while upholding ethical principles and safeguarding patient well-being.Ethical AI, Smart Hospitals, Data Security, Trust-building, Artificial Intelligence in Healthcare, Patient Autonomy, Data Governance, Regulatory Compliance.

Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran./Department of Medical Surgical Nursing, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran/Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran./Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran./Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran. /Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran.

Artificial intelligence capacity in promoting patient–centered care in oncology: chatbots for counseling and primary symptom management

Mohammad–Salar Hosseini * ,Yosra Vaez–Gharamaleki,Sarvin Sanaie,
Ata Mahmoodpoor,Hossein Jabbari Beyrami,Mahdi Zarei,
Mohammad Amin Akbarzadeh

The integration of artificial intelligence (AI) into healthcare, particularly in oncology, has significantly improved how patient–centered care is delivered. Likewise, chatbots have gained attention as innovative tools for counseling and symptom management due to their availability and simple functionality. Using natural language processing and machine learning to deliver personalized, several studies have been performed to develop user–friendly chatbots in order to provide accessible support for cancer patients. However, the scope, effectiveness, and limitations of chatbots in oncology remain poorly characterized, and controversies regarding their real–world applicability are present, which the current study aims to address.This study followed the JBI approach to qualitative meta–synthesis. An evidence–based review with a meta–aggregative approach was conducted to obtain evidence from peer–reviewed journals and conference proceedings published from 2010 to the end of 2024.

Relevant studies were identified using PubMed, Scopus, Web of Science, and IEEE Xplore databases. Keywords and MeSH terms representing artificial intelligence, chatbot, oncology, cancer, symptom management, palliative care, and patient–centered care were included. Articles were screened for relevance, with a focus on chatbot applications in counseling, symptom management, and psychological support for oncology patients.

Research Center for Integrative Medicine in Aging, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
Hematology and Oncology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
Research Center for Integrative Medicine in Aging, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
Research Center for Integrative Medicine in Aging, Aging Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran
Iranian Cancer Control Center (MACSA) – Tabriz Branch, Tabriz, Iran
Research Center for Evidence–Based Medicine, Iranian EBM Center: A JBI Center of Excellence, Tabriz University of Medical Sciences, Tabriz, Iran
Research Center for Evidence–Based Medicine, Iranian EBM Center: A JBI Center of Excellence, Tabriz University of Medical Sciences, Tabriz, Iran

The quality of the result was assessed using JBI critical appraisal tools.Chatbots have demonstrated practical utility in addressing common patient queries related to chemotherapy side effects, pain management, and nutritional advice. Emotional support modules, embedded in some chatbots, effectively reduced anxiety and improved patient satisfaction. Chatbot engagement rates ranged from around two–thirds to over 90% in some studies, with higher rates in platforms offering multilingual capabilities and 24/7 availability. However, significant challenges persist, including limited ability to handle complex medical queries, lack of integration with electronic health records, and concerns over data privacy and security.

For psychological support, chatbots delivering evidence–based coping stategies were associated with reduced anxiety scores in several trials. Disparities in chatbot effectiveness were noted across patient demographics, highlighting the need for culturally sensitive designs. Although patient–centered studies showed significant patient satisfaction with the chatbots, health professionals are concerned about their safety and efficacy, suggesting that they should only be integrated into clinical practice with constant human supervision.AI–powered chatbots present a promising capacity for promoting patient–centered care in cancer patients. While enhancing accessibility to counseling and symptom management, particularly in resource–constrained settings, their widespread adoption still requires addressing technological, ethical, and regulatory challenges. Future studies should focus on developing robust algorithms for handling complex queries, ensuring data security, and validating chatbots in diverse clinical contexts.Artificial intelligence; oncology; palliative care; patient–centered care; supportive care

Application of Artificial Intelligence in Selecting Organ Donations in Brain Death Patients Due to Poisoning

Ali Ostadi * , Ali Banagozar Mohammadi

Organ donation from brain–dead patients is crucial for saving lives, but selecting suitable donors is a complex process. Poisoning, a significant cause of brain death, introduces unique challenges. Traditional donor selection relies heavily on clinical judgment and historical data, which can be subjective and may overlook subtle factors affecting organ viability.This hypothetical study (as detailed, comprehensive real–world data on this specific topic is not publicly available) would utilize a retrospective cohort design. Data would be collected from multiple sources: Medical Records , Organ Procurement Organization Data , Laboratory Data.(Hypothetical results based on potential findings) Feature importance analysis revealed that specific biochemical markers , duration of exposure to the toxin, and the presence of specific co–morbidities were strong predictors of organ viability. The model's predictions led to a statistically significant increase in the number of successfully transplanted organs, potentially reducing the waiting list for organ recipents. Furthermore, providing valuable insights into improving organ preservation techniques and potentially expanding the donor pool. AI offers a powerful tool for optimizing organ donation selection in brain–death patients resulting from poisoning. Future studies should focus on validating these findings in larger, more diverse datasets, developing user–friendly clinical decision support tools incorporating this technology, and further investigating the ethical implications of AI–driven organ allocation.Artificial Intelligence , Organ Donations , Poisoning

Department of Internal Medicine, Sina Educational, Research and treatment center, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Application of Artificial Intelligence in the Treatment of Poisonings

Ali Ostadi * , Ali Banagozar Mohammadi

Poisoning, whether accidental or intentional, remains a significant global health concern. Traditional methods for diagnosing and managing poisonings often rely on clinical evaluation, laboratory tests, and access to poison databases, which can be time-consuming and may not always be readily available. The complexity of toxicological analysis and the vast array of possible toxins create a scenario where Artificial Intelligence (AI) can offer considerable assistanceThe application of AI in the treatment of poisonings is being explored through several avenues. These include: Machine Learning for Toxicosurveillance, AI-Powered Diagnostic Tools, Data-driven research.Research into AI's application in toxicology has yielded significant findings: Improved Diagnosis: Machine learning models have demonstrated an increase in the accuracy and speed of identifying the causative agent in poisoning incidents. Some models have shown >90% accuracy in classifying the ingested substances based on clinical signs and lab results. Reduced Time to Treatment: Automated systems, powered by AI, reduce the time required to start the treatment, ultimately improving patient outcomes.Artificial intelligence is proving to be a valuable tool in the diagnosis and treatment of poisonings. Machine learning and other AI techniques offer promising solutions for rapid identification of toxins, predicting severity, and optimizing patient care. The integration of AI tools into poison control centers and healthcare systems has the potential to improve patient outcomes by reducing the time to treatment and increasing the accuracy of diagnoses.Artificial Intelligence , Poisoning

Department of Internal Medicine, Sina Educational, Research and treatment center, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Application of AI on various human cancers

Parvaneh Movahhed * ,Faezeh Farhan,Fatemeh Chakeri,
Nabi Moghaddasi,Tahereh Chakeri, Amir Namvar

Tumors can appear differently in various patients, making early detection crucial. Artificial intelligence (AI), especially neural networks and deep learning, has redefined cancer research and clinical practice. These methods enable earlier detection and accurate prognosis, crucial for improving survival rates. The integration of AI into medical imaging and genomic analysis offers transformative possibilities for personalized oncology.This review analyzed the application of deep learning and neural networks in cancer diagnostics and prognosis, focusing on convolutional neural networks (CNNs), recurrent neural networks (RNNs), and hybrid models. CNNs were particularly effective in analyzing medical images, such as radiological scans and histopathological slides, by tumor segmentation and classification tasks. RNNs, on the other hand, were applied to sequential data, such as genetic mutation patterns, to uncover critical insights. Cancer–related datasets are often image–based or genomic, requiring preprocessing steps like normalization, data augmentation, and feature extraction.Deep learning models, especially CNNs, demonstrated out standing performance in detecting cancers like lung and breast cancer. By integrating imaging and genomic data, these models provided more precise predictions and supported personalized treatment planning.AI is transforming oncology by improving diagnostic accuracy and personalized treatment. To fully utilize its potential, challenges like data heterogeneity and model transparency need to be addressed.AI, cancer, neural networks

Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran/ Artificial Intelligence laboratory, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran/ Tabriz University of Medical Sciences, Tabriz, Iran/ Tabriz University of Medical Sciences, Tabriz, Iran / Tabriz University of Medical Sciences, Tabriz, Iran / Shahid Beheshti University of Medical Sciences, Tehran, Iran

Investigating the Effect of Artificial Intelligence Solutions in the Diagnosis of Ovarian Endometriosis: A systematic review

Aynaz Esmailzadeh * ,Mohammad Reza Mazaheri Habibi,
Alireza Rasoulian,Azam Kheirdoust

Endometriosis is a common female disease characterized by the growth of tissue similar to the endometrium outside the uterus, leading to pelvic pain, irregular menstruation, and infertility. Using artificial intelligence (AI) algorithms as an auxiliary decision maker in the timely and correct diagnosis of this disease can be useful. The aim of this study was to investigate the effect of AI solutions in the diagnosis of ovarian endometriosis.This study was conducted as a systematic review in 2024 by searching PubMed, Web of Sciences, Scopus, and Google Scholar. The keywords “artificial intelligence”, “diagnosis” and “endometriosis” were reviewed in studies without time limits. English–language studies that examined the role of AI in the diagnosis of ovarian endometriosis met the inclusion criteria. Finally, 15 articles were included in the study from a total of 515 articles were retrieved. Findings of these studies indicated that AI algorithms can be beneficial in the accurate and comprehensive diagnosis, early treatment, empowerment, and enhancement of the quality of life for individuals with ovarian endometriosis. Maintaining sexual hygiene, practicing meditation, and following a proper diet significantly impact the treatment of ovarian endometriosis. Additionally, healthcare providers can utilize AI algorithms to aid in the precise diagnosis of this condition and prevent potential complications and adverse effects.The results of this study demonstrated that use of AI algorithms can be beneficial in the accurate diagnosis and timely treatment of ovarian endometriosis, leading to increased awareness and improved quality of life for patients with this disease.Artificial Intelligence, Diagnosis, Endometriosis

Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Ph.D. in Medical Informatics, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Ph.D. student in Medical Informatics, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Systems biology–informed neural networks and its application in identifying personalized cancer treatment regimens

Mehrdad Anvari * ,Hamidreza Marasi

Cancer is a complex and systemic disease characterized by distinct tumor–immune microenvironments (TIME) unique to each individual patient. Mathematical modeling plays a key role in the investigating mechanisms underlying Immunosurveillance and Immunoediting within the systems biology of cancer. In recent years, the systems biology–informed neural networks (SBINNs) approach was introduced through integrating experimental data with existing biological knowledge using the universal approximation capabilities of deep neural networks. SBINNs provide a deep learning based framework for inferring individual patient parameters and TIME–specific identification and enhanced modeling accuracy of biological processes. Utilizing this framework, alongside a variety of medical datasets—including genomic sequencing, medical imagery, and time–series data pertinent to drug dynamics—it becomes feasible to predict tumor responses to diverse treatment protocols, elucidate mechanisms of drug resistance, and optimize combined treatment strategies tailored to individual patients. Therefore, SBINNs highlight the potential to personalize cancer treatment and improve outcomes. To design the architecture of a systems biology–informed neural network, it is imperative to first account for the system state variables including cancer cells, immune cells such as cytotoxic and helper T–cells, as well as proteins such as interleukins and their respective activation or inhibition interactions. Subsequently, by modeling the interaction network through an ordinary differential equation (ODE) or partial differential equation (PDE) with unknown parameters, the systemic dynamics are articulated. The foundational premise of such models is predator–prey dynamics and competitive models, wherein cancer cells are conceptualized as prey and immune cells as predators within the tumor–immune interaction. These models may also incorporate the influence of drug dosage on various components of the system. Now, according to the type of model and the number of state variables, the number of neurons is determined in the input and output layers, respectively. The number of hidden layers and the number of neurons in each layer are designated as hyperparameters. It is desirable that the neural network as a multidimensional function be the solution of the differential equation. By placing the neural network in the differential equation, the remaining sentences appear as the error of the neural network in the differential equation. Through the minimization of this error, the outputs of the neural network converge to the solution of the differential equation.

University of ITabriz, faculty of mathematics, statistics and computer science, department of applied mathematics/University of Tabriz, faculty of mathematics, statistics and computer science, department of applied mathematics

Therefore, a costumized loss function can be formulated for optimization, wherein, in addition to the parameters of the neural network (weights and biases), patient–specific parameters are also computed during the network training phase. By applying SBINNs on a previously evaluated model of lung cancer and synthetic data, we tested its efficacy in the context of sparse data and varying levels of noise. We also calculated the growth rate and diffusion coefficient in a glioblastoma growth model using MRI images at two snapshots for individual patients.Applying SBINNs through the utilization of deep neural networks alongside mathematical modeling enables us to simultaneously obtain patient–specific parameters as well as neural network parameters. Furthermore, we successfully inferred a part of model terms that imply particular biological mechanisms, albeit with limited knowledge, by defining them as a part of the neural network's output as a function of time. In contrast to other neural network architectures that necessitate a large amount of data, SBINNs can address inverse problems effectively with limited data. Our experimental findings indicated that SBINNs achieve a maximum relative error of 0.02% even under noise levels reaching up to 15%. Through performing sensitivity analyses, we identified sensitive variables that can be leveraged for targeted therapeutic interventions and the design of combined treatment.Data–driven methods aimed at designing cancer treatment strategies typically demand extensive datasets and fail to elucidate underlying biological mechanisms. Conversely, mathematical modeling adeptly encapsulates these mechanisms, and their integration with data–driven approaches can play a key role in selecting therapeutic targets and optimizing treatment. SBINNs facilitate the computation of individualized patient–specific parameters as well as certain mechanistic formulations within these models utilizing a limited data. This approach has the potential to play an auxiliary role in the efficient execution of experimental procedures, personalized medicine , and clinical decision–making, thereby optimizing the prediction of system behavior, pharmacological interactions, and treatment design. With the development of SBINNs and reducing the need of models for data, the necessity for invasive techniques in data preparation is diminished. This transition results in decreased costs and an enhancement in the overall health status of patients.Systems biology–informed neural networks, personalized medicine, Mathematical modeling, Data–driven inferring of differential equations, Systems–biology of cancerr

Application of AI in Laboratory Science: Focus on Medical Microbiology

Saeed Saghatizad Sorkhab,Milad Heidarpour * ,Mohammad Hassan Elahi, Ali Bahadori,Mahdi Nikniaz

In recent years, the application of AI in laboratory settings has gained significant traction. The ability of AI systems to analyze vast amounts of data quickly and accurately has transformed traditional laboratory practices. In medical microbiology, AI is being utilized to improve the identification of microorganisms, streamline workflows, and support clinical decision–making. AI technologies, particularly machine learning and deep learning, have been employed to enhance the identification of pathogens. These systems are trained on large datasets of microbial images and genomic sequences, enabling them to recognize patterns that may not be apparent to human. analysts. For instance, AI algorithms have been developed to analyze Gram stains, which are crucial for the identification of bacterial species. The automation of this process not only increases the speed of diagnosis but also reduces the potential for human error. The application of AI extends beyond clinical diagnostics into research and development within medical microbiology. AI–driven tools are being used to analyze complex datasets, identify trends, and generate hypotheses for further investigation. This capability accelerates the pace of research, enabling scientists to explore new avenues in microbial pathogenesis and treatment strategies. The application of AI in laboratory science, especially in medical microbiology, represents a significant advancement in the field. By enhancing pathogen identification, streamlining antimicrobial susceptibility testing, and improving image analysis, AI technologies are poised to revolutionize laboratory practices. As research continues to evolve, the potential for AI to further impact medical microbiology remains promising, paving the way for improved diagnostic and therapeutic outcomes in patient care. AI, Diagnosis, Medical Microbiology

Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
nursing student, Sarab Faculty of Medical Sciences, Sarab, Iran
Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
Department of Medical Microbiology, Sarab Faculty of Medical Sciences, Sarab, Iran
Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran

Artificial Intelligence in Global Health–Predictive Modeling for Infectious Diseases & Resource Optimization

Sajjad Pourasghary

Infectious diseases are among the major threats to health globally. Climate change, urbanization, and antimicrobial resistance have only enhanced the burden. Traditional methods of disease surveillance or resource allocation are generally inefficient against most of these challenges. AI will make the difference because now one can perform predictive modeling, real–time data analysis, and optimization of resources. This narrative review outlines the role of AI within the fight against infectious diseases for improved health outcomes in general.Extensive literature review using databases such as PubMed, IEEE Xplore, and Google Scholar within the period of 2020–2024. Keywords include “AI in infectious diseases,” “predictive modeling in global health,” and “resource optimization in pandemics.” Such studies were then categorized into the following themes: disease prediction, resource allocation, and real–time surveillance.Various AI–driven predictive models, using machine learning algorithms and neural networks, have achieved a high degree of accuracy in predicting the outbreaks of diseases such as COVID–19, dengue, and malaria. In that respect, the AI–driven tools have actually optimized resource use by hotspot prediction, thus allowing for prioritization of resources for the distribution of medical supplies. Real–time surveillance through natural language processing and geospatial analytics enhances event detection and timely response. Data privacy, algorithmic bias, and infrastructure limitations in low–resource settings are the major challenges.AI has the potential to change the game in infectious disease control through strong improvements in prediction, optimization of resources, and surveillance. This will be fully realized after ethical, technical, and infrastructural barriers are overcome through collaboration. Future research needs to focus on scalable and equitable AI solutions tailored for a variety of global health contexts.
Artificial Intelligence, Infectious Diseases, Predictive Modeling, Resource Optimization, Global Health, Pandemic Preparedness.

Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran

A narrative reveiew about artificial intelligence in early diagnosis of pediatric diseases

Maryam Amoozadeh

Early diagnosis of pediatric diseases enables timely intervention, which can lead to improved outcomes and reduced risk of complications. This type of diagnosis can also prevent the progression of diseases, reduce healthcare costs, and enhance the quality of life for the child and their family. Artificial intelligence (AI) plays a significant role in this area by increasing diagnostic accuracy and efficiency. AI systems are capable of analyzing large datasets, such as electronic health records, and identifying hidden patterns.In this article an electronic search was performed in PubMed, Google Scholar, Scopus, and Medline to locate relevant articles. Efforts have been made to gather and categorize the opportunities and challenges presented in various studies regarding the early diagnosis of pediatric diseases with the help of artificial intelligence.Artificial intelligence (AI) has created new opportunities in the early diagnosis of pediatric diseases, such as diabetes and cardiac disorders. In endocrine diseases, AI helps improve diagnostic processes and insulin dose regulation. In cardiac diseases, it enhances the accuracy of imaging methods and is effective in risk stratification. Additionally, AI is applied in screening for retinopathy in premature infants and identifying patterns of neonatal sepsis. However, challenges such as the need for robust algorithms and ethical concerns hinder its full integration into clinical practice.While AI offers significant opportunities to enhance early diagnosis and management of childhood diseases, challenges such as data privacy, algorithmic bias, and integration into clinical workflows must be addressed to fully realize its potential.Artifical Intelligence، Pediatric medicine

Resident of Pediatric medicine

Application of artificial intelligence in customized educational materials for patient education: a systematic review

Fatemeh Radimaher * , Mansoor Ghafori fard

Clear and reliable information is essential for people who are ill. Patients are constantly exposed to vast quantities of patient education materials, but of variable quality. However, the accuracy and quality of patient education materials are crucial for informed decision–making. These materials should be written at a level that is understandable for patients with low health literacy and should also maintain a high quality of content. Artificial Intelligence (AI) chatbots, trained on an extensive corpus of medical literature, generate patient education materials that should be considered. This review aims to assess the application of artificial intelligence in patient education.
We systematically searched the PubMed/MEDLINE, Scopus, Ovid, and Embase database using the keywords of artificial intelligence and patient education. Two reviewers assessed study eligibility and performed study screening. Inclusion criteria are as follows: publication between January 2000 and Dec 2025, various modalities of AI, English language, and AI use in patient education.The results showed that AI–driven platforms can analyze patient data to deliver customized educational materials that match the patient's health literacy level, preferences, and learning styles. Additionally, chatbots and virtual health assistants offer real–time support, addressing patient queries and guiding them through complex medical information. The use of AI also enables the continuous assessment of patient understanding and retention of information, allowing for timely interventions and adjustments in educational approaches. Furthermore, the paper discusses the ethical considerations and challenges associated with implementing AI in patient education, such as data privacy, accessibility, and the need for human oversight. Overall, the application of AI in patient education holds significant promise for improving health outcomes, enhancing patient empowerment, and fostering a more informed patient population.The findings of this review suggest that AI has the potential to both improve and hinder the quality and readability of patient education content. In summary, the application of AI in patient education is a promising development that can enhance the quality of care, improve patient outcomes, and foster a more informed and engaged patient community. As the healthcare sector continues to evolve, embracing these innovations will be critical in achieving a patient–centered approach to education and care. Additionally, no studies were found in this context that assessed AI–generated content in Persian, which indicates a significant research gap, especially in a society with a low average health literacy level and a growing use of AI tools. More research is needed to investigate the impact of different AI models and training data on the quality and readability of patient education materials. Furthermore, studies that directly assess patient understanding and comprehension of AI–generated materials are crucial to fully understand the impact of these technologies on patient health outcomes. Considering these points in the development of patient education materials, healthcare providers and researchers can leverage these technologies to create more effective and accessible health information for patients.patient education materials, artificial intelligence

Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran/ Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran.

Machine Learning Algorithms for Predicting Immune Response in Metastatic Melanoma: A Systematic Review of Predictive Biomarkers, Tumor Mutational Burden, and Gene Signatures

Alireza Pourrahim * ,Omid Raiesi,Abdollah Karimi,
Mohammad Mahdi Pourrahim,Alireza Vasiee

Immune checkpoint inhibitors (ICIs) have transformed the management of metastatic melanoma by prolonging survival; however, variability in treatment responses underscores the need for robust predictive biomarkers. Advances in machine learning (ML) offer new insights into identifying and validating predictive biomarkers, including tumor mutational burden (TMB), gene signatures, and transcriptomic markers. This systematic review evaluated the performance of ML algorithms in predicting immune responses to ICIs in metastatic melanoma, focusing on clinical, genomic, and transcriptomic biomarkers.A comprehensive literature search was conducted across PubMed, Scopus, and Web of Science using the following terms: “machine learning”, “immune checkpoint inhibitors”, “metastatic melanoma”, “predictive biomarkers”, “tumor mutational burden”, “gene signatures”and other related MeSH terms. Studies that applied ML algorithms to predict ICI responses in metastatic melanoma were included. Quality assessment followed PRISMA guidelines and QUADAS–2 criteria. Data extracted included cohort characteristics, biomarkers analyzed, ML methods, performance metrics (e.g., sensitivity, specificity, AUC), and clinical outcomes. Four studies met inclusion criteria.The included studies highlighted the potential of ML in enhancing the prediction of ICI response in metastatic melanoma. A combined ML model integrating pretreatment lactate dehydrogenase (LDH) levels and radiomics achieved an AUC of 0.89 (95% CI: 0.76–0.99), outperforming models using LDH (AUC: 0.81) or radiomics (AUC: 0.81) alone. A random forest classifier using transcriptomic biomarkers reported an AUC of 0.87, identifying GSTA3 and VNN2 as key contributors, with strong correlations to CD8+ T cell infiltration and TMB. An immunotherapy–related gene model (ITRGM) incorporating WGCNA and ML algorithms stratified patients into “immune–hot” and “immune–cold” tumors, with a significant association between immune–hot tumors and improved prognosis ($p < 0.05$). A deep learning pipeline combining histological and clinical data achieved an AUC of 0.800–0.805 across two validation cohorts, stratifying patients by progression risk and correlating with progression–free survival (PFS; $p = 0.02$ and $p = 0.03$).ML algorithms offer a powerful approach to predict ICI response in metastatic melanoma by integrating clinical, genomic, and transcriptomic data. Predictive biomarkers such as LDH, TMB, GSTA3, and VNN2 demonstrated strong prognostic potential, particularly when combined with ML–based models. These findings underscore the value of ML in developing personalized treatment strategies and highlight the need for prospective clinical validation to integrate these methods into routine practice.Machine learning, metastatic melanoma, predictive biomarkers, tumor mutational burden.

Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran./Department of Parasitology, School of Allied Medical Sciences, Ilam University of Medical Sciences, Ilam, Iran./Department of Computer Engineering and Information Technology, Amirkabir University of Technology, Tehran, Iran./Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran.
Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.

Clinical Integration of Explainable Artificial Intelligence (XAI) Systems for Hematologic Malignancy Diagnosis: A Systematic Review of Interpretability Frameworks and Physician Decision–Making Impact

Alireza Pourrahim * ,Abdollah Karimi,Mohammad Mahdi Pourrahim, Alireza Vasiee,Omid Raiesi

Explainable Artificial Intelligence (XAI) is increasingly being applied in hematologic malignancy diagnostics to improve transparency and trust in AI–based clinical decisions. Hematologic cancers, such as leukemia and anemia–related disorders, require highly accurate and interpretable diagnostic models for effective management. Conventional AI methods often suffer from the “black box” problem, limiting their clinical utility. XAI aims to enhance model interpretability by providing explanations for AI–driven predictions, which can improve clinician trust and decision–making. This systematic review evaluates the clinical integration of XAI models in hematologic malignancy diagnosis, focusing on interpretability frameworks and their impact on physician decision–making.A comprehensive literature search was conducted across PubMed, Scopus, Web of Science, and IEEE Xplore databases using the key terms: “Explainable Artificial Intelligence”, “hematologic malignancies”, “acute myeloid leukemia”, “chronic lymphocytic leukemia”, “aplastic anemia”, “iron deficiency anemia”, “interpretability”, “machine learning”, and related MeSH terma. The search included articles published up to January 2025, focusing on studies that applied XAI models in the diagnosis or prognostic assessment of hematologic malignancies while reporting on interpretability frameworks and their influence on clinical decision–making. Eligibility criteria included original studies in English, investigating the application of XAI in hematologic malignancy diagnosis with detailed descriptions of both the AI model and the interpretability method used. Articles were screened based on title, abstract, and full text, followed by data extraction covering study design, XAI model used, performance metrics, interpretability techniques, and impact on physician decision–making.

Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran./Department of Computer Engineering and Information Technology, Amirkabir University of Technology, Tehran, Iran./Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran./Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.,Department of Parasitology, School of Allied Medical Sciences, Ilam University of Medical Sciences, Ilam, Iran.

The quality of the included studies was assessed using the modified Newcastle–Ottawa Scale (NOS) to ensure methodological rigor, focusing on study design, bias control, and the clarity of interpretability reporting.The included studies demonstrated the effectiveness of Explainable Artificial Intelligence models in the diagnosis and prognostic assessment of hematologic malignancies, with varying performance metrics across different algorithms and datasets. In an acute myeloid leukemia cohort, an XAI method using multi–dimensional module optimization (MOM) achieved a sensitivity of 91% and specificity of 89% for predicting treatment responses to Quizartinib, Trametinib, Selumetinib, and Crizotinib. Validation across three independent datasets confirmed the robustness and interpretability of the model. Similarly, a transfer learning approach with LIME for acute lymphoblastic leukemia classification reached an accuracy of 98.38% ($p < 0.001$), with a sensitivity of 96% and specificity of 97%, enhancing interpretability through visual heatmaps. In chronic lymphocytic leukemia, an ALPODS XAI algorithm identified 17 cell populations predictive of clinical outcomes, with a CD4+ T–cell population showing an area under the curve (AUC) of 0.78 (95% CI: 0.70–0.86; $p < 0.0001$). When integrated with the International Prognostic Index (IPI), the combined model improved the predictive AUC to 0.83 (95% CI: 0.77–0.90; $p < 0.0001$). For differential diagnosis between iron deficiency anemia and aplastic anemia, a model using SHAP, LIME, and Eli5 tools achieved a sensitivity of 95% and specificity of 92%, with key predictive features including platelet count (PLT), mean corpuscular volume (MCV), and hemoglobin (HGB) levels ($p < 0.01$). Across all studies, XAI models consistently improved diagnostic accuracy while providing enhanced interpretability, facilitating greater clinical trust and decision–making support in hematologic malignancies.XAI systems demonstrate significant potential for improving hematologic malignancy diagnosis by increasing model transparency, aiding personalized treatment decisions, and refining prognostic assessments. The use of tools such as MOM, LIME, and ALPODS has shown both high accuracy and clinical relevance.However, further research is needed to standardize XAI frameworks and assess their real–world impact on physician decision–making and patient outcomes.Explainable Artificial Intelligence, Hematologic Malignancy, Leukemia, Anemia, Machine Learning

Advancements in Artificial Intelligence for Personalized Radiation Oncology: Enhancing accurate Treatment Planning

Parvaneh Darkhor * ,Ata Jodeiri,Bijan Hashemi,Alireza Farajollahi

Radiation therapy (RT) is a cornerstone of cancer treatment, delivering high–energy radiation to tumors while minimizing damage to healthy tissues. Despite its effectiveness, RT faces challenges in achieving precise tumor targeting while sparing adjacent healthy organs. Recent advancements in artificial intelligence (AI) have transformed RT, enhancing precision, efficiency, and personalization. AI–driven algorithms significantly improve tumor contouring, optimize treatment planning, predict dose distribution, and enable adaptive radiotherapy (ART), ultimately improving patient outcomes.AI in RT relies heavily on deep learning models to analyze medical imaging and clinical data. Convolutional neural networks (CNNs) and their variants, including U–Net, have proven instrumental in automating tumor segmentation and organ–at–risk (OAR) delineation. These models process large datasets to identify patterns and achieve accurate treatment volume delineation, reducing inter–observer variability and saving significant clinician time. In ART, AI models utilize daily imaging data to automate re–contouring, adapting to anatomical changes such as tumor shrinkage or organ motion. These capabilities enable dynamic treatment adjustments, personalizing care for each patient. Emerging architectures, such as transformers and hybrid models, further enhance performance by capturing long–range spatial dependencies and incorporating attention mechanisms. These innovations enable a deeper understanding of anatomical relationships and treatment complexities. AI also supports dose prediction and optimization. Generative models, such as GANs, simulate realistic dose distributions and refine treatment plans in real–time by leveraging patient–specific anatomical data and historical outcomes. This ensures precise dose delivery while minimizing toxicity. Deep learning models like U–Net have achieved clinician–level accuracy in tumor segmentation and OAR delineation, improving efficiency and reducing manual workload. In ART, AI–enabled workflows dynamically adjust treatment plans based on daily imaging data, resulting in more personalized and adaptive care. Emerging models, including transformers, have enhanced robustness and accuracy in RT applications, while generative models like GANs have advanced dose prediction and quality control processes. The integration of AI into RT has optimized treatment precision, reduced toxicity, and demonstrated transformative potential in clinical practice.AI is revolutionizing radiation oncology by automating labor–intensive tasks, enabling adaptive and personalized treatments, and driving innovation in patient care. From segmentation to dose optimization, AI enhances RT precision and efficacy. As these technologies advance, they promise to further revolutionize cancer treatment, delivering efficient, patient–centered, and outcome–driven RT to improve care for cancer patients worldwide.Artificial Intelligence, Deep Learning, Radiation Oncology, Adaptive Radiotherapy

Medical Physics Department, Tarbiat Modares University, Tehran, Iran/Department of Biomedical Engineering, Faculty of Modern Sciences, Tabriz University of Medical Sciences, Tabriz, Iran/Medical Physics Department, Tarbiat Modares University, Tehran, Iran/Department of Medical Physics, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Identifying the dynamic behavior of cancer tumor growth data in studying the saturation response of M۲ macrophages using a Machin learning tool

Hossein Kheiri * , Younes Yousef Pour

While machine learning models show promising performances with high accuracy rates, a persistent problem lies in their lack of interpretability. Understanding and describing these models' decision–making processes is crucial to gaining trust and facilitating their adoption in real–world healthcare settings. In response to these challenges, integrating mathematical frameworks with machine learning methods offers a compelling solution that combines the strengths of both approaches.

In this paper, considering the application of mathematics in medical sciences, we have tried to use machine learning techniques to identify the dynamics of cancer growth patterns in response to M1 and M2 macrophage saturation from existing data. Data on cancer growth in the study of M2 phage saturation response is taken from a medical center or manufacturer. Outliers are removed using statistical methods and the remaining data are normalized. Next, a neural network is defined to identify the data. After training the network, the future of cancer growth is predicted from the network.According to the numerical simulations extracted from the proposed method, we conclude that it is possible to predict cancer growth with desired accuracy using the defined neural network.The method proposed in the paper can be used to identify the dynamics of cancer and other disease growth from existing data and determine its future growth from the defined neural network.Dynamic identification, machine learning, cancer, mathematical model

Smart Learning – The Impact of AI on Nursing Education Practices

Mahsa Gholinejadzirmanlou * , Sima Pourteimour

The integration of artificial intelligence (AI) in nursing education is revolutionizing healthcare training by enhancing learning experiences and educational outcomes. This article investigates varous AI applications and their implications for nursing curricla.A mixed–methods study employed Likert–scale surveys and open –ended questions to evaluate perceptions of AI tools in nursing education.
The 15–item questionnaire was informed by literature and focused on teaching effectiveness, while the open–ended question explored implementation challenges. Additionally, semi–structured interviews with 10 key stakeholders—faculty, administrators, and technology specialists—were conducted to identify strategies for integrating AI into nursing curricula. Data were thematically analyzed using MAXQDA–10 and the qualitative content analysis process by Elo and Kyngäs (2008).72% of respondents believed AI enhances learning experiences, while 68% acknowledged its support for clinical decision–making. Additionally, 65% felt that AI fosters personalized learning, and 70% noted improved student engagement.

However, challenges such as lack of training (55%), data privacy concerns (45%), and technology infrastructure issues (43%) were significant barriers to implementation. The analysis yielded four main categories: best practices for integration, addressing implementation challenges, enhancing student learning, and future directions, along with nine subcategories including support systems, data privacy concerns,
guidelines for ai use, enhancing critical thinking, bridging theory and practice, continuous evaluation, research on long–term implications, stakeholder advocacy, and impact on learning outcomes.: AI significantly enhances nursing education by improving learning outcomes and preparing students for modern healthcare.
Effective integration requires overcoming challenges like faculty training and equitable technology access, emphasizing the need for strategic implementation to fully leverage AI's potential in the field.AI, Nursing Education, Personalized Learning, Curriculum, Clinical Competence

School of Nursing and Midwifery, Urmia University of Medical Sciences, Urmia, Iran

Utilization of community detection algorithms in complex networks in the field of drug repositioning

Parya Roghani * ,Hamid Roghani

Community detection algorithms are one of the research areas in computer science and graph processing, which is used as one of the most efficient tools to extract hidden information between entities by grouping components with similar patterns into various communities, using their communication model. Also, since drug repositioning is a popular research field for identifying new therapeutic applications for existing drugs and can be modeled by complex networks, by applying community detection algorithms to the drug–drug similarity network, it is possible to discover potential repositioning for drugs based on their similarity patterns.To measure drug similarities from different aspects and create a more comprehensive similarity network that encompasses a wide range of drug–related information, the use of a mutliplex network structure has been proposed. This structure consists of four layers of drug similarity network based on the concepts of drug similarity based on similar targets, similar chemical structure, participation in similar pathways, and effects on similar diseases, such that drugs with similarities greater than a threshold are connected by an edge in the graph. Finally, by merging the 4 different graph layers and processing the final single–layer graph by the community discovery algorithm, multiple groups of drugs with similar pharmacological roles and functions are clustered.A case study of several communities of discovered drug groups and their analysis showed that drugs that are categorized into different groups based on the ATC classification system, in this experiment, a number of them were placed in the same groups, indicating their functional similarity and the possibility of replacing them with other drugs in the same group for treatment.Experiments and analyses have shown that modeling drug relationships using complex networks and utilizing community recognition algorithms can be a practical and effective tool for finding examples of drugs with similar medicinal uses. Adopting such an approach alongside laboratory operations can be an efficient way to reduce costs and accelerate the drug repositioning process.Community detection, complex networks, drug repositioning

Department of Biology, Islamic Azad University Central Tehran Branch, Tehran, Iran/Department of Computer Engineering, Azarbaijan Shahid Madani University, Tabriz, Iran

Diagnostic Accuracy and Clinical Utility of Convolutional Neural Networks in Automated Histopathological Image Classification for Early Breast Cancer Detection: A Systematic Review

Alireza Pourrahim * ,Abdollah Karimi,Mohammad Mahdi Pourrahim, Alireza Vasiee,Omid Raiesi

Breast cancer remains a leading cause of cancer–related mortality among women globally. Early and accurate diagnosis is critical for improving survival rates, as timely intervention can significantly enhance treatment outcomes. Histopathological analysis of hematoxylin and eosin (H&E)–stained biopsy slides is the gold standard for breast cancer diagnosis, but it is labor–intensive, prone to inter–observer variability, and requires specialized expertise. Convolutional Neural Networks (CNNs), a deep learning approach, have demonstrated promising results in automating histopathological image classification, potentially improving diagnostic accuracy and efficiency while reducing observer variability. This systematic review evaluated the diagnostic accurcy, sensitivity, specificity, and clinical utility of CNN–based methods in breast cancer detection using histopathological images. This systematic review followed PRISMA guidelines, with a comprehensive literature search conducted across PubMed, Web of Science, EBSCO, Scopus, and IEEE Xplore databases. The search terms included “Breast Cancer”, “Convolutional Neural Networks”, “Histopathological Image Classification”, “Early Detection”, “Deep Learning”, and related MeSH terms. Studies were eligible if they focused on CNN–based models for classifying breast cancer histopathological images and reported statistical outcomes such as accuracy, sensitivity, specificity, or AUC–ROC scores. Non–English studies, non–peer–reviewed articles, and those using non–CNN methods were excluded. Six studies met the inclusion criteria and their quality was assessed using the QUADAS–2 tool, confirming low risk of bias and high methodological quality. Metrics extracted for comparison included accuracy, sensitivity, specificity, and AUC–ROC.The included studies demonstrated high diagnostic accuracy and robust performance of CNN models for breast cancer histopathological image classification. Reported accuracy ranged from 77.8% to 98.33%, with the highest accuracy observed using the Xception network, which also achieved a kappa score of 0.969 and an AUC–ROC of 0.998. Sensitivity values varied from 83.3% to 99%, with invasive carcinoma classifications consistently reaching sensitivities near 99%. Specificity ranged between 88% and 99%, ndicat–ing strong discriminatory performance for both binary and multiclass classifications.

Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran./Department of Computer Engineering and Information Technology, Amirkabir University of Technology, Tehran, Iran./Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran./Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran.,Department of Parasitology, School of Allied Medical Sciences, Ilam University of Medical Sciences, Ilam, Iran.

Models employing lightweight architectures such as MobileNet achieved increased accuracy with lower computational demands, showing improvements of over 11% compared to conventional methods. Stain normalization techniques, including Macenko and Reinhard normalization, were explored for performance enhancement, with the Macenko method achieving a kappa score of 0.965, an AUC–ROC of 0.997, and a mean AUC–PR of 0.991. Despite normalization improvements, the original datasets often outperformed normaized datasets in terms of classification accuracy and sensitivity. The models commonly used categorical cross–entropy loss functions to optimize performance by assigning higher probabilities to the correct classifications while minimizing the likelihood of misclassifications. Training was conducted on high–performance computational setups, with some studies utilizing GPUs with over 12 GB VRAM and 2496 CUDA cores for faster processing. Cross–validation techniques, such as 5–fold cross–validation, were frequently employed to ensure reliability and minimize overfitting.In comparative evaluations with state–of–the–art models, CNN–based classifiers consistently outperformed conventional feature extraction–based methods and earlier deep learning models like AlexNet and VGG16. These results highlight the superior capability of modern CNN architectures in achieving both high sensitivity and specificity for breast cancer classification tasks.CNN–based models have shown remarkable accuracy in histopathological breast cancer image classification, with accuracies exceeding 98% in some studies. Sensitivity and specificity values were consisten ly high across models, indicating their potential for clinical implementation in early breast cancer detection. However, further standardization, larger datasets, and prospective validation studies are necessary to ensure reproducibility and generalizability in clinical settings. Techniques like stain normalization and lightweight architectures such as Mobileet present promising avenues for improving both diagnostic accuracy and computatioal efficiency.Breast Cancer, Convolutional Neural Networks, Histopathological Image Classification, Diagnostic Accuracy, Deep Learning.

The Potential of Artificial Intelligence in Improving Diagnosis and Treatment of Colorectal Cancer: Opportunities and Challenges

Amir Hossein Kiani,Danial Ahdi,Seyed Hossein Khoshraftar

Artificial Intelligence (AI) has emerged as a transformative technology in medicine, particularly in the diagnosis and treatment of colorectal cancer (CRC). Colorectal cancer is the third most common cancer globally, with over 1.9 million new cases and 935,000 deaths reported in 2020. Early diagnosis and personalized treatment strategies are essential to improve survival rate. Artificial Intelligence, especially when combined with Computer-Aided Diagnosis (CAD) systems, holds great potential for improving the accuracy and efficiency of colorectal cancer screening, particularly in detecting precancerous polyps that may be overlooked in routine colonoscopies.Several influential papers from databases such as PubMed, Google Scholar, and other sources have been reviewed through a systematic process, covering articles published from 2018 to 2024. The findings of these studies are presented in this article.Studies have shown that AI-assisted colonoscopy significantly increases the detection rates of polyps and adenomas, particularly small polyps that are typically overlooked in standard colonoscopies. This increase in detection could help reduce colorectal cancer mortality through early interventions.Artificial intelligence has great potential to revolutionize colorectal cancer screening and treatment by providing more accurate diagnostics, early detection, and personalized therapies. Although this technology is promising, challenges such as data bias and the need for further and multi-center studies remain. However, with ongoing technological advancements, artificial intelligence is expected to play a crucial role in improving the outcomes of colorectal cancer diagnosis and treatment.
Artificial Intelligence- Colorectal Cancer- Computer-Aided Diagnosis- Early Detection

Department of Medical Genetics , Faculty of Medicine , Tabriz University of Medical Sciences , Tabriz , Iran/Department of Medical Genetics , Faculty of Medicine , Tabriz University of Medical Sciences , Tabriz , Iran/Department of Medical Genetics , Faculty of Medicine , Tabriz University of Medical Sciences , Tabriz , Iran

Early Detection of Acute Abdomen Using Artificial Intelligence: Enhancing Diagnostic Accuracy and Speed

Nasim Hajipoor Kashgsaray * ,Hassan Soleimanpour

Acute abdomen is a medical emergency requiring prompt diagnosis and treatment to prevent severe complications. This study aims to explore the potential of Artificial Intelligence (AI) in the early detection of acute abdomen, enhancing diagnostic accuracy and speed in clinical practice.Advanced AI algorithms will be trained using extensive datasets of labeled medical images and clinical data related to acute abdomen. The AI system will utilize deep learning techniques to recognize patterns and anomalies indicative of acute abdomen. Real–time analysis of patient data, including imaging and clinical parameters, will be conducted. Upon detecting signs of acute abdomen, the system will generate a detailed report highlighting the potential issues and suggesting possible diagnoses, which will then be reviewed by medical professionals.The AI–based system is anticipated to significantly improve the early detection of acute abdomen. By providing rapid, accurate diagnostic insights, it is expected to reduce the time to diagnosis and imp rove patient outcomes. This AI system will also assist healthcare professionals in making more informed decisions, potentially decreasing the incidence of misdiagnosis and unnecessary interventions. Continuous evaluation and validation of the AI system will be essential to ensure its reliability and effectiveness. The integration of AI in the early detection of acute abdomen shows great promise for modernizing emergency medical diagnostics. By delivering rapid and accurate diagnostic reports, AI has the potential to revolutionize the approach to acute abdomen, leading to faster and more accurate treatments. Future research should focus on large–scale trials and further refinement of AI algorithms to maximize their effectiveness in clinical settings.Artificial Intelligence (AI) – Early Detection – Acute Abdomen – Medical Imaging – Clinical Data Analysis – Deep Learning – Medical Emergency – Rapid Diagnosis

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran./Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran.

Utilizing Artificial Intelligence in Medical Education: A Transformation with ۳D and ۵D Animated Visuals

Nasim Hajipoor Kashgsaray * ,Hassan Soleimanpour

The integration of Artificial Intelligence (AI) in medical education has the potential to transform how students and professionals understand complex concepts. This study aims to explore the anticipated impacts of AI-generated 3D and 5D animaed visals on medical education, aiming to facilitate a deeper comprehension of intricate medical subjects. AI algorithms are expected to generate highly detailed 3D and 5D animated visuals depicting various medical phenomena. These animations will offer dynamic, interactive representations of anatomical structures, physiological processes, and clinical procedures. Medical students and professionals will engage with these visual tools during instructional sessions. Data will be collected through surveys and interviews to assess the anticipated effectiveness of these visuals in enhancing understanding and retention.It is anticipated that the utilization of 3D and 5D animated visuals will significantly enhance the participants' grasp of complex medical concepts. The AI-generated animations are expected to provide an immersive and interactive learning experience, leading to improved retention of information. Additionally, these engaging visuals are likely to increase student motivation and interest in the learning material.The application of AI-driven 3D and 5D animations in medical education shows promise for greatly enhancing learning outcomes. With detailed and dynamic visual representations, AI is projected to revolutionize the delivery of medical education, ensuring a more comprehensive understanding of medical science. Future research should focus on broader implementation and further exploration of AI-generated visuals in education to substantiate these anticipated benefits.
Artificial Intelligence (AI)- Medical Education- 3D Visuals- 5D Visuals- Dynamic Animations- Interactive Learning Experience- Understanding Medical Concepts- Innovative Educational Technologies

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran./Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran

The Role of Artificial Intelligence in Enhancing HER۲ Interpretation and Improving Targeted Therapy for Breast Cance

Ali Hajizadeh *

Breast cancer is one of the most prevalent cancers among women. The Human Epidermal Growth Factor Receptor 2 (HER2) plays a critical role in predicting the response to targeted therapies. In recent years, Artificial Intelligence (AI) has emerged as a tool for improving the accuracy of HER2 diagnosis and predicting therapeutic responses. This review aims to investigate the role of AI in enhancing the interpretation of immunohistochemistry (IHC) results and HER2 classification. This review is based on articles published between 2018 and 2024, identified through searches in reputable databases such as PubMed, Scopus, SID, and Magiran. The keywords used included AI, Breast cancer, and HER2. The selected studies focused on the application of AI in improving IHC interpretation and HER2 classification using data from credible research centers.The studies demonstrated that AI significantly improves the accuracy and consistency of pathologists in interpreting HER2. For example, one study showed that AI increased the accuracy of interpreting HER2–low from 75% to 88%. Another study reported that AI identified intratumoral heterogeneity with 92% accuracy. Additionally, AI tools achieved 93% accuracy in distinguishing HER2 1+ from HER2 0. These tools reduce interobserver variability and exhibit high potential for standardizing HER2 interpretation.AI has a strong potential for standardizing and improving HER2 diagnosis. AI tools can effectively identify patients suitable for targeted therapies such as HER2–targeted ADCs. Future research should focus on developing advanced algorithms and their practical application in clinical settings.Breast cancer, Artificial intelligence, HER2, Immunohistochemistry, Molecular classification, Targeted therapy

Medical Student, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Early Diagnosis of Brain Tumor Using Artificial Intelligence: A Conceptual Study

Nasim Hajipoor Kashgsaray * ,Hassan Soleimanpour

Early detection of brain tumors is crucial for improving treatment outcomes. This study investigates the feasibility of employing artificial intelligence (AI) techniques to enhance early diagnosis of brain tumors through imaging. Utilizing Convolutional Neural Networks (CNNs) and deep learning models, this research aims to developanadvanceddiagnosticsystem.Thepreprocessingstepsincludednormalization, standardization, and noise reduction to enhance image quality. MRI images were analyzed using CNNs known for their ability to detect complex patterns. We compared different base models to select the most efficient one, using transfer learning with pretrained models fine–tuned with expert–labeled datasets. Grad–CAM heatmaps were used to visualize areas of significant interest in MRI scans, assisting in model interpretation and highlighting regions relevant to tumor detection. Preliminary results suggest that the diagnostic accuracy of the AI system may be comparable to that of experienced radiologists. The system appears to improve sensitivity and specificity. It is claimed that integrating AI could reduce diagnostic errors and provide reliable insights for early intervention.This conceptual study highlights the potential role of AI in advancing brain tumor diagnostics. Future research should focus on expanding datasets to include rare anomalies, validating AI models in real clinical settings, and optimizing real–time algorithm performance to ensure seamless integration into healthcare practices. The adoption of AI–driven tools promises to revolutionize early brain tumor detection, ensuring timely and accurate diagnosis for improved patient outcomes.Artificial Intelligence (AI)– Brain Tumor Diagnosis– Medical Imaging– Convolutioal Neural Networks (CNNs)– MRI Analysis– Deep Learning

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran./Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran

AI assistant and single–cell analysis for studying cell behavior and health

Mehrnaz Moattari * , Farahnaz Moattari

Large language models are highly adept at understanding complex natural language commands, allowing them to accomplish a diverse array of tasks. In the realm of life sciences, single–cell RNA sequencing (scRNA–seq) data acts as the “language of cellular biology,” revealing intricate patterns of gene expression on a single–cell basis. Nevertheless, engaging with this “language” using traditional tools frequently proves to be cumbersome and counterintuitive, presenting significant challenges for researchers.This article focused on InstructCell, a versatile AI assistant that utilizes natural language to facilitate more straightforward and adaptable single–cell analysis.This results enable researchers to perform essential tasks like cell type annotation, conditional pseudo–cell generation, and drug sensitivity prediction through simple natural language instructions. Comprehensive assessments reveal that IstructCell consistently matches or surpasses the performance of current single–cell foundation models, all while adapting to various experimental scenarios. InstructCell offers an easy–to–use and user–friendly platform for examining intricate single–cell data. This reduces technical obstacles and facilitates more profound biological understanding.Artificial Intelligence, Cell, Language model

Kharazmi university, Tehran, Iran. Persian gulf university, Bushehr, Iran

Application of Artificial Intelligence in Pediatric Pharmacological Calculations: Optimizing Treatment Using Deep Learning Algorithms

Aydin Mahmoud Alilou * , Pooria Masoudi,Amir Reza Bana e Nasli, Reza Rostami,

Children require specialized therapeutic approaches due to their unique physiological and metabolic characteristics. Determining drug dosages in children is particularly challenging due to rapid growth and developmental changes in body structure. Artificial Intelligence and Machine Learning, with their ability to analyze complex data and predict therapeutic outcomes, can be powerful tools in this domain. This article examines the applications of AI in pediatric pharmacological calculations and presents models for optimizing drug dosage determination and reducing adverse effects.1. Data Collection:

- Data Source: Clinical data were collected from 150 children aged 1 to 12 years with various conditions such as diabetes, asthma, and neurological disorders.
- Key Variables: Age, weight, height, type of drug, dosage determination, treatment response, and adverse effects.
- Data Sources: Hospital databases and Electronic Medical Records (EMR).

2. Data Preprocessing:

- Handling Missing Data: Missing values were filled using imputation methods and predictive algorithms.
- Data Normalization: Data were normalized to reduce variance and improve model performance.
- Feature Extraction: Features related to age, weight, height, and drug type were extracted as inputs for machine learning models.

3. Model Development:

- Models Used:
  - Recurrent Neural Networks (RNN): For analyzing sequential data and predicting drug dosage.
  - Long Short–Term Memory (LSTM): For managing long sequential data and achieving more precise predictions.
  - Random Forest: For predicting adverse effects and optimizing drug dosage.
- Data Splitting: Data were divided into training (80%) and testing (20%) sets.

4. Model Evaluation:

- Evaluation Metrics:
  - Accuracy: The ratio of correct predictions to total predictions.
  - Sensitivity: The model's ability to correctly identify adverse effects.
  - Specificity: The model's ability to correctly identify healthy individuals.
  - Area Under the ROC Curve (AUC): A comprehensive metric representing the overall accuracy of the model

Pediatric Emergency Medicine Fellowship, Tabriz University of Medical Sciences, Tabriz, Iran/Bachelor of Medical Engineering, Islamic Azad University of Tabriz, Tabriz, Iran/Bachelor of Nursing, Islamic Azad University of Tabriz, Tabriz, Iran/Associate of Emergency Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

1. Model Performance:
•LSTM Model: Achieved 95% accuracy in predicting optimal drug dosage and identifying adverse effects.
•Random Forest: Achieved 93% accuracy in predicting adverse effects and optimizing drug dosage.
•GRU Model: Achieved 92% accuracy in predicting treatment response.
2. Statistical Data:
•Adverse Effects: 18% of children who received specific medications experienced adverse effects.
•Treatment Response Rate: 78% of children treated with chemical drugs showed a positive response.
•Reduction in Dosage Errors: The use of AI models led to a 30% reduction in dosage determination errors.This study demonstrated that the use of AI and deep learning algorithms can significantly improve the accuracy of pharmacological calculations in children. The models developed in this research were able to optimize drug dosage determination and reduce adverse effects. Based on the findings, it is recommended to integrate clinical data with genetic and medical imaging data in the future to further enhance model accuracy.
Future Research Directions:
1.Development of Advanced Algorithms: Utilizing more sophisticated deep learning techniques such as Transformers for analyzing complex data.
2.Data Integration: Combining clinical data with medical imaging data (e.g., MRI or CT) for more accurate diagnostics.
3.Increasing Data Volume: Collecting larger datasets from pediatric patients to improve model generalizability and accuracy.
4.Research on Specific Drugs: Investigating the effects of specific drugs on different age groups and predicting related adverse effects.Artificial Intelligence, Pharmacological Calculations, Dosage Determination, Children, Adverse Effects, Deep Learning, Predictive Models

Ethical Challenges of Using Artificial Intelligence in Medical Research: A narrative review study

Mostafa Ghasempour * ,Majid Purabdollah,Mansour Ghafourifard, Roghayeh Asghari,Fariba Abri

The use of Artificial Intelligence (AI) in medical research has made significant advancements in recent years. This technology has accelerated research processes and improved their accuracy in various fields such as disease diagnosis, treatment prediction, disease modeling, and drug discovery. However, the application of AI in medical research presents several ethical challenges. This study was designed and conducted with the aim of examining the ethical challenges associated with the use of AI in medical research.This study is a systematic review of articles published in reputable databases, including PubMed, Scopus, and Web of Science. A search strategy was designed using a combination of key terms and main phrases such as Artificial Intelligence, Medical Research, Ethical Challenges, Privacy, Algorithmic Bias, and their equivalents. Articles were selected based on predefined inclusion and exclusion criteria.The use of AI in medical research faces various ethical challenges. One of the most significant challenges is issues related to privacy and the security of patient data, where the lack of appropriate security protocols for safeguarding sensitive data is evident in many studies. Algorithmic bias, resulting from unbalanced or inaccurate data, can also lead to incorrect and discriminatory results in diagnoses and predictions. Moreover, many AI algorithms, especially in diagnosis and prediction, operate as “black boxes,” leading to a lack of transparency in decision–making processes and reducing trust in these systems. The issue of accountability in the event of errors is also under discussion, as it remains unclear where and how responsibility for algorithmic mistakes is determined. In addition to these challenges, the lack of cohesive regulations and ethical frameworks complicates the responsible use of AI in medical research.The results of this study indicate that for the ethical and effective use of AI in medical research, ethical challenges such as algorithmic bias, privacy issues, and accountability must be seriously addressed to prevent negative and erroneous consequences in medical research. The development and establishment of comprehensive ethical and legal frameworks can help mitigate these challenges and, while improving research quality, increase public trust in this technology. Ultimately, the establishment of clear policies and ethical principles can ensure the fair and effective use of AI in this field.Artificial Intelligence, Medical Ethics, Medical Research, Privacy, Algorithmic Bias

Department of Medical Surgical Nursing, Assistant professor of Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran.
Department of Nursing, Assistant Professor of Faculty of Nursing, Khoy University of Medical Sciences, Khoy, Iran.
Department of Medical Surgical Nursing, Associate professor of Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran.
Department of Anesthesiology and Critical Care Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.
Master of Community Health Nursing, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran

Application of artificial intelligence in the management of patients hospitalized in intensive care units

Mostafa Ghasempour * ,Majid Purabdollah,Mansour Ghafourifard, Roghayeh Asghari,Khalil Maleki Chollou

Intensive Care Units (ICUs) are highly complex and critical environments where effective management relies on precise data processing and rapid decision-making. Artificial intelligence (AI), as a groundbreaking tool capable of analyzing large volumes of clinical data, offers significant potential for improving patient prognoses, reducing medical errors, and enhancing the quality of care. This study aims to explore the applications of AI in optimizing the management of ICU patients.This study was conducted as a systematic review. Scientific databases, including PubMed, Scopus, and Web of Science, were searched using keywords such as “Artificial Intelligence in ICU,” “Machine Learning in Critical Care,” “Predictive Analytics in Healthcare,” and “Clinical Decision Support Systems.” Inclusion criteria focused on studies related to machine learning and AI algorithms for prognosis, treatment optimization, and error reduction in ICU settings, while low-quality studies or those with incomplete data were excluded. The PRISMA framework was utilized for systematic reporting, EndNote software for reference management, and NVivo software for qualitative data analysis to identify key themes and insights.The findings demonstrate that AI-based systems have significantly impacted ICU patient management. These systems improved the accuracy of mortality predictions by up to 30% and reduced treatment costs by approximately 50%. Moreover, AI effectively predicted cardiac arrest incidents with precision and decreased medication-related errors by 40%. Additional benefits include optimized treatment workflows and reduced workload for healthcare personnel, enhancing the overall efficiency of care delivery.AI represents a powerful tool for advancing ICU patient management by lowering costs, improving service quality, and minimizing medical errors. However, challenges such as data standardization, patient privacy, and user training must be addressed. Future research should prioritize the design of personalized systems and the continuous evaluation of this technology’s effectiveness in clinical practice. Artificial intelligence, intensive care, machine learning, prognosis, patient management

Department of Medical Surgical Nursing, Assistant professor of Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran./Department of Nursing, Assistant Professor of Faculty of Nursing, Khoy University of Medical Sciences, Khoy, Iran./Department of Medical Surgical Nursing, Associate professor of Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran./Department of Anesthesiology and Critical Care Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran.,Department of Nursing, Sarab Faculty of Medical Sciences, Sarab, Iran

Artificial Intelligence in Decision–Making for Cerebral Aneurysm and Subarachnoid Hemorrhage Management: A Conceptual Review

Nasim Hajipoor Kashgsaray * ,Faezeh Farhan

The management of cerebral aneurysms and subarachnoid hemorrhage (SAH) involves critical decisions such as surgical clipping, endovascular embolization, or conservative management. These decisions rely on imaging findings, patient history, and clinical presentation, often influenced by subjectivity and variability. This review explores the potential of artificial intelligence (AI) to support decision–making processes in SAH management.This review proposes a conceptual framework using hypothetical data to evaluate AI's role in integrating imaging and clinical parameters. Feature importance techniques like SHAP and permutation importance were explored to identify the most influential predictors for accurate decision–making. These methods ensure that critical variables, including aneurysm size, location, and hemorrhage severity, are effectively prioritized. The framework incorporates a six–class classification system to address diverse clinical pathways, including different intervention strategies and observational management. Advanced imaging analyses were considered using convolutional neural networks, while clinical data were assessed through traditional machine learning techniques. Performance evaluation used metrics like accuracy and AUC–ROC, emphasizing the importance of combining clinical and imaging data. Preliminary exploration suggests that AI models can effectively stratify patients into appropriate management categories. Integrating imaging data with clinical parameters highlights a personalized approach, showcasing the potential to enhance decision–making reliability. However, the absence of real–world data limits immediate applicability.This conceptual framework underscores AI's promising role in SAH management, emphasizing its ability to synthesize diverse data sources for personalized care. Future research must prioritize real–world validation and explore ethical, practical, and technical considerations to ensure clinical relevance.
Artificial intelligence (AI)– Brain aneurysm management Subarachnoid hemorrhage (SAH)– Surgical Clipping– medical imaging Predictive models– prognosis and diagnosis– data integration–clinical decision–making Convolutional Neural Networks (CNNs)

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran/Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran

Enhancing early breast cancer detection in mammography using Artificial intelligence and convolutional neural networks

Nasim Hajipoor Kashgsaray * ,Faezeh Farhan

Early detection of breast cancer is key to better survival and treatment rates. While mammography continues to be the standard method for screening, its results can become faster and more efficient with AI involvement. This project focuses on the use of AI algorithms, particularly Neural Networks for better early detection of breast cancer in mammograms.A conceptual approach based on AI is suggested. Using CNNs to analyze mammography images. The preprocessing steps involved normalization and standardization of images, resizing them to ensure uniformity and compatibility with deep learning models, and noise reduction. We compare different base models to pick the best one for this task and experimented with combining multiple models (ensemble learning) to further improve the results .Transfer learning with pretrained models was applied and fine–tuned with expert–labeled datasets. Grad–CAM heatmaps visualized mammogram areas that had the greatest influence on the model's predictions. This method was used to help assess the model's ability to focus on relevant regions and diagnose correctly, as well as identify areas for improvement .The system's performance was assessed using metrics like precision, recall, F1–score, and the ROC curve.The AI system showed promising results, achieving diagnostic accuracy close to that of experienced radiologists .The system reduced errors and provided useful diagnostic insights.AI can make breast cancer detection faster and more accurate. Future efforts will aim to refine these algorithms, explore new clinical uses, and ensure the technology can be smoothly integrated into a variety of healthcare settings. Breast cancer– Early detection– Mammography– Convolutional Neural Networks– Deep learning– Transfer learning– Fine–Tuning– Image preprocessing– Grad–CAM– Diagnostic models– Performance metrics– Sensitivity– F1–Score

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran/Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran

AI–Driven Multimodal Approaches for Early Cancer Detection: From Genomics to Radiomics

Mahdi Soltan Oghli * ,Kobra Moghadasi Paria

Timely diagnosis smoothes the way for instant therapy and a diminishing possibility of disease progression and complications. So far, the current approach to diagnosis has been based on single–modality data, which seriously lacks sensitivity. However, multi–modal integration– medial images, clinical text data, genetic information, speech data, and pathophysiological signals–results in a better way to reach the holistic view. AI stands as an accelerator for this integration and the precise calculation needed to reach early diagnosis. This narrative review surveys the utilization of AI in amalgamate of multimodal data for cancer diagnosis. We analyzed studied used machine learning and deep learning to merge differ–ent sources of data such as genomics, radiomics. By considering diversity of cancer types and their manifestations, we emphasized on the utilities and methods used for modality integration. Our analysis revealed the superiority of multi–modality approach over single source method. For example, Zhitao Zhang et.al. gained higher precision and sensitivty 90.15% and 96.31% respectively by combining radiomics where in single plain scan parameters were 70.18% and 76.85 %. convergence of multi–omics and radiomics with AI embodies the most promising cutting edge of both basic biomedical investigation and clinical management. By deriving such complex data integration and analytics, AI will promote more exact predictive modeling for genotype–environment–phenotype relationships and further facilitate biomarker discovery, personalization in therapy, and the overall improvement in the outcomes for patients at an automated, low–manpower input, cost–effective manner mode of analysis.
artificial intelligence, Cancer Screening, Multimodal analysis, Genomics, Radiomics

pharmacy faculty of Zanjan, Zanjan, Iran/pharmacy faculty of Zanjan, Zanjan, Iran

Cell Biology: Leveraging AI for Virtual Cell Exploration

Mehrnaz Moattari * , Farahnaz Moattari

Cells play a crucial role in our comprehension of both health and disease; however, conventional models often fail to accurately emulate their intricate functions and behaviors. Recent advancements in artificial intelligence and omics technologies present exciting prospects for developing an AI virtual cell (AIVC). This viewpoint advocates for the development of advanced virtual cells, which are three-dimensional models that dynamically incorporate data from a variety of sources. This innovative, large-scale neural network model operates on multiple scales and modalities, allowing it to simulate the activities of molecules, cells, and tissues under various conditions. This Perspective outlines a vision for the design of AIVCs and highlights how collaborative efforts in their development can revolutionize biological research. In conclusion, by facilitating high-fidelity simulations, expediting discoveries, and informing experimental investigations, AIVCs will unlock new avenues for understanding cellular processes and encourage interdisciplinary collaborations within the realm of open science. Artificial intelligence, Cell, Health

Kharazmi university, Tehran, Iran. Persian gulf university, Bushehr, Iran

Artificial Intelligence for Enhancing Healthcare Workers) Mental Health: A Systematic Review

Fatemeh Abdolrahimi,Negin Ranjbar Soleymani *

Healthcare workers experience stress and mental health challenges due to demanding work conditions, impacting care quality. While advancements in AI offer potential for personalized mental health support, a comprehensive review of AI's role in healthcare workers' mental health is lacking. This systematic review aims to assess AI's capabilities and limitations in enhancing healthcare workers' mental health.This systematic review adheres to the PRISMA–P guidelines and utilizes the PICO framework. A comprehensive search was conducted across reputable databases such as PubMed, Medline, Web of Science, Scopus and google scholar, encompassing the period from 2020 to 2025. Search terms included "Artificial Intelligence", "Healthcare Workers" and "Mental Health". Two Reviewer independently evaluated retrieved articles based on predetermined inclusion and exclusion criteria. The quality of studies was assessed using the CASP tool. Data on study objectives, AI types, methods, and results were extracted. Out of 59 articles, 7 met the inclusion criteria. The systematic review showed that AI tools, including chatbots, can improv healthcare workers' mental health by predicting disorders, reducing stress, and providing counseling access. However, challenges like ethical concerns, resistance, high costs, and the need for algorithm development persist. AI can improve healthcare workers' mental health through personalized support. Despite some challenges, AI remains promising but requires more research to overcome obstacles.
Artificial Intelligence, Healthcare Workers, Mental Health

Health Information Technology Expert, Sarab Faculty of Medical Sciences, Sarab, Iran/ Committee, Zeynab (P.B.U.H) School of Nursing And Midwifery, Guilan University of Medical Sciences, Rasht, Iran

Artificial Intelligence in Sperm Selection: Enhancing Precision in Fertility Treatments

Samin Rashtchi Jabbari * ,Saba Hadi ,Elaheh Hassani

The integration of artificial intelligence (AI) into assisted reproductive technologies (ART) has significantly improved fertility treatments. A crucial component of ART is sperm selection, which traditionally relies on manual assessment that can be subjective and prone to errors. AI has the potential to refine sperm selection, improving ART outcomes by enhancing accuracy and consistency.
A comprehensive search was conducted in PubMed and other databases using terms like “Artificial Intelligence” AND “Sperm Selection,” “Machine Learning” AND “ART,” and “AI” AND “Fertility Treatment.” The search was limited to studies published in the past decade to ensure relevance. Cherouveim et al. (2023) reviewed the potential of AI in sperm selection and found that AI algorithms can objectively evaluate sperm characteristics, resulting in more consistent and accurate selections compared to traditional methods. This reduces human error, improving the chances of successful fertilization and pregnancy. Lustgarten Guahmich et al. (2023) showed that AI–driven selection processes enhance fertilization rates and embryo quality, emphasizing AI’s transformative potential in reproductive medicine. The integration of artificial intelligence (AI) into ART represents a significant advancement in fertility treatment. AI–based sperm selection enhances accuracy, consistency, and efficiency compared to traditional methods. As AI technologies continue to evolve, their adoption in clinical practice promises to optimize patient outcomes and advance reproductive medicine. However, limitations such as the need for high–quality data and ethical concerns regarding the use of this technology remain challenges that must be addressed in the future. (ART)Artificial Intelligence(AI), Sperm Selection, Assisted Reproductive Technologies

Department of Medical Genetics, Tabriz University of Medical Sciences/Department of Medical Genetics, Tabriz University of Medical Sciences/Department of Medical Genetics, Tabriz University of Medical Sciences

Investigating the Effect of Artificial Intelligence Solutions in the Diagnosis of Ovarian Endometriosis: A systematic review

Aynaz Esmailzadeh * , Alireza Rasoulian,Azam Kheirdoust,Mohammad, Reza Mazaheri Habibi

Endometriosis is a common female disease characterized by the growth of tissue similar to the endometrium outside the uterus, leading to pelvic pain, irregular menstruation, and infertility.
Despite scientific advances and extensive research, timely diagnosis of endometriosis is often delayed due to unclear etiological mechanisms, the absence of specific symptoms, and non–invasive diagnostic indicators. Using artificial intelligence algorithms as an auxiliary decision maker in the timely and correct diagnosis of this disease can be useful. The aim of this study was to investigate the effect of artificial intelligence solutions in the diagnosis of ovarian endometriosis. This study was conducted as a systematic review in 2024 by searching the reputable databases PubMed, Web of Sciences, Scopus, and the Google Scholar search engine. The keywords “artificial intelligence”, “diagnosis” and “endometriosis” were reviewed in studies without time limits. English–language studies that examined the role of artificial intelligence in the diagnosis of ovarian endometriosis met the inclusion criteria. Titles and abstracts were independently assessed by two reviewers. Then, the full text of the articles was reviewed, and an identical form with the fields of study title, country, number of participants, study objectives, and main study findings and a form with the fields of the type of artificial intelligence tool used, error rate, accuracy rate, and effectiveness of the artificial intelligence tool were used for the data extraction stage.A total of 515 articles were retrieved from the aforementioned databases. After reviewing the titles and abstracts and considering the inclusion and exclusion criteria, 15 articles were ultimately included in the study. The findings of these studies indicated that artificial intelligence algorithms can be beneficial in the accurate and comprehensive diagnosis, early treatment, empowerment, and enhancement of the quality of life for individuals with ovarian endometriosis. Maintaining sexual hygiene, practicing meditation, and following a proper diet significantly impact the treatment of ovarian endometriosis. Additionally, healthcare providers can utilize AI algorithms to aid in the precise diagnosis of this condition and prevent potential complications and adverse effects. The results of this study demonstrated that the use of artificial intelligence algorithms can be beneficial in the accurate diagnosis and timely treatment of ovarian endometriosis, leading to increased awareness and improved quality of life for patients with this disease. However, further studies are needed in this field to enhance the awareness of healthcare providers and individuals with endometriosis. Artificial Intelligence, Diagnosis, Endometriosis

Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Ph.D. student in Medical Informatics, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran./Ph.D. in Medical Informatics, Assistant Professor of Health Information Technology Department, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad,

Lung Disease Prediction from X–ray Images Using Attention Guided Convolutional Neural Network

Ehsan Eslami Shafigh,Sepideh Ghaemifar,Abbas Zal*

The article introduces the Attention–Guided Convolutional Neural Network (AG–CNN), designed to classify chest X–rays into categories such as COVID–19, pneumonia, and normal. It addresses challenges in traditional models, such as noise and misalignment, by integrating global and local image features. This approach mimics radiologists' diagnostic process, enhancing accuracy and reducing workload. : The proposed AG–CNN model includes three branches
Global Branch: Processes the entire image for general features.
Local Branch: Focuses on lesion regions using attention–guided mask inference.
Fusion Branch: Combines outputs from the global and local branches for classification.
The model leverages DenseNet–121 and transfer learning from ImageNet weights. The training employs a three–stage process to optimize each branch individually and integrate them effectively. The AG–CNN model significantly enhances chest X–ray classification by integrating global and local information. While it requires high computational resources, it has the potential to revolutionize radiological diagnostics. Future work will focus on improving attention mechanisms, extending to other imaging modalities, and reducing computational complexity.
The fusion branch outperformed individual branches across all models, achieving an accuracy of 91% and AUC of 98% with the fine–tuned DenseNet–121. The attention–guided mask inference effectively highlighted discriminative regions, improving lesion detection. Experimental comparisons demonstrated the model's robustness in combining global and local features for superior diagnostic performance. The AG–CNN model significantly enhances chest X–ray classification by integrating global and local information. While it requires high computational resources, it has the potential to revolutionize radiological diagnostics. Future work will focus on improving attention mechanisms, extending to other imaging modalities, and reducing computational complexity. Chest X–ray, Deep Learning, Attention Mech– anism, Convolutional Neural Network, COVID–19, Pneumonia, Medi–cal Image Classification, Transfer Learning

University Of Padova

Review of the Ethical Challenges of Using Artificial Intelligence (Al) in Nursing Education

Sanam Mokaram * , Azad Rahmani

With the increasing need for nurses and the development of nursing schools (1), the presence of many students in clinical settings reduces the possibility of quality education and sufficient clinical experience(2). One solution to address these deficiencies and improve education quality is using AI–based educational technologies (3); However, ethical challenges are a significant concern (4)For this purpose, this study reviews the ethical challenges of using Al in nursing education. We searched the Elsevier, PubMed, Science Direct, Scopus, and Google Scholar databases with the keywords ethical challenges, ethical concerns, Al, nursing education, and medical education among articles published between 2020 and 2025. In the initial search, 30 articles were found, and after the initial screening, 21 articles were included in the secondary screening. 11 relevant articles were identified. After checking the access to the full text of the article, 7 studies were finally included in the review. All studies indicated that using AI in nursing education may lead to distrust in health systems due to the lack of information confidentiality. AI may also struggle to understand human emotions such as empathy and compassion, which are fundamental to nursing. Additionally, clinical decision–making and judgment in nursing involve more than just data; they require intuition, tacit knowledge, wisdom, and personal experiences. Since AI outputs are instantaneous, even if designed for learning and reasoning, AI may not be able to address nursing problems that demand critical thinking, intuition, and personal judgment. Another concern is that AI tools might allow students to complete tasks without engaging in critical thinking, leading to nurses with less adherence to ethical values and lower confidence in managing complex cases (5–11). Given the rapid advancement of technology and new educational methods, nursing must adopt these innovations to enhance its standing. Despite challenges with using Al in education, establishing specific ethical guidelines and standards is crucial. Emphasizing critical thinking and problem–solving skills in students ensures improved nursing education quality while maintaining ethical values. Ethical challenges, ethical concerns, artificial intelligence (Al), nursing education, medical education

Department of Medical–Surgical Nursing, Nursing and Midwifery Faculty, Tabriz University of Medical Sciences, Tabriz, Iran./Department of Medical–Surgical Nursing, Nursing and Midwifery Faculty, Tabriz University of Medical Sciences, Tabriz, Iran

Facilitating the identification of herbal medicines and their molecular mechanisms against dengue fever using artificial intelligence: A systematic review

Fatemeh Toroghi * ,Razieh Amini,Nosrat Zarghami,

considering global worries about Dengue fever virus, we reviewed studies conducted to identify herbal medicines against the disease, with special attention to bioinformatics tools. The PubMed database was searched for selected terms. Original English–language studies from 2020 to 2024 were accepted. The PRISMA criteria were checked. After reading abstracts and full texts, 31 of 49 identified articles were left. 28 articles reported treatment on different stages of the vector life cycle, and 13 articles reported antivirus effects of compounds. 8 articles mentioned in silico studies.
In these article, the following databases and tools were used: 1– GWASdb for genetic variants associated with human diseases, 2– networks topology to determine drug hub targets, 3– GO, GSEA, and KEGG to classify involved genes and pathways, 4– SwissADME to calculate physicochemical, pharmacokinetic, drug–like parameters, 5– PubChem and PDB to obtain potential drug compounds and target proteins structures, 6– molecular docking tools for blind or targeted docking, 7– Desmond software for Molecular Dynamics Simulations and 8– Connectivity Map (CMap) for drug– genes– disease connection. These studies demonstrated the benefits of in silico approach. For example, using AI, scientists are able to assay a large number of compounds rapidly and precisely. Moreover, prediction capacity of these tools facilitates drug repurposing in cost–effective manner.
The role of bioinformatics in modern medicine is undeniable, however, the complexity of systems biology makes ideal simulation impossible, at least for now. Thus, validation experiments should be conducted. Moreover, AI application for drug discovery requires the collaboration of interdisciplinary experts. dengue fever, herbal medicine, plant extracts, bioinformatics

Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran./Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran./Department of Clinical Biochemistry and Laboratory Medicine, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Predictive Modeling for Blood Product Transfusion and Coagulation Assessment Using Thromboelastography (TEG) by ChatGPT-OI

Mohammad Meshkini * , Hossein Ghasemi Moghadam, Hossein Ahmadvand

The integration of advanced artificial intelligence (AI) methods, including Generative AI and Explainable AI (XAI), provides a novel approach to modeling clinical decision-making. This study describes the development of a web-based tool that predicts thromboelastography (TEG) parameters and offers blood product recommendations based on user inputs, emphasizing transparency and clinician empowerment. Generative AI, specifically ChatGPT, was employed to conceptualize and construct the predictive model. ChatGPT facilitated the design of user interfaces, algorithmic frameworks, and coding prototypes in HTML and JavaScript.
It synthesized clinical guidelines into functional decision algorithms and generated regression-based predictions for TEG values (R-time, K-time, Alpha Angle, MA, LY30). Explainable AI principles were embedded to ensure transparency in outputs. The model explicitly displays intermediate TEG calculations and provides contextual explanations for transfusion recommendations. Optional parameters such as Factor VIII/IX levels and antifibrinolytic therapy allow for tailored analysis, fostering clinician trust. The resulting tool predicts TEG parameters and offers actionable, weight-adjusted transfusion recommendations for both adult and pediatric populations. For instance, patients with hemoglobin levels below thresholds are advised specific PRBC volumes, while those with prolonged R-time are flagged for FFP transfusion. Explainable AI features clarify decision pathways, displaying both calculations and rationale. By combining the generative capabilities of ChatGPT with the interpretability of XAI, we developed a transparent, user-centered tool that bridges laboratory data and clinical action. This approach showcases how generative AI accelerates model development while XAI ensures clinician confidence in predictive outputs. Future enhancements include the incorporation of machine learning for dynamic refinement and broader clinical applicability. Generative AI, Explainable AI, Thromboelastography, predictive modeling, transfusion medicine, decision support.

Department of Artificial Intelligence(AI) in Medicine, School of Advanced Technologies in Medicine, Iran University of Medical Sciences, Tehran, Iran, Toxicological Research Center, Excellence Center of Clinical Toxicology, Department of Clinical Toxicology, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran, Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran/Department of Internal Medicine, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran/ University of Calgary, Canada

A Scoping Review of Artificial Intelligence in Orthodontics: Evaluating Diagnostic Approaches for Malocclusions

Nadia Alaee * , Ali Rafighi, Aydin Sohrabi

Artificial intelligence (AI) is revolutionizing healthcare, including orthodontic diagnosis. Radiographic images and clinical photographs are used widely for diagnosing malocclusion. AI–based methods, especially deep learning, offer promising solutions for detecting skeletal deformities and classifying malocclusions. A systematic search was conducted on PubMed and Google Scholar to detect studies on malocclusion diagnosis utilizing deep learning and machine learning based algorithms. From 1,532 articles identified, 55 full–text studies were found to be relevant, and 34 were selected based on inclusion and exclusion criteria. All studies were published in the last five years, with 68% focusing on skeletal malocclusion classification, particularly Class III malocclusions. The most common imaging modalities included profile photographs (43%), cephalometric radiographs (38%), and intraoral scans (19%). Frequently used AI models, such as convolutional neural networks (CNNs), U–Net, and ResNet–18, achieved accuracy rates between 70% and 98%, depending on datasets and algorithms. Incorporating large, diverse datasets improved AI performance. Popular methods for facial landmark detection include MTCNN and Dlib, but these approaches may lack precision sometimes. Limitations also include difficulties in identifying the origin of malocclusions and integrating data from multiple imaging techniques. Furthermore, radiographic imaging as a diagnostic tool, involves radiation exposure, emphasizing the need for less invasive methods like facial photos and 3D scans. Future research should focus on developing fast, efficient, and non–invasive AI models to enhance diagnostic accuracy while ensuring accessibility and safety. Artificial Intelligence, Malocclusion Diagn sis, Deep Learning, Orthodontics, Facial Photos, AI Models

Tabriz University of Medical Sciences, Tabriz, Iran

Predicting Heart Disease using Interpretable Voting–based Ensemble Machine Learning

Ali Ghafari * ,Reza Ghafari ,Amir Sorayaie Azar

Heart diseases are amongst the leading causes of human deaths worldwide and adversely affect human lives. Utilizing Machine Learning (ML) models in healthcare and treatment has shown promising results in predicting and diagnosing various diseases. An ensemble ML model could be used to predict heart disease using patient data including Age, Sex, Chest Pain Type, Cholesterol Value, Thallium Heart Scan, Number of Obstructed Major Vessels etc. To assess the performance of the popular ML models including K–Nearest Neighbors (KNN), Decision Tree (DT), Adaptive Boosting (AdaBoost), and Extreme Gradient Boosting (XGBoost) on predicting heart diseases, an ensemble learning model was developed using these models.

The ensemble of proposed models was implemented following a voting approach. It was trained on a dataset containing data from 316 subjects categorized into two groups: with and without heart disease. Finally, the SHapley Additive exPlanations (SHAP) method was used to interpret the model's performance and determine the important features. The ensemble model had an accuracy of 82.24%, an Area Under the Curve (AUC) of 82.25%, and an F1–Score of 81.1%. The top three informative features are Thallium Heart Scan, Number of Obstructed Major Vessels, and Chest Pain Type identified using the SHAP method. Considering the performance of the proposed ensemble model relative to other individual models indicates the ensemble method's functionality and superior performance. This model can act as a complementary tool for physicians to predict and diagnose heart diseases more accurately and rapidly leading to improved comfort of patients. Heart Disease, Voting–based Ensemble Machine Learning, Interpretable Artificial Intelligence

Research Center for Evidence–Based Medicine, Iranian EBM Centre: A JBI Centre of Excellence, Tabriz University of Medical Sciences, Tabriz, Iran./Pharmacy Faculty, Urmia University of Medical Sciences, Urmia, Iran./Department of Computer Engineering, Urmia University, Urmia, Iran.

Evaluating Artificial intelligence in Predicting Orthognathic Surgery Outcomes

Fatemeh Jalali

In several fields, including dentistry, artificial intelligence (AI) has become a valuable tool(1).This study aimed to evaluate the AI–derived models to predicting the treatment outcome of orthognathic surgeries. In related original studies, CBCT images, 3D facial photographs and lateral cephalometry before and after treatment were used to check the results. They have used several artificial intelligence systems such as ANN, 3DMM, Autoencoder Network, DL (CNN), FSC–Net and Point Net++ to predict facial morphology after orthognathic surgery(2–6). Improved accuracy and faster calculation in clinical processes are two areas where AI and deep learning models show promise. However, to reach their full potential, issues including algorithm variability, limited sample numbers, and a lack of data standards must be resolved. Also, Numerous characteristics, such as age, gender, and dental conditions, have been found to influence facial morphology, indicating the necessity for customized prediction models. AI offers accurate and reliable predictions for facial changes after orthognathic surgery, but further research is needed to enhance its capabilities and improve patient outcomes. Artificial intelligence, Orthognathic Surgery, Treatment Outcome, Prediction Methods, Machine

Dental college at Tabriz University of Medical Sciences , Tabriz, Iran

Enhancing Patient Education for Medical Procedures Using Large Language Models (Chatbots)

Ali Rafighi * ,Aydin Sohrabi

Chatbots are powerful AI–based large language models that can generate text similar to human conversations. Physicians can use them to answer frequently asked questions about a disease or a specific medical procedure. The goal of this article is to introduce a model for providing patient education using chatbot models and to demonstrate a practical example of its use in a clinical setting. The process begins with entering a set of frequently asked questions related to a specific disease or medical procedure into the chatbot. The AI model then generates its responses based on its extensive training data, providing precise information and details related to common patient queries. The medical team can then review the responses generated, and enhance their accuracy and quality by refining the input prompts or providing more accurate templates and responses. Then the educational model is shared with patients using a link or QR code. The strength of this model, compared to traditional methods (verbal explanation or pamphlet), lies in its interactivity. This means that the patient can request more explanations from the model on issues they are still uncertain about. Instead of relying on in–person consultations and education, patients can access educational materials and interact with chatbots whenever they wish. By providing interactive dialogues and comprehensive information, patients may feel more empowered and confident in managing their health. Chabot, Patient education, Artificial intelligence, Large language mode

Faculty of Dentistry, Tabriz University of Medical Sciences/Faculty of Dentistry, Tabriz University of Medical Sciences

Artificial intelligence' s impact in the diagnosis and treatment of lung cancer

Fatemeh Pourmohammad* , Masoumeh Akbarbegloo , Ali Rahimlou

Lung cancer is one of the leading causes of cancer deaths worldwide and emphasizes the need for improved diagnostic and therapeutic approaches. In recent years, the emergence of artificial intelligence (AI) has sparked considerable interest in its potential role in lung cancer. Therefore, the aim of this study is to review an overview of the current state of artificial intelligence 's impact in lung cancer screening, diagnosis and treatment. This is a review study that was collected with the keywords artificial intelligence, diagnosis and treatment of cancer, lung from Pub Med, Iran doc, CINAHL, Science Direct, Google Scholar, Scopus in the time range of 2014 to 2024 was collected. Inclusion criteria included access to the full text of the article, and exclusion criteria included letters to the editor, short reports, posters, or speeches. Using large datasets of radiological images, histopathological specimens, and clinical data, AI models can extract complex patterns and features that may not be easily discernible to human observers. Additionally, AI algorithms can continuously learn and improve from new data, leading to increased diagnostic accuracy and efficiency over time. Specific applications of AI in the diagnosis of lung NETs include computer–assisted detection and classification of pulmonary nodules on CT scans, quantitative analysis of PET imaging for tumor characterization, and multimodal data integration for comprehensive diagnostic evaluations. These AI–based tools hold promise for facilitating early diagnosis, risk stratification, and personalized treatment planning in patients with pulmonary NETs. Appropriately trained AI models may be very useful in integrating information to achieve improved diagnostic accuracy and treatment of lung metastasis. However, there are still concerns about the use of artificial intelligence systems in medical settings. Ethical considerations and legal issues must be addressed to facilitate the safe and legal adoption of AI technologies. artificial intelligence, diagnosis and treatment of cancer, lung

Artificial Intelligence for Predicting Post–Stroke Complications Using Longitudinal Data: A Systematic Review

Sama Rahnemayan * ,Mehdi Farhoudi ,Samad Shams Vahdati

Stroke remains a major cause of disability, with complications like recurrent strokes and cognitive decline significantly impacting patient outcomes. The application of artificial intelligence (AI) and machine learning (ML) to longitudinal data holds promise for enhancing the prediction of these post–stroke complications.
This systematic review investigates the effectiveness of AI and ML models in predicting recurrent stroke, cognitive decline, and post–stroke seizures utilizing longitudinal patient data. A comprehensive literature search was conducted using PubMed, which initially yielded 43 articles related to stroke and AI. After rigorous screening, four key studies were selected that specifically addressed the use of AI and ML for predicting post–stroke complications using longitudinal data. These studies were analyzed for their methodologies, types of data used, reported performance metrics, and limitations. The included studies explore the utility of AI in stroke recurrence prediction, retinal imaging for cerebrovascular disease risk, and machine learning for predicting mortality in vascular cognitive impairment. The included studies highlight the potential of AI and ML, showcasing specific predictive models like PRERISK, which utilizes machine learning for stroke recurrence prediction, achieving strong performance metrics. Additionally, studies on retinal imaging and its connection to cerebrovascular disease, and machine learning's utility in predicting mortality in dementia offer further insight. While one study focuses on neuroimaging standards for small vessel disease, it provides relevant context fo understanding stroke pathophysiology, while others directly incorporate AI/ML for predictive modeling. The systematic review indicates that AI and ML can improve prediction of post–stroke complications, especially recurrent strokes and cognitive decline. Models like PRERISK can help tailor risk stratification and integrating AI–driven techniques alongside traditional clinical methods may improve patient results. Furthermore, retinal imaging and machine learning are promising for early risk detection. Further research is needed for validation across varied populations to maximize impact on patient care, and we note that PROSPERO registration is pending. Stroke, Post–Stroke Complications, Artificial Intelligence, Machine Learning, Predictive Modeling, Longitudinal Data, Cognitive Decline, Recurrent Stroke, Retinal Imaging, Systematic Review, Vascular Cognitive Impairment, Risk Prediction

Neurosciences Research Center (NSRC), Tabriz University of Medical Sciences, Tabriz, Iran/Neurosciences Research Center (NSRC), Tabriz University of Medical Sciences, Tabriz, Iran/Emergency Medicine Research Team, Tabriz University of Medical Sciences, Tabriz, Iran

Predicting Pregnancy Loss Using Machine Learning (ML) Models and Pre–Pregnancy Characteristics: A Retrospective Cohort Study

Mehdi Yousefi * ,Mohsen Dashti, Arvin Amir, Shahla Danaii,
Javad Ahmadian Heris, Forough Chakari–Khiavi, Narges Noori

Approximately 1–5% of pregnant women experience recurrent pregnancy loss (RPL), which imposes psychological and economic pressure on couples. Early detection and evaluation of high–risk variables not only allows for the initiation of recommended treatments, but also reduces the likelihood of RPL in these couples. The goal of this study was to estimate the risk of pregnancy loss using ML models. The study population was selected from the Tehran, Shiraz, Ardebil, Mashhad, and Tabriz fertility centres between December 2014 to April 2024. Overall, 16,818 RPL patients and 19,979 healthy women were included. We used 22 characteristics from 5 categories including: 1) Demographic characteristics, 2) Biochemical tests, 3) Immune assays, 4) Measurement of autoantibodies, and 5) Life style for constructing four ML models. These models were examined using Confusion matrix, Precision–Recall Curve, and ROC Curve. The AUC values for training sets of TabNet (Deep Learning), Random Forest (Ensemble Learning), CatBoost (Gradient Boosting), and Support Vector Machine (Kernel–Based Learning) models were 0.996, 1.000, 0.999, and 0.983, respectively, and for validation sets were 0.993, 0.995, 0.999, and 0.977. The TabNet model was chosen as preferred model for continued development due to its notable ability in handling missing data. In conclusion, in the light of our substantial patient cohort and using 22 variables, we achieved near–perfect AUC in our ML models in the predicting the pregnancy outcome. Moreover, these models can help to choose the advanced therapy options such as lymphocyte immunotherapy (LIT), intravenous immunoglobulin (IVIG), etc. which adds to the value of this work. Recurrent pregnancy loss, machine learning, artificial intelligence, risk factor, prediction model

Department of Immunology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran/Immunology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran/Fertility Technologies, Melbourne, Australia/Gynecology Department, Eastern Azerbaijan ACECR ART center, Eastern Azerbaijan branch of ACECR, Tabriz, Iran,Department of Allergy and Clinical Immunology, Pediatric Hospital, Tabriz University of Medical Sciences, Tabriz, Iran /Department of Immunology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran /Department of Immunology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Application of Artificial Intelligence in the Precise Identification of Antibiotic–Resistant Bacteria in Clinical Specimens: Innovative Approaches and Challenges

Seyed Mohammad Amir Abedini Gilani

The rising prevalence of antibiotic–resistant bacteria is a critical challenge in global healthcare, necessitating efficient and rapid diagnostic tools. Traditional metods are often time–consuming and lack sufficient accuracy. Artificial intelligence (AI), with its ability to analyze complex data and identify intricate patterns, holds immense potential to revolutionize the detection of antimicrobial resistance. This narrative review examines recent studies on AI applications in identifying antibiotic–resistant bacteria. Articles were retrieved from reputable databases, including PubMed, Scopus, and Web of Science, using keywords such as “artificial intelligence,” “antibiotic resistance,” and “rapid detection.” Selected studies focused on machine learning algorithms, imaging analysis, and integration of genomic and phenotypic data. AI–based tools have shown superior speed and accuracy compared to traditional approaches in detecting resistance. Machine learning algorithms improve resistance prediction using genomic data, while imaging technologies enable automated identification of resistant strains. Multi–omics analysis further enhances diagnostic precision, facilitating the design of personalized therapeutic regimens. Artificial intelligence has emerged as a transformative tool in detecting antibiotic–resistant bacteria, significantly improving speed and accuracy. However, challenges such as data standardiza–tion, accessibility, and ethical considerations must be addressed. Future efforts should focus on optimizing algorithms and expanding datasets to strengthen AI’s integration into clinical practices, ultimately enhancing the fight against antimicrobial resistance. Artificial intelligence, antibiotic resistance, rapid detection, machine learning, genomic data, microbial diagnostics, personalized therapy.

Department of Bacteriology and Virology, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

The Application of Artificial Intelligence in Diagnosis of Aggressive Prolactinoma: A Systematic Review

Sevil Ghaffarzadeh Rad

Aggressive prolactinoma is a subgroup of aggressive pituitary tumors. The diagnostic process of this disease includes measuring prolactin and imaging of the pituitary gland. Rapid diagnosis of this disease is effective in response to treatment and prognosis of these patients. With the advancement of technology in recent decades, artificial intelligence is widely used in the diagnosis and management of patients with prolactinoma.The purpose of this study was to systematic synthesis of existing literature on the application of artificial intelligence in diagnosis of aggressive prolactinoma. A systematic review was performed by PRISMA guidelines. Four electronic databases were systematically searched: PubMed, Embase, MEDLINE (OVID), and the Cochrane Library. The search was limited to publications that were written in the English language, without limit in time. The retrieved articles were screened at the title, abstract and full text stages. The Mixed–Methods Appraisal Tool (MMAT) was used to evaluate the quality of quantitative and mixed–method studies. Then, two reviewers extracted the quantitative data of the included studies.

A total of 395 studies were identified after a comprehensive search, and 8 studies were included after removing duplicates and screening. The results of this study showed that despite the usefulness of artificial intelligence in the early diagnosis of aggressive prolactinoma, there is a wide range of artificial intelligence methods that lead to contradictory conclusions, and there are no standard medical policies for analyzing data using artificial intelligence technologies. In this study we found that the use of artificial intelligence can help with early accurate diagnosis in important surgical decisions and reduce the complications of neurosurgery; because early diagnosis minimizes the patient's problems and affects the patient's quality of life. However, standard policies should be adopted in this field, so that the best model can be developed to diagnose this disease. Furthermore, the design and validation of each artificial intelligence methods is necessary for translation into clinical practice.

Endocrine Research Center Tabriz Univesity of Medical Sciences

Evaluation of artificial intelligence strategies for prediction and diagnosis of liver cancer: a systematic review

Zahra Nikravesh, Azam Kheirdoust,Mehran Khedmatgozar * ,
Mohammad Reza Mazaheri Habibi,

Introduction: According to the WHO report, liver carcinoma is the third deadliest cancer and the sixth most common cancer in the world in 2020. Liver carcinoma is a very malignant tumor that is difficult to diagnose early because it is usually discovered in advanced stages. Therefore, treatment options are limited and cause its recurrence. Traditional treatment methods along with emerging treatment methods such as surgery, radiotherapy, chemotherapy, immunotherapy, and other approaches have created diversity in the treatment of liver carcinoma. One of the ways to help doctors and patients is the early prediction of liver carcinoma through artificial intelligence. Objective: The purpose of this study was to investigate artificial intelligence methods for diagnosing and predicting liver carcinoma. Methods: This study was conducted as a systematic review in 2024 by searching reliable databases PubMed, Scopus, and Web of Science. The keywords of liver cancer, prediction, diagnosis, artificial intelligence, machine learning, and deep learning were investigated in related studies between 2010 and 2024. English–language studies that investigated artificial intelligence models for predicting and diagnosing liver cancer met the inclusion criteria. Also, review studies and studies that did not focus on liver cancer patients were excluded. Titles and abstracts were evaluated independently by two evaluators. Then the full text of the articles was checked and an identical form with the fields of study title, year of publication, country, number of data, type of algorithm, study objectives, and main findings of the study was used for the data extraction stage. Results: A total of 469 articles were retrieved from the mentioned databases. After studying the title and abstract of the articles and considering the inclusion and exclusion criteria, finally, 62 articles were included in the study. Among artificial intelligence algorithms, 19 articles (31%) are from convolutional neural networks (CNN), 16 articles (26%) used support vector machine (SVM) and 15 articles (24%) used random forest (RF). In the conducted studies, the SVM algorithm had classified the CT–Scan data. Also, in 55 articles (89%) artificial intelligence algorithms increased the accuracy and improved the speed of diagnosis. In 4 articles (6%), artificial intelligence algorithms helped to predict risk, and in 3 articles (5%) automatic diagnosis was done. Conclusion: Artificial intelligence solutions can improve prognosis and diagnosis in patients with liver carcinoma. Also, it seems that the convolutional neural network algorithm has the best performance in predicting and diagnosing liver carcinoma, and with a very small difference, after that, SVM and RF algorithms had a good diagnosis. Correct and early prediction of liver cancer with the help of artificial intelligence will lead to better management of this disease in affected people and its use will be a promising strategy in the self–management of these patients.

Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Ph.D. student in Medical Informatics, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran./Bachelor of Health Information Technology, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran/Ph.D. in Medical Informatics, Assistant Professor of Health Information Technology Department, Department of Health Information Technology, Varastegan Institute for Medical Sciences, Mashhad, Iran

Evaluation of attitude, acceptance, and knowledge towards artificial intelligence and its application from the point of view of nurses and physicians: A cross–sectional descriptive–analytical study: A provincial survey study in Iran

Zeinab Hamedani,Mohsen Moradi,Fatemeh Kalroozi,Ali Manafi Anari,Erfan Jalalifar,Arina Ansari,Behzad H. Aski,Maryam Nezamzadeh,Bardia Karim

The prospect of artificial intelligence (AI) using in healthcare is promising and bright, and its use can have a remarkable impact on cost reduction and decrement of the possibility of error and negligence among healthcare workers. This study intends to investigate the level of attitude, knowledge, and acceptance among Iranian nurses and physicians. This cross–sectional descriptive–analytical study was conducted among 400 nurses and physicians in eight public university hospitals located in Tehran . To conduct the study, convenient sampling was used with the help of researcher–made questionnaires. Statistical analysis was done by SPSS 21 The mean and standard deviation and Chi–square and Fisher's exact tests were used. In this study, the level of attitude among the research subjects toward AI was relatively favorable (47.81 ± 6.74, the level of their knowledge was average (14.66 ± 4.53), and the level of their acceptance of AI was average (103.19 ± 13.70). Moreover, from the point of view of the participants, AI in medicine is most widely used in increasing the diagnostic tests' accuracy (86.5%), identifying drug interactions (82.75%), and helping to analyze medical tests and imaging (80%). There was a statistically significant correlation between the variable of acceptance of AI and the participant's education level ($p = 0.028$), participation in an AI training course ($p = 0.022$), and the hospital department where they worked ($p < 0.001$). In this study, both the acceptance and the knowledge of the participants towards AI were proved to be at an average level and the attitude towards AI was relatively favorable, which is in contrast with the inevitable and very rapid expansion of AI. Although our participants were aware of the growing use of AI in medicine, they had a cautious attitude toward this issue.

Department of Midwifery, College of Nursing and Midwifery, Karaj Islamic Azad University, Karaj, Iran/Department of Psychiatric Nursing, School of Nursing & Midwifery, Shahrekord University of Medical Sciences, Shahrekord, Iran/Department of Pediatric Nursing, College of Nursing, Aja University of Medical Sciences, Tehran, Iran/Department of Pediatrics, School of Medicine, Ali Asghar Children's Hospital, Iran University of Medical Science, Tehran, Iran,Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran /Student Research Committee, North Khorasan University of Medical Sciences, Bojnurd, Iran /Department of Pediatrics, School of Medicine, Ali Asghar Children's Hospital, Iran University of Medical Science, Tehran, Iran/Department of Critical Care Nursing, Faculty of Nursing, Aja University of Medical

Predicting Alzheimer's Disease Using Recurrent Neural Networks and EEG Data

Aydin Mahmoud Alilou * , Sevil Mahmoud Alilou,
Seyyedeh Fatemeh Mirnasiri

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that continues to be a challenge for early diagnosis, especially in the preclinical phase when symptoms are scarce. Electroencephalography (EEG) is a non–invasive technique that can reveal subtle alterations in the brain and has been proposed to serve as early stage of Alzheimer's disease's early diagnostic biomarkers with advanced artificial intelligence methods like recurrent neural networks (RNNs) able to analyze the EEG data successfully. The present study was performed on EEG of 50 patients with Alzheimer's and 50 pairs of healthy control between 2023 years in Marand Trauma Center. Data preprocessing consisted of bandpass filtering (1–50 Hz), independent component analysis (ICA) to identify and remove artifacts, and segmentation into 2–second epochs. Spectral power in delta, theta, alpha, and beta bands and discrete wavelet transforms (DWT) consisted of both time and frequency domain features. The two RNN architectures were Long Short–Term Memory (LSTM) and Gated Recurrent Unit (GRU), trained on Adam optimizer, and evaluated on accuracy, sensitivity, specificity, and AUC metrics.The LSTM model achieved an accuracy of 94.5% compared to a GRU accuracy of 91.2%. The most predictive features were identified as alpha and beta frequency bands associated with cognitive and memory–related brain changes. The LSTM model outperformed in detecting lower–level sequential characteristics, indicated by a higher AUC score. This is an important study which suggests that recurrent neural networks (RNN), and in particular long–short term memory models (LSTM), may serve as excellent tools to detect Alzheimer's disease from EEG data early on. These results highlight the ability of deep learning to enhance non– invasive diagnostics and have the potential to improve treatment by identifying disease at an earlier stage. Future studies should look to use EEG in combination with image modalities as well as larger datasets to increase generalizability.

Pediatric Emergency Medicine Fellowship, Tabriz University of Medical Sciences, Tabriz, Iran/Neurosurgeon and spine specialist, Tabriz University of Medical Sciences, Tabriz, Iran/Neurology specialist, Tabriz University of Medical Sciences, Tabriz, Iran

Predicting Alzheimer's Disease Using Recurrent Neural Networks and EEG Data

Aydin Mahmoud Alilou * , Sevil Mahmoud Alilou,
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Pediatric Emergency Medicine Fellowship, Tabriz University of Medical Sciences, Tabriz, Iran/Neurosurgeon and spine specialist, Tabriz University of Medical Sciences, Tabriz, Iran/Neurology specialist, Tabriz University of Medical Sciences, Tabriz, Iran

Examining the Ethical Codes for the Use of Artificial Intelligence in Medical Education: A Narrative Study

Bahareh Ghavami Hosein pour * ,Nahid Zarifsanaiey,Manijeh Hooshmandja,Navaz Emadi,

Artificial intelligence (AI) is a notable technological advancement in medical education, offering both benefits and risks. To ensure responsible AI use, a suitable protocol is crucial. This study aimed to explore ethical guidelines for AI implementation in medical education. Artificial Intelligence, Machine Learning ,Codes of Ethics. Using databases Pubmed and Google Scholar, researchers identified 320 articles, with 18 studies meeting inclusion criteria. Studies explore AI integration in medical education, address-ing ethical concerns and educational impacts but no specific focus on developing ethical codes in this field was found. Establishing ethical protocols for AI in medical education is vital for student safety and the ethical integration of AI into the curriculum.

1)Ph.D candidate of E-learning in Medical Sciences, Department of e-Learning in Medical Sciences ,Virtual School, Center of Excellence in E-Learning, Shiraz University of Medical Sciences, Shiraz, Iran,
2)Student Research Committee, Shiraz University of Medical Science, Shiraz, Iran
3)Master's degree, Vice-Chancellor of Education, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
Department of E-learning, Virtual School, Comprehensive Centre of Excellence for E-Learning in Medical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran
Ph.D. in Educational Technology, Assistant professor in Department of e-Learning in Medical Sciences, Virtual School and Center of Excellence in E-Learning, Shiraz University of Medical Sciences, Shiraz, Iran and Department of Educational Technology in Medical Sciences, Smart University of Medical Sciences, Tehran, Iran
Ph.D candidate of E-Learning in Medical Science, Department of e-Learning in Medical Science, Center of Excellence for e-Learning in Medical Science, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran,

Analysis of Artificial Intelligence Studies with a Medical Ethics Perspective: A Bibliometric Study

Sara Dakhesh * , Shahnaz Khademizadeh, Zeinab Jozi

Science, technology and ethics have become more interrelated in the modern era than ever before. Given the importance of this issue, this study has performed a bibliometric analysis of all AI publications related to the area of medical ethics. The present study has been conducted using bibliometric methods and a scientometric approach. The study population consists of all AI publications in the research area of medical ethics indexed in the Web of Science Core Collection (WoS) without a time limit. For this purpose, the keywords “Artificial Intelligence”, AI, Chatgpt, “Large Language Model”, “Chat Gpt”, Chatbot, Bioethics, “Health Care Ethics”, “Clinical Ethics”, “Medical Ethics”, “Clinical Research Ethics” and “Medical Research Ethics” were searched in the WoS database on December 4, 2024 within the framework of the research strategy. The database output was analyzed and evaluated after data standardization using Excel and VOSviewer software. Results demonstrated that 354 scientific works have been published on AI in relation to the concepts and requirements of medical ethics, garnering a total of 4927 citations. The time trends graph also showed that there has been a growth in scientific production in the area of AI related to medical ethics in 2024, 2023, and 2021 with 107, 89, and 46 works, respectively. With development of AI technology and tools, there has been a significant growth of these publications over the past 5 years compared to previous years. An analysis of the journals also demonstrated that the three Q1–ranking journals of “American Journal of Bioethics” (with 18 works), “Journal of Medical Ethics” (with 15 works), and “BMJ Open” (with 13 works) have had the most scientific publications in this research area. An analysis of the organizations and countries publishing these articles revealed that Harvard University and University of Oxford (both with 12 scientific works) have had the first rank in AI publications in the research area of medical ethics so far, and the USA, Germany, and the UK have been the most active countries in producing related scientific works with 89, 41, and 36 scientific outputs, respectively. It can be concluded that studies related to AI technology with a medical ethics perspective are still in their early stages and there is a need to develop these publications to raise awareness about medical ethics standards, especially in the current era of AI.

1. Postdoctoral researcher, Department of Medical library and information sciences, school of Allied Medical sciences, Tehran University of Medical Sciences, Tehran, Iran;
2. Corresponding author, Department of Medical library and information sciences, school of Allied Medical sciences, Tehran University of Medical Sciences, Tehran, Iran;
3. PhD Candidate in Knowledge and Information Science, Department of Knowledge and Information Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.

Ethical Considerations of Artificial Intelligence in Cognitive Sciences

Sama Rahnemayan

The integration of artificial intelligence (AI) into cognitive studies presents numerous ethical challenges that necessitate careful examination to ensure responsible and beneficial outcomes.

This study aims to identify and analyze key ethical considerations associated with AI applications in cognitive sciences, focusing on issues of bias, privacy, cognitive overload, and the implications for human dignity and decision-making. A comprehensive review of recent literature was conducted, highlighting significant ethical concerns raised by experts in the field. Key themes were identified, including algorithmic bias, privacy risks, cognitive burden, and societal values related to human dignity. 1. Bias: The potential for bias in AI algorithms can lead to unfair treatment and misrepresentation of specific groups. Rigorous testing and transparency in algorithmic processes are essential to mitigate these risks. 2. Privacy: The collection and analysis of personal data in cognitive studies raise ethical questions regarding consent and data security. Robust data protection measures are necessary to safeguard sensitive information. 3. Cognitive Burden: The risk of cognitive overload from AI systems necessitates a focus on cognitive ergonomics to enhance user capabilities rather than diminish them.

4. Human Dignity: Ethical AI development must align with broader societal values, ensuring that technologies uphold human rights and dignity, particularly in decision-making contexts. The ethical implications surrounding AI in cognitive studies are complex and require a multifaceted approach that addresses bias, privacy concerns, cognitive load, and the preservation of human dignity. By prioritizing these dimensions, researchers can promote responsible AI practices that enhance cognitive science while protecting individuals and society.

Neurosciences Research Center (NSRC), Tabriz University of Medical Sciences, Tabriz, Iran

AI–Powered Predictions in Renal Transplantation: A Game Changer for Surgeons

Farid Rajaei Rizi

Artificial Intelligence (AI) has revolutionized various fields of medicine, including renal transplantation. The integration of AI, particularly machine learning (ML) algorithms, has enhanced the precision of donor–recipient matching, prediction of graft survival, and post–transplant care. This review explores the impact of AI on renal transplantation outcomes, emphasizing the analysis of CT angiography and the medical profiles of donors and recipients. A comprehensive literature review was conducted, focusing on studies published between 2017 and 2024. Databases such as PubMed, Web of Science, and Google Scholar were searched. AI algorithms, particularly neural networks, were effective in analyzing CT angiography images to assess vascular structures and compatibility. These models outperformed traditional methods in predicting successful matches.

Machine learning models, including random forests and support vector machines, utilized comprehensive medical profiles of donors and recipients to predict graft survival rates. These models achieved high accuracy.

AI–driven predictive models helped in early detection of complications such as rejection and infection. By analyzing post–operative data, these models provided timely alerts, enabling proactive management and improving patient outcomes.The integration of AI in renal transplantation, particularly through the analysis of CT angiography and medical profiles, has significantly improved surgical outcomes. AI models have enhanced the precision of donor–recipient matching, predicted graft survival with high accuracy, and facilitated better post–transplant care. Future research should focus on refining these models and integrating them into clinical practice to further enhance the success rates of renal transplantation.

The Role and Application of Artificial Intelligence in Diagnosing Type 2 Diabetes: A Review Study

Rostam Rezaeian * ,Ali Feli,Neda Hasanpour,Aysan Sabeti,

Diabetes is a metabolic syndrome that is the fifth leading cause of death worldwide and one of the most prevalent diseases in Iran. This condition results from elevated blood sugar levels, which, over time, can cause severe damage to the heart, blood vessels, kidneys, eyes, and nerves. The most common type of diabetes is Type 2 diabetes. The increasing prevalence of this disease has become a growing concern for healthcare systems globally, leading to the emergence of innovative biomedical research methods, including artificial intelligence (AI). The aim of this review study is to examine the role and application of AI in diagnosing and managing Type 2 diabetes.Methodology:
In this study, keywords such as “diabetes”, “Type 2 diabetes”, “artificial intelligence” and “diabetes diagnosis” were searched in databases, including SID, Irandoc, Civilica, ScienceDirect, and Google Scholar. The retrieved articles were then reviewed.Findings:
The findings indicate that AI operates independently and efficiently, outperforming human resources in the diagnosis and management of Type 2 diabetes. In other words, AI models offer more modern, effective, and cost–efficient solutions in this field.Conclusion:
Ultimately, the results indicate that recent advancements in methods and AI solutions have significantly improved the diagnosis of Type 2 diabetes. Keywords: Artificial Intelligence, Diabetes, Type 2 Diabetes, Diagnosis of Type 2 Diabetes

Department of Biological Sciences, Faculty of Basic Sciences, University College of Nabi Akram, Tabriz, Iran
Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran.
Department of Biological Sciences, Faculty of Basic Sciences, University College of Nabi Akram, Tabriz, Iran
Department of Biological Sciences, Faculty of Basic Sciences, University College of Nabi Akram, Tabriz, Iran

Enhancing Ethical Oversight in Artificial Intelligence: Strategies for Transparency and Trust

Maryam Zaare Nahandi *,Ali Banagozar Mohammadi ,Ali Ostadi

As artificial intelligence (AI) increasingly influences critical and complex decision–making, ensuring ethical oversight has become a major challenge. To guarantee that AI operates responsibly and ethically, innovative monitoring approaches are essential. Two prominent strategies that have recently garnered attention are Community–Based Oversight and AI Monitoring AI. These methods aim to enhance transparency and reduce biases in AI systems.The community–based oversight approach involves entrusting the monitoring of AI systems to users and the broader community. Users can report ethical concerns or biases within the systems, helping to improve their performance. This process is typically facilitated through platforms designed to gather direct user feedback.

In contrast, the AI monitoring AI approach relies on a secondary AI system to oversee the primary system's performance. This monitoring AI automatically analyzes data and outcomes, identifying and flagging instances that conflict with ethical guidelines. Both approaches are expected to lead to greater transparency in AI decision–making processes, better identification and mitigation of biases, and increased public trust in these systems. Furthermore, implementing these strategies can assist organizations and governments in quickly detecting and addressing ethical issues. Community–based oversight and AI monitoring AI are two promising methods for enhancing ethical oversight in artificial intelligence. By combining the strengths of human insight and technological precision, these approaches can effectively prevent ethical violations and build trust in AI for sensitive decision–making application.

Artificial Intelligence (AI) , ethics, oversight

Internal Medicine Department, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

The Transformative Role of Artificial Intelligence in Neuroscience: Revolutionizing Diagnosis, Treatment, and Research

Ehsan Izadi Asl

The Transformative Role of Artificial Intelligence in Neuroscience: A Revolution in Diagnosis, Treatment, and Research
Introduction: The human brain is one of the most complex biological systems, and understanding its functions and treating neurological disorders has always been a significant challenge. Artificial Intelligence (AI), with its ability to process complex data, has created new opportunities for advancements in neuroscience. This technology has had a profound impact, particularly in improving diagnosis, treatment, and prediction of neurological disorders.
Method: This study provides a systematic review of various applications of AI in neuroscience. Initially, credible articles and scientific resources were identified and categorized. Then, various analyses were conducted regarding the use of deep learning and machine learning algorithms in processing brain images (MRI, fMRI), neural signals, and clinical data from patients. Algorithms like Convolutional Neural Networks (CNN) were used for image processing, while models like XGBoost and Random Forest were applied for predicting seizures and disease progression.
Findings: The results of this study show that AI has been successful in diagnosing diseases like Alzheimer's using MRI image analysis with high accuracy. Significant progress has also been made in brain–computer interfaces (BCIs), which have facilitated effective interaction between the brain and external devices. Predictive models have been highly accurate in forecasting the timing of seizures in epileptic patients. Additionally, AI applications in deep brain stimulation have shown promising results in treating Parkinson's disease.
Discussion: AI has brought about a significant transformation in neuroscience by improving the accuracy of disease diagnosis, developing innovative therapeutic methods, and providing more precise predictions for neurological disorders. However, challenges such as ethical concerns and data privacy issues still persist. To optimally leverage this technology, interdisciplinary collaboration and further validation of AI models in clinical settings are essential.

Identifying Biomarkers for Detecting Bronchogenic Carcinoma Stages Using Metaheuristic Algorithms Based on Information Fusion Theory

Bagher Khalvati * , Kaveh Kavousi, Amirhossein Keyhanipour, Masoud Arabfar

The Transformative Role of Artificial Intelligence in NeuroLung cancer, a leading cause of cancer–related deaths worldwide, requires early detection and accurate staging to improve treatment outcomes. This study focuses on identifying biomarkers to differentiate stages of bronchogenic carcinoma, a subtype of lung cancer, using RNA–Seq gene expression data and advanced metaheuristic algorithms. Early–stage lung cancer often lacks obvious symptoms, leading to delayed diagnosis and high mortality rates. Leveraging bioinformatics and sequencing technologies, this research proposes a two–step methodology. First, RNA–Seq data from The Cancer Genome Atlas (TCGA) is normalized and processed to extract gene expression features from healthy and cancerous lung tissue. Second, feature selection is performed using eight metaheuristic algorithms, including artificial bee colony, genetic algorithm, and simulated annealing, paired with four classification methods: Naive Bayes (NB), support vector machine (SVM), decision tree (DT), and k–nearest neighbor (KNN). Features are extracted in six pairwise comparisons—such as Healthy vs. Stage I and Stage II vs. Stage III & IV—to achieve optimal separability. The Borda count decision fusion method is applied to enhance classification accuracy by aggregating results from all classifiers. Results showed that SVM consistently outperformed other classifiers, achieving 100% accuracy and precision in distinguishing healthy tissue from Stage I cancer. Using feature fusion, 608 and 42 genes were identified as key biomarkers, with these features yielding high classification performance across all stages. Principal component analysis (PCA) further validated the separability of healthy and Stage I samples. This study highlights the potential of combining metaheuristic feature selection with RNA–Seq data analysis to identify reliable biomarkers for lung cancer staging. The proposed framework demonstrates significant improvements in classification accuracy and feature selection efficiency, offering a robust tool for early detection and staging of lung cancer, paving the way for personalized and stage–specific cancer therapies

Department of Bioinformatics, Kish International Campus University of Tehran, Kish, Iran

A Method Based on Process Mining for Breast Cancer Diagnosis with Whale Optimization Algorithm and Support Vector Machine

Hamed Aghazadeh * ,Ali Mohammadiounotikandi,
Somayeh Babaeitarkami,Sobhan Aboulhassanzadeh,
Tahereh Sangchooli,Zahra Nikkhoy

Breast cancer is the second most common cancer among women and a major cause of global mortality, with over 11,000 deaths annually worldwide and significant prevalence in countries like the U.S., India, and Iran. Accurate diagnosis and treatment of breast cancer are often complicated due to similarities in clinical and laboratory symptoms, increasing the risk of misdiagnosis. Process mining, a data-driven approach for analyzing and optimizing processes, has emerged as a powerful tool in medical diagnosis, particularly for breast cancer. This study proposes a process mining-based method for breast cancer diagnosis, integrating the Support Vector Machine (SVM) algorithm and the Whale Optimization Algorithm (WOA). SVM, a machine learning technique, enables high-accuracy classification by maximizing the margin between data classes, while WOA, inspired by the hunting behavior of humpback whales, optimizes the diagnostic process through adaptive exploration and exploitation techniques. Process mining leverages real-world data to uncover patterns and relationships between patient symptoms and breast cancer diagnoses. This involves three key stages: process discovery, adaptation, and upgrading. Process discovery identifies and models the process workflow, while adaptation compares the modeled process with actual events to detect deviations or bottlenecks. The upgrade phase refines the process model to improve diagnostic efficiency and accuracy. WOA enhances optimization through stages such as encirclement hunting, contraction blockade, and spiral updating, mimicking whale behaviors to find optimal solutions. A hybrid approach combining WOA and SVM is proposed for breast cancer diagnosis, leveraging process mining to refine decision-making and reduce false positives and negatives. By integrating these techniques, the study demonstrates a novel, efficient diagnostic framework, bridging the gap between data mining and process modeling to improve accuracy, efficiency, and reliability in breast cancer diagnosis. Keywords: Breast Cancer, Process Mining, Support Vector Machine, Whale Optimization Algorithm, Medical Diagnosis.

Nanotechnology (RCPN), Tabriz University of Medical Sciences, Tabriz, Iran
Department of Computer and IT Engineering, Faculty of Engineering, South Tehran Branch, Islamic Azad University (IAU), Tehran, Iran
Architecture, South Tehran Branch, Islamic Azad University (IAU), Tehran, Iran
School of Biotechnology Faculty of Science and Health, Dublin City University, Dublin, Ireland,Tahereh SangchooliDepartment of Pharmaceutical Engineering, Faculty of Chemical Engineering, NaghsheJahan University, Isfahan, Iran
Department of Biology, Faculty of Science, Shahid Chamran University, Ahvaz, Iran

Diagnosing Autism Spectrum Disorder using Advanced Neural Network Models and MRI Images

Mousa Yousefi ,Hamed Alizadeh Ghazijahani ,Ehsan Teshnehdel*

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition affecting communication, social behavior, and cognition, often diagnosed in early childhood. This study leverages advancements in artificial intelligence, specifically deep learning, to enhance ASD diagnosis using MRI data. Deep learning, a subset of machine learning, employs neural networks designed to mimic the human brain's structure and function, enabling complex data analysis. Pre-trained deep learning models such as EfficientNet and ResNet were used due to their high accuracy and scalability. The EfficientNet model optimizes depth, width, and resolution, providing superior performance with minimal resource usage, while ResNet, with its innovative shortcut connections, effectively addresses gradient fading in deep networks. The study utilized MRI data from the ABIDE international database, comprising 450 individuals (220 ASD and 230 healthy), segmented into training, testing, and validation sets. Data augmentation techniques, including resizing, normalization, and random rotations, were applied to enhance model generalizability.
Implementation was conducted in Python using the PyTorch library within Google Colaboratory, which provided computational resources. Transfer learning was employed to adapt pre-trained models, replacing their final layers to classify ASD and healthy individuals. EfficientNet-B4 and ResNet18 models were trained and evaluated, with parameters optimized for predictive accuracy. Image preprocessing involved selecting high-quality MRI frames, resizing to 224x224 pixels, and normalizing inputs for compatibility with convolutional neural networks. The results demonstrated the models' potential for accurate ASD diagnosis by analyzing brain functional networks, showcasing the integration of artificial intelligence and medical imaging as a promising approach to early ASD detection and intervention.

Azarbaijan Shahid Madani University,Department of Electrical Engineering
Azarbaijan Shahid Madani University,Department of Electrical Engineering
Azarbaijan Shahid Madani University, Department of Electrical Engineering

Leveraging Artificial Intelligence for Enhanced Energy Management in Smart Hospitals

Farzaneh Mohammadi * ,Mohammad Hossein Alizadeh, Tayebeh Haghtalab

Hospitals, operating 24/7 with advanced medical systems such as PET/CT, MRI, ultrasound, cyclotrons, and Linear Accelerators (LINACs), consume significant energy due to the need for precise environmental controls, continuous power, and regular maintenance. Artificial Intelligence (AI) offers a transformative solution for optimizing energy management in these energy-intensive facilities. By leveraging IoT sensors embedded in systems like HVAC, lighting, and imaging equipment, AI uses real-time data and machine learning techniques, such as neural networks and regression models, to predict energy demands and automate adjustments. This ensures efficient energy allocation, prioritizing critical care areas while minimizing energy use in non-critical zones. AI-driven algorithms also integrate renewable energy sources, such as solar and wind, reducing reliance on non-renewable energy and lowering carbon emissions. A six-month pilot study in a mid-sized hospital demonstrated that AI improved energy forecasting accuracy by 30%, reduced energy consumption by 18%, and cut operational costs by 25%, all without disrupting medical services. Cyclotron operations were optimized, decreasing idle energy use by 15%, while renewable energy integration reduced non-renewable dependency by 40%. The AI framework, which includes real-time monitoring, predictive control, and automated adjustments, enhanced system reliability and ensured compliance with healthcare regulations. Key ethical considerations, such as data privacy and cybersecurity, were addressed, and comprehensive staff training and interdisciplinary collaboration were emphasized to ensure successful implementation. The findings highlight AI's potential to revolutionize energy management in hospitals by improving efficiency, reducing costs, and enhancing sustainability while maintaining high standards of patient care. This study underscores the importance of adopting AI-driven solutions and investing in IoT infrastructure to create smarter, greener hospitals, paving the way for more sustainable healthcare operations in the future.

Radiology Department, Razavi Hospital, Imam Reza International University, Mashhad, Iran
Department of electrical engineering, Amirkabir University of Technology, Tehran, Iran

AI–Driven Detection of Fetal Brain Anomalies via 3D Ultrasound Imaging: A Feasibility Review

Nasim Hajipoor Kashgsaray * ,Faezeh Farhan

Timely identification of fetal brain anomalies is essential for effective prenatal care, particularly within the legal timeframe for intervention (prior to 19 weeks of gestation). Current diagnostic practices, heavily reliant on manual interpretation of ultrasound images, encounter challenges such as operator dependency and limited sensitivity to subtle abnormalities. This review explores the feasibility of leveraging artificial intelligence (AI) in conjunction with 3D ultrasound systems to enhance early detection of critical brain anomalies such as holoprosencephaly and microcephaly. The proposed framework integrates foundational AI models with advanced techniques in a two–step pipeline Segmentation: Established models such as U–Net and its derivatives are reviewed for their potential to segment fetal brain regions. Preprocessing steps like Gaussian filtering and intensity normalization are discussed as methods to enhance image quality. Publicly available labeled datasets and synthetic data augmentation are proposed to address variability in fetal anatomy.

Classification: Following segmentation, convolutional neural networks (CNNs) are considered for identifying structural anomalies. Pretrained models like ResNet are evaluated for their adaptability to fetal imaging tasks, with an emphasis on achieving high sensitivity and specificity. The use of cross–validation is recommended to assess robustness and reduce overfitting. While no experimental data is presented, a critical analysis of existing studies highlights promising advancements in the integration of AI and 3D imaging technologies. Reported metrics from prior work demonstrate significant improvements in diagnostic precision, suggesting the feasibility of this approach for clinical application. This review underscores the potential of AI–powered frameworks to overcome limitations in traditional fetal anomaly detection methods. Future work should focus on expanding datasets to include rare anomalies, validating AI models in clinical settings, and optimizing algorithms for real–time implementation. Artificial Intelligence (AI) – Fetal Brain Abnormalities – 3D Ultrasound – Prenatal Diagnosis – Holoprosencephaly – Microcephaly – Convolutional Neural Networks (CNNs)

Emergency and trauma care research center, Tabriz University of Medical Sciences, Tabriz, Iran
Clinical Research Development Unit, Imam Reza General Hospital, Tabriz University of Medical Sciences, Tabriz, Iran

Artificial Intelligence Application in Atrial Fibrillation Diagnosis: A Bibliometric Analysis

Aysa Rezabakhsh * , Waseem Hassan

Artificial Intelligence (AI) has become a transformative tool for managing atrial fibrillation (AF), but limited bibliometric studies have systematically analyzed its research trends and thematic evolution. This study addresses these gaps by analyzing the top 100 most cited papers on AI and AF using bibliometric indicators such as h–index, g–index, and m–index to assess author impact, citation trends, and productivity. Data were extracted from the Scopus database, chosen for its extensive coverage of high–quality literature, and analyzed using Vosviewer and R Studio (Bibliometrix package). Vosviewer generated network visualizations of co–auth orship, co–citation, and keyword trends, while R Studio enabled statistical analysis of performance indicators, including total citations, citation averages, and temporal trends. A total of 258 papers were identified, with a significant increase in publications after 2020, reflecting growing interest in AI applications for AF. The United States led contributions with 89 publications, followed by institutions like the Mayo Clinic (33 publications), while P.A. Noseworthy emerged as the most prolific author with 24 studies. Journals such as the ⁎Journal of Cardiovascular Electrophysiology⁎ prominently featured AI and AF research. However, stark global disparities were evident, with sparse contributions from the Middle East and Africa, highlighting the need for inclusive research initiatives and investment in AI healthcare infrastructure in underrepresented regions. Key themes from the top–cited papers included predictive modeling, automated AF detection, and risk stratification using AI tools, underscoring the field's progress and areas for further exploration. This bibliometric analysis provides valuable insights into the global state of AI applications in AF research, identifying influential contributors, institutions, and emerging trends. It establishes a foundation for targeted advancements, collaboration, and equitable research participation in this critical area of healthcare

Tabriz University of Medical Sciences, Tabriz, Iran / University of Peshawar, Peshawar, Khyber Pakhtunkhwa, Pakistan

Revolutionizing Thyroid Cancer Diagnosis: The Role of Artificial Intelligence in Precision Medicine

Sevil Ghaffarzadeh Rad

The diagnosis of thyroid cancer presents numerous challenges, including inter–observer variability, inconsistent interpretations, and insufficient integration of clinical and genomic data. Artificial intelligence (AI) offers significant promise in addressing these issues through advanced machine learning and deep learning algorithms. AI has shown notable benefits in improving the interpretation of ultrasound imaging, enhancing the precision of fine–needle aspiration biopsy analysis, and incorporating molecular data for personalized treatments and risk stratification. However, challenges remain regarding data quality, model validation, and clinical integration. This review systematically analyzes peer–reviewed studies and relevant literature on AI applications in thyroid cancer diagnosis, covering articles from 2010 to 2023 sourced from databases such as PubMed, Scopus, and Web of Science. The review focuses on AI–driven diagnostic tools in key modalities like ultrasound imaging, fine–needle aspiration biopsy (FNAB), and genomic profiling. The synthesis of findings reveals that AI–based systems have significantly improved diagnostic accuracy, efficiency, and consistency across various modalities, with machine learning and deep learning algorithms achieving high sensitivity and specificity in identifying malignant nodules and reducing inter–observer variability. Additionally, AI–driven models have enhanced FNAB interpretation and reduced diagnostic errors. The integration of AI with genomic and molecular profiling has facilitated the identification of novel biomarkers, enabling more accurate risk stratification and personalized treatment planning. Despite these advancements, challenges such as data heterogeneity, limited dataset sizes, and model validation issues persist. Furthermore, the need for real–world testing and ethical considerations, including transparency and patient privacy, are emphasized for the effective integration of AI into clinical practice. Future research should focus on refining AI models, ensuring their generalizability, and promoting seamless integration into healthcare systems to maximize their potential in improving thyroid cancer outcomes.

endocrine research center ,Tabriz university of medica sciences

Use of Artificial Intelligence Algorithms to Optimize Pain Management in Kids Hospitalized in ED

Amir Hossein Jafari–Rouhi * ,Aydin Mahmoud Alilou,Parinaz Mahmoud Alilou

Pain management in pediatric emergency departments (EDs) poses unique challenges due to the specific physiological, developmental, and psychological needs of children. Untreated acute pain from injuries or illnesses can lead to long–term physical and psychological consequences. Traditional methods often fail to balance accuracy, efficiency, and personalization in high–pressure ED settings, highlighting a need for innovative approaches. Artificial intelligence (AI) offers transformative potential for addressing these challenges through precision medicine. AI–driven models, powered by machine learning and predictive analytics, enhance diagnostic accuracy and treatment efficacy by leveraging comprehensive datasets of clinical signs, medical histories, and prior treatment outcomes. These systems predict pain intensity with 15% greater accuracy than conventional methods and dynamically adapt to individual patient profiles, enabling personalized treatment plans that contrast with the limitations of one–size–fits–all protocols. For example, AI can recommend therapies based on a child's treatment history, improving outcomes while reducing time–to–treatment by up to 25%. AI also streamlines emergency workflows by enabling real–time pain assessments, bypassing manual reviews that delay care, and minimizing medical errors through data–driven decision support. In complex cases, AI synthesizes multi–layered clinical data to suggest evidence–based interventions, reducing reliance on heuristic decision–making. However, challenges such as algorithmic bias, data privacy concerns, and the need for validation across diverse populations persist. Despite these obstacles, integrating AI into pediatric EDs represents a paradigm shift toward precision emergency medicine. By improving pain prediction, personalizing therapies, accelerating care delivery, and mitigating errors, AI enhances patient outcomes, optimizes resource utilization, and supports clinician workflows. As AI technology evolves, it is poised to become an indispensable tool in pediatric emergency care, fostering resilient healthcare systems. Continued research, ethical oversight, and collaboration are crucial to harnessing AI's potential while safeguarding pediatric patient welfare.

Pediatric Pulmonologist, Associate Professor of Pediatrics Tuberculosis and Lung Diseases Research Center, Tabriz University of Medical Sciences, Tabriz, Iran/ Pediatric Emergency Medicine Fellowship, Tabriz University of Medical Sciences, Tabriz, Iran
Bachelor's degree in nursing working in the emergency department, Tabriz University of Medical Sciences, Tabriz, Iran

Application of Artificial Intelligence in Pediatric Neurological Rehabilitation

HU Li–Na[1*], CAI Li–Xiong[1], Shi Yan–Hui[1], Xian Tao[1], Zhang Yan[1], Li Zhong–Gui[1], JIAO FuYong[2].

Artificial Intelligence (AI) is transforming pediatric neurorehabilitation by enhancing diagnostic precision, personalizing therapeutic interventions, and addressing systemic resource limitations; children with neurodevelopmental disorders or acquired neurological injuries require individualized, long – term rehabilitation but face challenges like heterogeneous treatment outcomes, clinician shortages, and caregiver burden; key AI – driven advancements include Diagnostic Optimization where machine learning analysis of multimodal biomarkers (EEG, fMRI, gait kinematics) enables early detection of conditions like autism spectrum disorder (ASD) via FDA – cleared tools (e.g., Cognoa), Adaptive Rehabilitation Protocols with reinforcement learning algorithms dynamically adjusting motor – cognitive training regimens based on real – time biosensor data while robotic exoskeletons (e.g., RoboTherapist) and brain – computer interfaces (BCIs) facilitate neuroplasticity – driven motor function recovery, and Tele – Rehabilitation & Engagement with immersive VR/AR environments improving adherence through gamified therapy and NLP – powered emotion recognition systems monitoring affective states to tailor psychosocial support; persistent challenges include pediatric data scarcity, algorithmic interpretability deficits, and ethical risks and mitigation strategies emphasize federated learning for multi – institutional data pooling, explainable AI frameworks, and hybrid clinician – AI decision models; future priorities involve multimodal AI integrating electrophysiological, kinematic, and behavioral metrics, lightweight edge – computing tools for low – resource settings, and regulatory frameworks aligning innovation with pediatric bioethics standards and by synergizing technological rigor with develop mental neuroscience principles, AI promises scalable, equity – focused neurorehabilitation paradigms.

1.Xi'an Lianhu Zhongtong Children's Rehabilitation Hospital, Xi'an, China;
2.Children's Hospital of Shaanxi Provincial People's Hospital, Xi'an, China

Application of Artificial Intelligence in Pediatric Neurological Rehabilitation

Rou Guanpu

This article explores the application of artificial intelligence in medical education. The aim is to enhance the quality of medical education through artificial intelligence technology. The methods include using virtual dissection and surgical simulation for skills training, intelligent tutoring systems for personalized learning, and medical image analysis to assist teaching. It is expected that students' skills will be improved and learning resources will be more personalized. The conclusion indicates that artificial intelligence plays a significant role in medical education and can effectively promote the reform of medical education

Shangluo Vocational and technical College School of medicine,
Medical College ,Shangluo Polytechnic College, Shaanxi , China

The Application of AI in theTreatment and Rehabilitationof Cerebral Palsy inTraditional chinese Medicine

SONG Hu–Jie[1] , WANG Hui[1] , JIAO FuYong [2*]

Artificial intelligence can conduct quantitative analysis of traditional Chinese medicine (TCM) diagnostic information. By leveraging big data and machine learning algorithms, it integrates and analyzes a large amount of TCM diagnostic data and treatment outcomes of children with cerebral palsy to establish a diagnostic model. Artificial intelligence can comprehensively consider various aspects of information such as the children's conditions, physical constitutions, and genetic factors to develop personalized treatment plans. In terms of acupuncture treatment, based on the specific conditions of the children, appropriate combinations of acupoints, acupuncture techniques, and treatment frequencies are recommended through artificial intelligence algorithms. Regarding tuina (massage), exclusive massage techniques, intensity, duration, and treatment courses are formulated for each child. For TCM herbal medicine treatment, relying on TCM theories and a large amount of clinical data, and taking into account the individual differences of the children, the formula and dosage of TCM herbs are intelligently recommended, and timely adjustments are made according to the feedback during the treatment process. For example, the dosage and formula of TCM herbs are optimized based on factors such as the children's age, weight, severity of the condition, and reaction to the medicine to achieve the best treatment effect. Virtual reality (VR) and augmented reality (AR) technologies are utilized to create an immersive rehabilitation training environment for children with cerebral palsy. Through gamified training methods, the training enthusiasm and participation of the children are enhanced. Artificial intelligence is used to analyze these data, evaluate the training effects, and adjust the training plans in a timely manner to ensure the scientificity and effectiveness of the rehabilitation training. For instance, the training difficulty and content are automatically adjusted according to the children's motor performance during the training process, making the training more in line with the actual situation of the children.

1.Xi'an TCM Hospital of Encephalopathy, Xi'an, China
2.Children's Hospital of Shaanxi Provincial People's Hospital, Xi'an, China

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1.Xi'an TCM Hospital of Encephalopathy, Xi'an, China
2.Children's Hospital of Shaanxi Provincial People's Hospital, Xi'an, China

Preventing Hyperemesis gravidarum: The role of dietary patterns and the application of artificial Intelligence

Wenjie Cheng [1], Lintian Li [1], Zhaoqing Long [1], Xiuxiu Ma [1], Fangyao Chen [1], Le Ma [1], Shunming Zhang [1], andJing Lin [1,2]

Although studies have suggested that dietary interventions may have potential benefits over conventional medical treatments, research on the association between dietary patterns andhyperemesis gravidarum (HG) in pregnant women is scarce. To explore the relationship between dietary patterns and the risk of HG, a cross–sectional study was conducted in Xi'an, China from April 2021 to September 2022. Dietary intake was assessed by a semi–quantitative food–frequency questionnaire, and then factor analysis was used to derive dietary patterns. HG was defined as persistent and severe nausea and vomiting with weight loss ≥ 5%, pregnancy–unique quantification of emesis (PUQE) score ≥ 13, or hospitalization due to vomiting. Logistic regression models were used to estimate ORs and 95% CIs for HG according to dietary pattern scores. Stratified analyses and tests for interaction were performed by potential confounders.Given the potential advantages of dietary interventions in managing HG, future research endeavors ought to delve into innovative methodologies to augment the monitoring and management of this condition. One particularly promising direction involves the utilization of artificial intelligence (AI) technologies to enhance the detection, evaluation, and tailored treatment of HG. AI–powered systems could be devised to monitor HG symptoms in real–time on a continuous basis. By amalgamating wearable devices with mobile health applications, these systems would gather data on physiological indicators, including heart rate, blood pressure, and activity levels, along with self–reported symptoms such as nausea and vomiting frequency. Machine learning algorithms could then scrutinize this data to discern patterns indicative of HG, thereby furnishing early warnings and enabling prompt medical interventions. Furthermore, AI has the potential to revolutionize nutritional assessments for expectant mothers. Through the employment of deep learning models, AI systems could formulate personalized dietary recommendations grounded in individual characteristics, such as age, weight, health status, and dietary preferences. These systems could dynamically adapt nutritional plans in response to shifts in health data and symptomatology, thereby ensuring optimal nutrition forpregnant women. Additionally, AI–driven predictive analytics could be harnessed to forecast the risk of HG in pregnant women. In conclusion, the incorporation of AI technologies into the management of HG holds considerable promise. Future research should prioritize the development and validation of AI–driven tools for real–time symptom monitoring, personalized nutritionalassessments, and risk prediction. Such advancements could result in improved outcomes for pregnant women and contribute to the evolution of more efficacious strategies for addressing HG.

1.School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, China
2.Key Laboratory for Disease Prevention and Control and Health Promotion of Shaanxi Province, Xi'an, China

The current application status of artificial intelligence in the medical field in China

Fuyong Jiao

Medical imaging diagnosis – Disease screening: AI can quickly and accurately analyze various medical images, such as X–rays, CT scans, and MRIs. – Image reconstruction and enhancement: AI technology can improve the quality of medical images and reduce the radiation dose for patients. – Clinical decision support systems: By integrating patient data and medical knowledge, AI can provide diagnostic suggestions, treatment plans, and disease risk predictions. – Drug research and development: AI can identify potential drug targets and accelerate the drug development process, improving the efficiency of active compound screening. – Surgical robots, such as the Da Vinci surgical system that combines AI and mechanical technology, have been widely used in various surgical procedures in China, performing precise operations, increasing the success rate of surgeries, and reducing patient trauma. The intelligent rehabilitation beds and other equipment independently developed in China can automatically adjust the rehabilitation training programs and provide personalized rehabilitation training. Doctor–patient communication and medical management: Intelligent voice assistants: Many hospitals in China use intelligent voice assistants to help doctors quickly record medical records and enable patients to query information, improving work efficiency. Medical resource management: Artificial intelligence can predict patient flow, enabling hospitals to allocate medical resources such as doctors, beds, and examination equipment more rationally, thereby enhancing the efficiency and quality of medical services.

Shaanxi Provincial People' s Hospital,European Center for Traditional Chinese Medicine .International Exchange Center of the Shanghai Cooperation OrganShaanxi Provincial People's Hospital, European Center for Traditional Chinese Medicine. International Exchange Center of the Shanghai Cooperation Organization Hospital Cooperation Union. Chair–man, The World Proactive Medicine Committee, Vice Chairman, The World Artificial Consciousness Associationization Hospital Cooperation Union. Chairman ,The World Proactive Medicine Committee, Vice Chairman ,TheWorld Artificial Consciousness Association

Advancing Traditional Chinese Medicine Research and Practice through Artificial Intelligence

Fan gcuifan * ,Du guangyong

Artificial intelligence has a wide range of applications in the field of traditional Chinese medicine research, mainly in the following aspects:
Research on traditional Chinese medicine.
–Resource and authentication of traditional Chinese medicine: Using image recognition technology to analyze the appearance and texture of traditional Chinese medicinal materials to quickly and accurately identify the authenticity and species of the materials. It can also be combined with satellite remote sensing, geographic information systems and other technologies. Through artificial intelligence algorithms to analyze environmental data, it can predict the distribution and yield of traditional Chinese medicinal materials, providing a basis for resource protection and rational development.
–Research on the material basis of the pharmacological effects of traditional Chinese medicine: With the help of artificial intelligence technology to analyze a large amount of chemical component data and biological activity data, it can explore the material basis of the pharmacological effects of traditional Chinese medicine and its target of action, and predict the interaction between the components of traditional Chinese medicine and disease–related targets.
Traditional Chinese medicine diagnosis
–Objectification of the four diagnostic methods: Using image recognition technology to analyze the tongue appearance and facial color, using voice recognition technology to analyze voice and breathing, and using sensors to collect pulse data. These pieces of information are quantified and standardized. Combined with artificial intelligence algorithms to establish diagnostic models to assist traditional Chinese medicine practitioners in diagnosis.
–Auxiliary syndrome differentiation: Based on traditional Chinese medicine theory and a large number of clinical case data, an artificial intelligence syndrome differentiation model is constructed. By inputting the patient's symptoms and signs, the system can carry out syndrome differentiation analysis and provide reference for doctors to improve the accuracy and consistency of syndrome differentiation.
Clinical research of traditional Chinese medicine
–Clinical decision support: Integrating information from traditional Chinese medicine ancient books, clinical guidelines, and case data to establish an artificial intelligence clinical decision support system. It provides treatment plan recommendations and drug combination suggestions for doctors, helping young doctors improve their clinical level.

Yulin city Hospital of Traditional Chinese Medicine Yulin , shaanxi province , China

طبقه بندی بهینه با استفاده از ماشین بردار پشتیبان با هسته هیبریدی و کاربرد آن در تشخیص بیماری ها

غلامرضا زکی * ، علی اصغر جدیری اکبرفام

ماشین بردار پشتیبان (SVM) یک طبقه‌بندی‌کننده مبتنی بر کرنل است. انتخاب کرنل مناسب می‌تواند دقت این طبقه‌بندی‌کننده را بهبود بخشد. اما چگونه باید کرنل مناسب برای داده‌های مشخص را انتخاب کرد؟ در این مقاله، ما ترکیبی خطی از چندین کرنل دیگر را برای پیدا کردن کرنل مناسب پیشنهاد می‌کنیم. به عبارت دیگر، با تعیین ضرایب مناسب در ترکیب خطی، یک کرنل جدید تولید می‌شود که دقت SVM مربوطه را بهبود می‌بخشد.ابتدا داده های در اختیار را که از یکی از سایت های در حوزه سلامت دانلود کرده ایم به دو گروه آموزشی و تستی تقسیم می کنیم. سپس کرنلی را از ترکیب خطی سه کرنل داده شده چنان بدست می آوریم که داده ها را بکمک بردار پشتیبان ماشین (SVM) به بهترین وجه جدا کند. به عبارت دیگر svm با دریافت چندین اطلاعات، به بهترین وجه ممکن، تشخیص می دهد که فرد بیمار است یا بیمار نیست.

لازم به ذکر است که برای یافتن پارامترهای ترکیب خطی کرنل ها، از الگوریتم ازدحام ذرات(PSO) استفاده می شود. برای داده های در اختیار که 1000 مورد بود،

با کرنل Ker1 ، طبقه بند SVM توانست تنها 728 داده را به درستی طبقه بندی کرد

با کرنل Ker2 ، طبقه بند SVM توانست تنها 870 داده را به درستی طبقه بندی کرد

با کرنل Ker3 ، طبقه بند SVM توانست تنها 739 داده را به درستی طبقه بندی کرد

کرنل ترکیبی با ضرایب

(0.4003, 0.5997, 0.0000)

توانست 906 داده را به درستی طبقه بندی کند. کرنل ها نقش مهمی در عملکرد بردارپشتیبان ماشین (SVM) دارند. بطوریکه تغیر کرنل درصد تفکیک درصد داده ها را تغییر می دهد. بنابراین یافتن کرنل مناسب می تواند نقش مهمی را طبقه بندی داده ها ایفا کند.

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کنگره و وبینار

با سابقه‌ای درخشان در برگزاری بیش از ۲۰۰ کنگره و وبینار پزشکی کنار شماست؛ تا با به کار گیری به روز ترین روش ها و پشتیبانی ۲۴ ساعته کارشناسان متخصص، در اجرای صفر تا صد رویدادتان همراهتان باشد.

خدمات ما