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Can AI Improve Health and Wellbeing?

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Abstract
Artificial intelligence (AI) is rapidly transforming several sectors. Particularly in healthcare, where its ability to improve health and wellbeing is becoming increasingly evident. This article delves into the many ways AI can contribute to enhancements in health and wellbeing. By thoroughly examining recent advancements and applications, we explore AI's role in predictive analytics, personalized medicine, medical imaging, mental health support, and public health management. AI algorithms, capable of handling large amounts of data, allow for early disease detection and precise diagnosis, leading to improved patient outcomes. Personalized treatment plans, based on AI analysis of genetic, lifestyle, and environmental factors, provide more effective and tailored healthcare solutions. In medical imaging, AI improves the accuracy and speed of interpreting complex images, aiding in the early identification of conditions like cancer. AI-powered chatbots and virtual therapists serve as accessible mental health support tools, offering timely interventions and reducing the stigma associated with seeking help. Additionally, AI's ability to analyse epidemiological data supports public health initiatives by predicting disease outbreaks and optimizing resource allocation. Despite these promising advancements, challenges such as data privacy, algorithmic bias, and the need for strong regulatory frameworks persist. This article emphasizes the importance of addressing these issues to fully utilize AI's potential in healthcare. By examining current evidence and future possibilities, we aim to provide a nuanced understanding of how AI can be used to enhance health and wellbeing, ultimately leading to more efficient, fair, and accessible healthcare systems
Keywords*: Artificial Intelligence, Healthcare, Wellbeing, Medical Innovation, Patient Outcomes. Health Technology*

1. Introduction

Artificial intelligence (AI) and associated technologies are becoming increasingly widespread in businesses and society, and they are starting to be used in healthcare. It has been recognised as the "fourth industrial revolution," having revolutionary and universal results in healthcare, community health, and worldwide health sectors (Murphy et al., 2021). The lives of doctors, patients, and hospital administration personnel are made easier by AI by performing activities normally performed by humans in a short time frame and with fewer expenses (Daley, 2021). Several patient care aspects, as well as administrative procedures within pharmaceutical organizations, payers, and providers, might be transformed by these technologies (Davenport, 2019). Heavy loads of cases and insufficient health records can lead to fatal human errors (Singh, N., et al, 2024). AI can detect and diagnose diseases faster than most medical experts. AI has several uses in healthcare. According to Daley (2021), AI has been a huge benefit to the healthcare sector, whether it is being utilised to identify linkages between power surgical robots, genetic information, or even enhance hospital performance. AI is redefining and boosting healthcare through technologies that may detect, understand, learn, and perform. It is also used to recognise new linkages between genetic information or to run robots assisting in surgery. (Davenport, 2019) also identified key areas of AI applications, including

participation in diagnostic and treatment decisions, patient persistence and participation, and administrative activities (Vats, S., & Dixit, A. 2023). Though AI can perform healthcare activities as well as or faster than humans in several circumstances, issues of implementation can delay the large-scale automation of health professional works for a long time. The AI sector, which was valued in 2014 at over $600 million and is expected in 2026 to hit $150 billion, is one of the world's fastest-growing sectors (Daley, 2021).

2. Applications of AI in Diagnosing and Treating Diseases

The concept of digital diagnostics has been fuelled by electronic health record digitalization since 1982. In 2018, Director Pari Schacht was appointed by WHO to lead a commission on the implementation of digital technology and AI in health. AI research often lacks input from clinicians due to the new combination of AI and clinical knowledge. The 2019 expert report on AI in global health makes no specific recommendation on digital diagnostics. Diagnostic accuracy is crucial, and the role of AI is to link complaints, the diagnostic journey, and the final diagnosis. The perception of AI replacing humans in healthcare raises concerns. AI will impact various aspects of clinical practice. This summary provides insights and a guide for those interested in deeper exploration.

The most common application of classical machine learning in healthcare is precision medicine, which determines which treatment strategies are most effective for a patient based on a variety of patient characteristics and the treatment scenario (Lee et al., 2018). In the USA, surgical robots, which were originally permitted in the 2000s, give surgeons "superpowers," enabling them to see better, execute more precise and less harmful surgeries, stitch wounds, etc. (Davenport and Glaser, 2002). However, human surgeons continue to make significant decisions. Some of the most prevalent surgical robot-assisted operations are prostate surgery, gynaecology surgery, and head and neck surgery (Davenport and Kalakota, 2019).

Since the 1970s, when MYCIN was developed at Stanford to diagnose bacterial infections, i.e., blood-borne (Bush, 2018). Despite having a high potential for accurate illness diagnosis and treatment, these and other initial rule-based methods were never approved for clinical use. They performed no better than human specialists, and their processes and systems of health-record were inefficiently linked (Davenport and Kalakota, 2019). In recent times, IBM's Watson, which focuses on precision medicine, especially for the detection and treatment of cancer disease, has received a lot of media attention. Watson combines machine learning and natural language processing (NLP). However, consumers' enthusiasm for the advancement of this technology has decreased as they realise how difficult it is to train Watson to deal with specific types of disease (Bush, 2018), as well as the possibility of incorporating Watson into care systems and processes (Ross and Swetlitz, 2017). Watson is a collection of "cognitive services" carried by application programming interfaces (APIs) containing the programmes for language and voice, data analysis, and vision built on machine learning. According to many professionals, the Watson APIs are conceivable technically, but pursuing cancer treatment is an admirable objective (Davenport, 2018).

The application of deep learning to medical imaging can be divided into two primary schools of activity: segmentation and classification. Segmentation identifies and labels objects within an image, while classification labels the presence of different objects. These areas share mechanisms and often support each other. AI in radiology has seen significant advancements through neural networks and deep learning. With large labelled datasets and advanced GPU technology, AI is approaching or exceeding human expert performance. This has led to a wider range of supportive tasks in radiology, from automating tedious tasks to decision support tools for better clinical decisions.

The structure of the molecule has risks for the human body and affects the compound's activity. Detailed information is needed for developing innovative medicines. However, obtaining biological activity data for all compounds is not possible. Developing new drugs takes a long time. Artificial intelligence models can help in the initial stages of drug discovery. Evaluating all potential candidate drugs is not feasible due to cost and limited success. AI can reduce the time and cost of drug discovery. Companies are using AI in different stages of drug development.

There are various administrative applications of AI in healthcare. As compared to patient care, the use of artificial intelligence in this area has a lower potential for innovation, yet it can still provide major benefits. (Efthymiou, 2021). These are required in healthcare because, on average, a nurse in the United States spends

25 per cent of her time on administrative and regulatory tasks (Berg, 2018). Processing of claims, health records, management of revenue cycles, and administration of health records are some of the uses it can manage in healthcare (Commins, 2010).

The engagement and persistence of patients have long been recognised as healthcare's "last mile" challenge, the major obstacle between good and poor health results. (Capriulo, M., et al, 2024). The better the results in terms of function, monetary results, and staff experience, the more patients vigorously engage in their treatment and well-being (Souliotis K., 2016). To address these issues, artificial intelligence and big data are widely used (Davenport and Kalakota, 2019).

The rapid development of communication technology and software systems has led to the promotion of remote patient monitoring (RPM). This allows for the instant transmission of individual health data to healthcare providers. RPM is particularly advantageous for early intervention when a patient's health condition changes or worsens. It has the potential to improve healthcare services, reduce costs, and enhance patient care. The advancement of sensors, wearable devices, and smart electronic devices has facilitated the quantification of human health and the generation of a large volume of individual data (Efthymiou, 2020). When combined with telecommunication technology, these devices can automatically collect and wirelessly transmit data to monitoring or management systems, enabling remote patient monitoring. (Lakshmi et al., 2021) (Akkaş et al., 2020)

Chatbots have also been used by some healthcare organisations for the interaction of patients, mental well-being, and telehealth. Basic dealings, like refilling medicines or booking schedules, may benefit from these services based on NLP. In a poll of 500 top five users of chatbots in healthcare in the United States, patients expressed concerns about providing sensitive data, addressing complicated health conditions, and ineffective functionality (Utermohlen, 2018).

Hospitals and providers regularly employ clinical skills to develop treatment plans that will improve the health of severe or chronically sick patients. Thus, if the patient is unable to make the necessary behavioural adjustments, such as losing weight, scheduling a follow-up visit, filling in medicine, or following a treatment process, it is unlikely that the doctor will be able to help. When a patient does not finish a treatment plan or take the medication as instructed, this is known as a "failure to comply" (Davenport and Kalakota, 2019).

According to Davenport and Kalakota (2019), artificial intelligence might automate 35 per cent of the United Kingdom's employment in the next ten to twenty years. According to another study, although certain professions can be automated, a range of external variables other than technology, such as the automation cost, workforce market expansion, advantages of automated systems beyond simple labour replacement, and regulation and social acceptance, could limit job loss (Deloitte LLP, 2015). As a result of these considerations, actual job losses may be limited to 5 per cent or less (Davenport and Kalakota, 2019).

Already, AI is being utilised to diagnose diseases like cancer with greater precision and in early stages (Hunter B, et al., 2022). It was stated by the American Cancer Society that a significant number of mammograms provide false results, ultimately leading to one in every two healthy women being diagnosed with cancer. Mammograms can be reviewed and translated 30 times faster and with 99 per cent accuracy using AI, reducing the need for unnecessary biopsies (Griffiths, 2016).

The applications of artificial intelligence in mental health are part of a bigger AI trend that will become more essential in the future. Across sectors, the capacity to discern behavioural traits in patients, consumers, or users of any type is employed as a solution to a variety of business difficulties. This underlines the necessity of data traceability and availability, making future AI programmes more accessible (Faggella, 2020). However, even in sectors such as pathologists and radiologists, AI adoption is likely to remain mild. Even if deep learning technologies are gaining ground in the capacity to analyse and categorise pictures, there are various reasons why radiology occupations, for example, will not go away anytime soon (Davenport and Kirby, 2016).

3. Ethical and Privacy Considerations

The use of AI in healthcare raises several ethical concerns. Humans used to make practically all healthcare choices, so using smart computers to make or assist with them creates issues of responsibility, clarity, authorization, and confidentiality. Algorithms of machine learning in healthcare may be subject to algorithmic bias, such as predicting an increased chance of disease based on race or gender when these

factors are not causative (Davenport and Dreyer, 2018). The possibility that AI will lead to job automation and large-scale labour displacement has gained a lot of attention. The appointment of a responsible AI officer to oversee the development and use of AI-driven technologies, the establishment of best practices in terms of data access, sharing, and governance, promotion of transparency, fairness, and interpretability are critical. Pioneering ethical and privacy guidelines can provide AI-cantered innovative methods aligned with the EU data protection principles and the General Data Protection Regulation (GDPR).

Sensitive data from users and healthcare professionals can have negative consequences for health-related AI technology. Respecting ethical considerations and privacy needs is crucial, along with data minimization techniques and transparency in data handling (Schönberger, D. 2019). Dealing with personal user data, and ensuring security and ethical management, are important. Trust in data handling processes is key to successful long-term use. (Efthymiou-Egleton, I. P., 2020). Data breaches or loss of control over personal health data can lead to harm and withdrawal from AI technology use. Various types of health data are sensitive and important for fair and responsible deployment of AI systems, including mental health insights and female-specific health issues (Tretter, M., et al, 2023). Protection of other sensitive data, such as financial and telecommunication data, is also crucial.

4. Conclusion

To conclude, we can say that, from monitoring, diagnosis, clinical trials, and delivery of health care to health economics, AI has particular potential for revolutionising practically every aspect of healthcare and health studies. In society and at home, AI can customise healthcare monitoring, diagnosis, and treatment. The health sector, on the other hand, is a developing sector of AI research, growth, and implementation, with AI showing improvement in the preventative measures, diagnosis, and treatment of disease, as well as healthy behaviour promotion and the diagnosis and early-stage treatment of infectious diseases and health risks (Bhagyashree et al., 2018). As a consequence of AI-based knowledge, healthcare workers will be better able to understand the daily behaviours and needs of the people they care for and will be capable of providing greater feedback, guidance, and assistance for staying healthy.

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