The Role of Artificial Intelligence in Diagnosis and Treatment of Disease

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الملخص:

لقد شهد الذكاء الاصطناعي في العقود الستة الماضية تطورًا غير مسبوق، وقد أصبح فعالًا في تشخيص وعلاج الأمراض. تعتمد تقنيات الذكاء الاصطناعي على استخدام تقنيات الواقعتين المعزز والافتراضي لعلاج الأمراض ومنصات السمنةوالمرض تساقط الشعر والاعتلال المزمن. تشكل الروبوتات النانوية الطبية إحدى الحلول المستقبلية بالخلايا الذكية، حيث يمكن تشغيلها عن بُعد لتوصيل مركّبات دوائية متعددة في نفس الوقت. كما تعرض عمليات التصوير بالذكاء الصناعي أيضًا وتعطي أدق الرؤى التي تساهم في تحسين الأداء الجراحي. في هذا السياق، هذا البحث هو حول الاستخدامات للآلات ذكية لأجهزة متطورة جراحيّة، وجهودها في التوثيق للعِلاج الدوائي، وقضايا النقل لتلك الأنظمة إلى النظم الصحية ويشتمل على الضّوابط السريّة الضّوابط الأخلاقية.

الكلمات المفتاحية: الذكاء الاصطناعي، التشخيص، الواقع المُعزز، الواقع الافتراضي، البيانات الصحية، الطب الوقائي.

Abstract

Healthcare witnessed a huge influence of machines and computers in the evolution and practice of medicine AI which has its history covering over six decades, has now reached within the reach of patients. engagement with the technology can opt for features such as nausea reducing, hair growth stimulation and chronic pain relief, which are features that exist within healthcare AI machines powered through augmented reality or virtual reality [1]. Providing future healthcare with an unlimited supply of medical nanobots that can be operated remotely and provide multiple treatments simultaneously while broadcasting in real time to the relevant healthcare professionals [2]. All of these inventions are the next big wave of AI expansion as a supplemental assistant in intrusion-free treatment of patients

whose anatomical structures hold an inherently greater threat than the approaches currently used in medicine and its surgery [1]. AI can integrate wearing a headset with a hologœur viewer capable of displaying digital images or infographics pertaining to the operation being performed or its emanation. In the performed case, AI supervised image addition which allows for seamless visualization of anatomy that is being operated on or adjacent to providing a tactical advantage during all types of surgery thanks to its imaging abilities. The paper illustrates some examples of AI applications in overall surgery techniques together with their analytical capabilities comprising the most recent developments in clinical medicine [3].

Keywords: AI, healthcare AI application, augmented reality, Virtual Reality, clinics, appendicitis.

Introduction

Recalling of an auxiliary intelligence that is artificial or has been developed through machines is not a new thing. As to where the term Artificial intelligence could be defined as a simulation of human intelligence processes by machines, especially computer systems [4]. Understanding the evolution of AI integrated into the diagnosis and treatment of patients' diseases and where it is at the present [7]. This review aims to specifically review the level and distribution of AI across health institutions with a focus on diagnostics and innovative treatment. The methods employed in conducting the study include the decade of the retrieved literature performed in the databases of Pub Med, Google Scholar and Research Gate [8]. Discussions within this paper recognize the reasons that led to the increased interactions of many professionals within the healthcare sector with AI as well some hindering factors, while raising the questions of what is yet to be done in order to better the relationship of the two.

Materials and Methods

In carrying out the study, a systematic review of the literature concerning the use of AI in disease diagnosis and treatment was undertaken. Resources employed included: PubMed Central, Google Scholar, Research Gate focusing on research published in the last ten years [9]. Significant search phrases were "artificial intelligence", "diagnosis of disease", "healthcare development", "methods of conventional diagnosis" and "preventive medicine". The studies collected showed

how AI can be of value in improving diagnosis, tailoring treatment plans, and making use of healthcare analytics in practice.

The Use of AI In the History of Medicine

The historical usage of artificial intelligence in healthcare emerged during the 1950s, when the first initiatives were introduced to improve diagnosis, medical imaging, and treatment methods [10]. These systems were limited to the integration of medical knowledge and continued to grow in complexity incorporating artificial neural networks and statistical approaches [11]. The establishment of electronic health record systems, together with others, during the 1950s and 1960s, marked the beginning of computerized healthcare systems, as well as the development of major databases such as PubMed Central [12]. Over the years, technology evolved, and new developments occurred such as IoT, big data, data mining and ML, which allowed AI to perform automated diagnostic tasks on large datasets [13, 14]. In the 2010s, convolutional neural networks, such as LeNet, began to be widely used, creating opportunities to enhance deep learning applications in clinical application coverage areas such as medical imaging, drug development and treatment planning [15].

Emerging Trends in AI Applications in Healthcare

A New Perspective on AI in Healthcare In PracticeAI has remarkably advanced disease evaluation and recognition, more particularly in the area of medical imaging [16]. In the field of radiology, AI applications algorithms continually scan X Rays, MRIs, and CT scans to facilitate precision diagnosis in the desired time frame [17, 18]. For instance, AI models assist diabetic retinopathy patients by performing image analysis of their retinas and other similar imaging models to assist radiologists in detecting different types of anomalies [19]. In pathology, AI makes slide transportation fast and improves the chances of detecting certain types of diseases while AI systems in dermatology would classify and identify skin cancer similar to a practicing dermatologist [20].NLP works hand in hand with clinical text in practice because it is used to analyze these documents for information that can be helpful during clinical evaluations [21]. The value of Artificial Intelligence goes beyond diagnosis as it can also predict the outcome and assist in creating an effective tailored approach for treating patients.

How is AI Changing the Way Drugs are Designed and Used

The involvement of AI in, the design of the therapeutics as well as in therapeutic development has advanced applying virtual screening, computer-aided synthesis and de novo molecule generation, and predictive modeling [22, 23]. AI's capacity to assess biological and genomic information will hasten the drug development process and enhance targeted therapies through estimating the disease progress and proposing advanced therapy [24]. Research studies reveal M-7 as a promising tool for many elements of computer drug design, including de novo drug design, drug-like properties, and virtual screening as part of therapeutic development which can impact positively on the time and costs in drug development [25].

Role's in Conflicts

Some of the advantages of using diagnostics powered by artificial intelligence (AI) include: being faster, more accurate and cost-efficient. On the other hand, there are issues concerning AI integration such as data privacy, moral dilemmas, and the lack of strong governance [26]. One of the best ways of ensuring compliance with the GDPR and HIPAA, as well as protecting one's privacy is ensuring that patient information is anonymized and protected [27, 28]. As clinicians have to make the ultimate decision, they can use AI as a tool, but they will require constant training on how to use AI's algorithms, what biases to expect and what its limitations are [29]. AI can also streamline certain processes which free up a healthcare professional to make critical decisions about patient care.

Critical Appraisal of the Efficiency of Diagnostic Approaches using AI and the Conventional Techniques

AI-based devices can analyze and integrate many data elements and render images interpretable [30] which is why they are becoming more common. Medical AI provides answers to the issue of diagnostic services [31]. In some cases, however, conventional approaches to diagnosis have advantages, such as the integration of clinical evidence into the process, stage-by-stage differential diagnosis, and their usefulness in averting advancement of acute diseases [32]. On the other hand, having a high level of precision, AI cannot carry out any clinical thinking and is dependent on the training data, which could be problematic in case of insufficient diversity in the data [33].

Strengths, Weaknesses, and Integration Requirements.

The NANBIOSIS D4 Unit is a scientific core facility including three HealthTechAI Lab biomedical engineering assets. Thanks to AI development in healthcare, the accuracy of diagnosis has been improved, complexity of management has been managed and potentials for the advancement of precision neurology have been created [34]. However, there are also some disadvantages, such as AI's inability for human-like cognitive processes and an overreliance on the variability in training datasets [35]. Tackling the above limitations requires not just training datasets, but also ethical principles and integration approaches which will support the effective utilization of AI in clinical practice [36]. Regulations as well as legal and technical standards bear significance in the barriers to the equitable integration of AI in healthcare.

Regulatory and Legal Matters Sensitivity Aspects

The environment governing AI based medical devices is changing. Both the U.S. FDA and the European Union are putting up measures aimed at AI medical technology {37]. Any AI tools must comply with data security policies and patients have to consent whenever such sensitive data is used in AI systems [38]. Minimum measures such as encryption, anonymization,(and) access control measures have to be out in place to safeguard the patient's privacy [39]. It is necessary that the healthcare providers get regular training so as to avoid misuse of AI and to implement ethical AI use in clinical practice.

Predictive Analytics in Preventive Healthcare with the Use of AI

AI utilizes predictive analytic solutions to assist healthcare professionals in recognizing patients at high risk for diseases, as well as suggesting preventative measures. Models that are powered by AI and utilize healthcare data, genetics, and habits, also enable practictioners to manage chronic diseases earlier, hence improving healthcare results [40, 41]. Other uses of AI in genomics, drugs development and mental illness also form part of the preventive care strategies changing healthcare from reactive to proactive [42].

Future Perspective concerning AI-Powered Diagnostic Tools

AI technology is gaining momentum and countries' efforts are underway to create regulations regarding AI use in the health sector. The U.S. FDA is one of the examples where AI/ML product software in medicine is given its guidelines [43].

IDx-DR for diabetic retinopathy and Viz.AI for stroke detection are other AI Supported tools that showcased AI's clinical efficacy [44]. More advanced AI systems could bring interactive models in the future promising real time changes for better improvements in diagnostic performance. However, despite these limitations, the opportunities of AI in healthcare imply that AI will transform the way diseases are diagnosed, managed, and treated, while enhancing access to healthcare services including telehealth and virtual caregivers [45].

Conclusion

AI in advanced technologies brings along several opportunities such as improved diagnosis, treatment, and operational workflows into clinical practice. The potential benefits of AI-based technologies are however accompanied by numerous challenges such as data security, privacy, ethics, and integration challenges. AI acts as an assistive technology and helps, rather than supplants, human intelligence. It has great prospects in the healthcare industry, especially to address unmet needs, where patients have limited access to care, improved access, efficacy, and outcomes through the support of advanced technology and regulations.

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