Artificial Intelligence Role in Healthcare: For Public Health Prospective

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Abstract

Artificial intelligence (Al) is going to be used in the healthcare industry more and more because of the complexity and growth of data in this sector. The healthcare providers and life sciences organisations currently use a variety of Al technologies. The main application categories include administrative tasks, patient engagement and adherence, and diagnosis and treatment recommendations.

Various Al technologies are presently used by life sciences organizations, payers, and healthcare providers. The primary application categories include diagnosis and treatment recommendations, patient involvement and adherence, and administrative activities.

Al has demonstrated its capacity to improve diagnostics, optimize treatment strategies, and enhance overall healthcare delivery. While acknowledging the ethical considerations and challenges, the promising outcomes underscore the importance of continued research, collaboration, and thoughtful implementation.

Keywords: Artificial intelligence, Role of AI in healthcare for public health prospective.

Introduction

Artificial Intelligence (AI) is a branch of computer science that deals with automating intelligent behaviours. It needs to be grounded in the use of suitable models and theoretical principles [1].There are other hazards and difficulties that come with it, including as the possibility of patient harm from system malfunctions, the risk to patient privacy when gathering data and making inferences from AI, and more. AI preventative care can help people stay healthy, which is vital for public health. For instance, applications are designed to provide users more control over their health and well-being.[2]Artificial intelligence and robots in healthcare are developing swiftly, particularly in the areas of early detection and diagnostic applications. AI is simultaneously growing more potent. They can accomplish tasks that humans can, frequently more quickly, simply, and affordably [3].In general, computing technologies that simulate human intelligence-assisted mechanisms including thought, deep learning, engagement, adaptation, and sensory comprehension are referred to as artificial intelligence (AI) [4,5] Certain gadgets are capable of performing tasks that usually require human interpretation and Making decisions [6,7]These methods can be used in many domains, including health and medicine, and they use an interdisciplinary approach. AI has been used in medicine since the 1950s, when doctors started experimenting with computer-aided programmes to help them diagnose patients more accurately [8,9].Recent years have seen a significant increase in interest in and progress towards medical AI applications because of the significantly increased processing capacity of contemporary computers and the abundance of digital data that can be gathered and used In general, artificial intelligence (AI)[10].

Healthcare systems around the world are facing substantial obstacles in meeting the 'quadruple objective' for healthcare: improving population health, improving patient experience of care, improving carer experience, and lowering escalating healthcare costs [11-13] .The AI industry in the US was estimated to be worth $600 million in 2014, making it one of the fastest-growing in the world. Artificial intelligence is widely employed in healthcare facilities across the globe today because it has made patients' and physicians' life easier by completing complicated tasks. Important jobs completed at a fraction of the cost and in less time. As a result, artificial intelligence (AI) has a wide range of uses in the healthcare sector. From identifying genetic code connections to controlling surgical robots, AI is truly revolutionising and advancing the field [14].AI is progressively transforming medicine. Numerous AI applications in medicine are applicable to a range of medical specialties, including clinical, diagnostic, surgical, rehabilitative, and predictive techniques. In yet another crucial field of health, artificial intelligence is impact on illness diagnosis and clinical decision-making. In order to identify illness and inform clinical judgements, artificial intelligence (AI) tools can consume, interpret, and report vast amounts of data from several modalities [15]. Applications of artificial intelligence (AI) can handle the enormous volume of data generated in the medical field and uncover fresh information that would otherwise be lost in the bulk of massive medical data [16,17,18]. Additionally, these technologies can find novel medications for patient care and health services management [8, 9].

Although the exact impact of AI on medicine is unknown, theory and experience in other industries can offer some direction.

Five things to consider regarding AI's potential impact on healthcare

Firstly, AI is anticipated to replace rote tasks currently performed by people, such as billing, appointment scheduling, and facilities management. These jobs are now labor-intensive; with AI, the necessity for and cost of office personnel can be minimised. Recently, several co-workers and It is anticipated that AI in this domain might save between $200 billion and $360 billion per year, with administrative savings accounting for around 35% of the total [19].

Secondly, AI is more likely to support physicians in clinical treatment than to replace them. While administrative jobs are often carried out in a different manner than clinical care, AI can be helpful in certain situations, such as reviewing test findings for anomalies. However, clinical Care also entails subtler elements that AI is not yet able to replicate. Does this patient usually describe being in a lot of pain? Does the patient appear to be more lost than normal? It will still be necessary for clinicians to blend recorded and unrecorded data, such as physical characteristics, voice quality, and speaking reluctance [20].

Third, Developing AI solutions that improve productivity by enabling less expensive monitoring, diagnosis, and staffing requirements is very crucial. Hospitals and post-acute care centres provide the most costly medical treatment. Such care is frequently provided to patients because they need on going observation. AI can assist in shifting part of this care into the house or a step-down observation unit by simplifying remote monitoring [21].

Fourth, AI systems ought to strive to outperform human thought processes rather than merely mimicking them. Humans are prone to making bad or biased decisions; some are random, while others systematically harm people from lower socioeconomic backgrounds, less educated backgrounds, and racial and ethnic minorities' minority ethnic groups. It is insufficient to create algorithms and software programmes that mimic bias and errors made by people. We need software that forecasts the underlying truth, not the subjective perception of a fallible human.[22,23].

Fifth, it's critical to understand what AI is not proficient in. Finding patterns in data can be greatly aided by machine learning. It can find subgroups with treatment effects that are greater than average by scanning the outputs of clinical trials. But rather than being evidence of differences, this is more like the creation of a hypothesis because Any data set will always have some subgroups with higher response rates than average. Classic hypothesis testing will still be needed to determine causality, either via clinical trials or by employing real-world quasi experimental scenarios [21].

Types of AI relevant to healthcare

Artificial intelligence is a collection of technologies, not a single one. The majority of these technologies are immediately applicable to the healthcare industry, although the precise operations and tasks they support differ greatly. Some of the most important AI technologies for healthcare are outlined and explained below.

Deep learning and neural networks are two types of machine learning.

Machine learning is a statistical technique for fitting models to data and teaching models to 'learn' by training them with data. Machine learning is one of the most widespread types of AI; 63% of organisations assessed in a 2018 Deloitte survey of 1,100 US managers whose organisations were already exploring AI used machine learning in their operations. [24]

Natural Language Processing (NLP)

Since the 1950s, AI researchers have sought to understand human language. NLP applications are included in this field such as speech recognition, text analysis, translation, and other linguistic tasks. There are two approaches: statistical NLP and semantic NLP. Statistical NLP is based on machine learning (particularly deep learning neural networks) and has contributed to a recent boost in recognition accuracy. It is necessary to have a substantial 'corpus' or body of language from which to learn [25]

Rules based on expert system

In the 1980s, expert systems based on collections of 'if-then' rules were the leading AI technology and were widely employed commercially at the time and later. They were widely used in healthcare for 'clinical decision support' purposes over the last several decades and are still widely used today. Many electronic health record (EHR) providers now include a set of guidelines with their systems [26]

Physical Robots

Physical robots are well-known at this time, with over 200,000 industrial robots installed worldwide each year world. They carry out predetermined duties such as lifting, relocating, welding, or assembling goods in areas such as factories and warehouses, as well as transporting supplies in hospitals. Robots have recently become more collaborative with people and are more easily trained by guiding them through a desired job. They are also becoming smarter as other AI capabilities are integrated into their 'brains' (actually their operating systems). Over time, it appears likely that the same advances in intelligence seen in other fields of AI will be implemented into physical robot [27].

Healthcare Data

The vast majority of data generated from health-related activities, including diagnosis, therapy assignment, and other activities, is used to train artificial intelligence algorithms. Gaining knowledge from a huge dataset will allow the algorithm to identify associations between subject qualities and interest-related outcomes, as well as similar groups of items. As a result, a medical dataset will include a variety of data, including demographics, clinical laboratory records, photographs, medical notes, physical examinations, and recordings from medical equipment. AI systems must assess a significant amount of data from genetic testing and diagnostic imaging during the diagnosis stage. Researchers Topol and Jha, for instance, recommended radiologists to use AI technologies to efficiently interpret diagnostic images that include a lot of information [28].

Artificial Intelligence used in treatment design

The use of AI technology has led to improved treatment in healthcare, improving treatment strategies and assisting in the analytical process that yields a satisfied treatment plan keeping an eye on medical interventions. Moreover, medical pictures like CT, MRI, ultrasound, and X-ray scans can be accurately analysed by artificial intelligence to identify symptoms and indicators. This shortens the time it takes for a patient to receive a diagnosis by enabling quicker diagnostics [29]

Role of AI in healthcare for public health prospective past, Future and today

AI today (and in the near future)

AI systems are not yet capable of reasoning in the same way as doctors, who can rely on "clinical intuition and experience" or "common sense. Rather, AI is similar to a signal translator: converting dataset patterns into human language. Healthcare organisations are starting to use AI technologies to automate repetitive, time-consuming procedures that need a significant volume of work. Moreover, there is considerable progress in demonstrating the application of AI in precision diagnosis (e.g. diabetic retinopathy and radiotherapy planning) [30]

AI in the medium term (the next 5–10 years)

Our proposal is that there will be substantial advancements in the medium term in the creation of potent algorithms that are effective (i.e., require less data to train), capable of utilising unlabelled data, and able to merge disparate structured and unstructured data, such as imaging, electronic health data, multi-omic,

information on behaviour and pharmacology. Furthermore, healthcare organisations and medical practices will change from being AI platform adopters to co-innovators in the creation of cutting-edge AI systems for precision therapies alongside technology partners. [31]

AI in the long term (>10 years)

With AI-augmented healthcare and connected care, AI systems will eventually become more sophisticated, enabling AI healthcare systems to reach a state of precision medicine. Traditional one-size-fits-all treatment will give way to preventative, individualised, data-driven illness management in the healthcare industry. Better patient outcomes (better patient and clinical experiences of treatment) in a more economical delivery system are the goals of this management approach. [31]

AI's prospects in healthcare

We think artificial intelligence (AI) will play a significant part in future healthcare products. It takes the shape of machine learning the main factor driving the development of precision medicine, which is generally acknowledged as a desperately needed improvement in healthcare. Even though early attempts to provide diagnosis and treatment recommendations have been difficult, we anticipate that AI will eventually become proficient in that area as well. A computer will probably analyse the majority of radiology and pathology images at some time, given the speed at which AI for imaging analysis is developing. Tasks like capturing clinical notes and facilitating patient communication currently make use of speech and text recognition, and this usage will only grow.

The Use of Artificial Intelligence in Drug Research

AI is anticipated to streamline and expedite pharmaceutical development in the future. AI can use robotics and data to transform the labor-intensive process of drug discovery into one that is capital- and data-intensive models of pharmacokinetics, safety, efficacy, and diseases and how they progress, as well as genetic targets and medications. Artificial intelligence (AI) has the potential to expedite and improve the efficiency and cost-effectiveness of the drug discovery and development process. AI was previously used to identify possible Ebola virus treatments, but like with any pharmacological study, finding a lead chemical does not ensure the creation of a safe and effective therapeutic [32].

AI Applications in Health Research

One significant area of AI-based health research is the application of data generated for electronic health records (HER). Use of such data could be challenging if the database and underlying IT infrastructure do not stop inconsistent or poor-quality data from spreading. However, artificial intelligence (AI) in electronic health records can be applied to clinical care optimisation, quality improvement, and scientific research. When AI is appropriately developed and sufficiently taught, it can assist in identifying clinical best practices from electronic health records before pursuing the conventional route of scientific publication, guideline development, and clinical support tools medical records. AI can help create new clinical practice models for healthcare delivery by evaluating clinical practice trends found in electronic health data [32]

Applications Artificial Intelligence in healthcare

It is widely accepted that AI tools will support and improve human labour rather than completely replace that of doctors and other healthcare professionals. AI is prepared to assist healthcare workers with a range of duties, including clinical documentation, patient outreach, administrative processing, and specialised help in areas like image analysis, patient monitoring, and medical device automation. Divergent views exist regarding the

best uses of AI in the healthcare industry. According to a 2018 Forbes article, clinical decision support, robotic surgery, image analysis, administrative procedures, and virtual assistants would be the most crucial sectors [33]. The same topics were included in a 2018 Accenture paper along with connected machines, cyber security, and dose error reduction [34].According to a McKinsey analysis from 2019, robotics-assisted surgery, targeted and personalised medicine, electroceuticals, and linked and cognitive gadgets are major sectors [35].The following sections will address some of the most significant uses of AI in healthcare, including those that are directly related to the field as well as others that fall outside the purview of the healthcare value chain, like drug development and Ambient Assisted Living (AAL).

Conclusion

The application of artificial intelligence in healthcare, especially in diagnostic and treatment recommendations, patient interaction, and administrative activities, heralds a new era in public health. Regardless of ethical concerns, the proven gains in diagnosis and treatment optimisation highlight the critical need for on-going research, collaborative efforts, and careful application. Al evolves, its incorporation into healthcare promises to form a more efficient, accessible, and patient-centric future, fostering innovations with large-scale consequences for public health.

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