Short Review

Artificial Intelligence in Healthcare

Running Title- Artificial Intelligence & Healthcare

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Abstract

Artificial intelligence (AI) is used in a variety of sectors, including medicine, and has been the potential to supplement or replace human healthcare practitioners. AI is useful in the healthcare industry for a variety of tasks including data mining medical records, treatment planning, health event forecasting, helping with repetitive tasks, conducting online consultations, assisting with clinical decision-making, medication management, developing new drugs, helping patients make healthier decisions and solving other public health issues. With AI, high-quality photos can be captured, picture quality can be improved, data can be extracted from them, and then use that knowledge to make a diagnostic or a forecast about the patient. With the help of AI, early detection of disease is possible which saves the life of human. With use of Al, in particular increasing the efficiency of clinicians, improving medical diagnosis and treatment, and optimising the allocation of human and technical resources. AI has the potential to be used to help with the early detection of epidemic causes and outbreaks of infectious diseases.

Keywords: Artificial Intelligence, Early Detection, Health care, Machine Learning,

Introduction

Artificial intelligence (AI) and related technologies are spreading throughout society and business, and they are now beginning to be applied in the

healthcare sector. These technologies have the ability to alter numerous aspects of patient care in addition to administrative processes the inside provider, payer, and pharmaceutical organisations. [1].Numerous studies have already shown that AI is capable of doing important healthcare jobs including disease diagnosis better than humans. Today, algorithms already surpass radiologists in identifying cancerous tumours and advising researchers on how to create cohorts for expensive clinical trials. In this article, the promise for automation in healthcare and some of the obstacles that stand in the way of its quick adoption were discussed [2].

The ultimate goal is to transform the healthcare sector by fusing the potential and applications of multiple AI technologies. The integration of AI technology into the medical industry has allowed for a number of conveniences, including task automation and the analysis of enormous amounts of patient data for better, faster, and less expensive treatment. Numerous studies have already demonstrated that AI is capable of carrying out critical healthcare tasks, like disease diagnosis, at least as well as humans. Algorithms already perform better than radiologists in the modern world at identifying cancerous tumours and directing researchers on how to build cohorts for costly clinical trials. We don't think AI will ever completely replace people in the context of intricate medical procedures for a variety of reasons. In areas like radiography and chronic illnesses like cancer, AI is being used to create

precise and useful products that will aid in treating patients and, eventually, lead to a cure.

AI has many benefits over traditional methods for healthcare decision-making and analytics. As they have the chance to comprehend training data, AI algorithms improve system accuracy. This further enables people to get previously unattainable insights into treatment variability, care procedures, diagnostics, and patient outcomes. Artificial intelligence systems in healthcare enable pathologists to make precise diagnoses, lower errors during the cancer diagnosis process, and provide a variety of novel methods for personalised medical care. Numerous lives may be saved if cancer patients were diagnosed more accurately so that the majority of them could be treated or cured before it becomes fatal [3].

When it comes to early detection of potentially fatal blood-related disorders, artificial intelligence is incredibly helpful. Doctors can now examine blood samples for dangerous compounds and bacteria, such Staphylococcus, E. coli, etc., at a far faster rate than they could before thanks to AI-enhanced microscopes, compared to the speed of manual scanning [4].

Some of these issues with supply and demand may be resolved by the use of technology and artificial intelligence (AI) in healthcare. An opportunity to fundamentally transform models of healthcare delivery through AI-augmented healthcare systems has arisen due to the growing availability of multi-modal data (including genomics, economic, demographic, clinical, and phenotypic data) as well as technological advancements in mobile, internet of things (IoT), computing power, and data security [5].

Medical practise is being gradually altered by AI. A variety of medical specialties, including clinical, diagnostic, rehabilitative, surgical, and predictive practises, can benefit from a number of AI applications in medicine. Clinical judgement and illness diagnosis are two more crucial areas of medicine where AI is having an impact. For the purpose of diagnosing disease and directing therapeutic decisions, AI systems can ingest, analyse, and report vast volumes of data from many modalities[6].

Discussion

Zupic and Ater described Bibliometric strategies that can introduce impartiality and reduce researcher bias can be used to evaluate a research stream, as described by Zupic and ater. Because of this, researchers are becoming more interested in bibliometric methods as a trustworthy and impersonal way of research analysis [7]. Bibliometrics has become a crucial tool for monitoring and predicting research trends in recent years. Huang et al explains virtual reality technologies used in rehabilitation care. For patients with physical impairments or disabilities, the authors claim that the main purpose of rehabilitation is to improve and restore functional ability and quality of life. Several technologies that offer tools for both research and clinical intervention have become available to several healthcare disciplines in recent years [8]. Hao et al highlight the use of text mining in medical research. Using a computer to automatically extract data from various text resources, text mining, as stated, provides fresh, previously undiscovered information. The application of data mining techniques to text data is known as text mining. Text mining is becoming more and more important in the analysis of medical data [9].

Santos et al promote using machine learning (ML) and data mining methods to address public health issues. According to this study's findings, the art and science of illness prevention, health promotion, and life extension constitute public health. It is feasible to unearth new information that would otherwise be hidden by using data mining and ML approaches. The two papers discussed here have something to do with big data in medicine [10].Conelly et al surveyed the number of surgeries aided by robots has grown significantly in recent years. Their bibliometric research indicates how robotic-assisted surgery has become more popular in a variety of medical specialties, including urological, colorectal, cardiothoracic, orthopaedic, maxillofacial, and neurosurgical applications [11].

Technology Related to Artificial Intelligence: The following highlighted technology of AI have been discussed here.

A. Machine Learning: Machine learning is a statistical method for 'learning' by 'teaching' models with data and for fitting models to data. One of the most prevalent types of AI is machine learning. According to a 2018 Deloitte poll of 1,100 US managers whose organisations were already exploring AI, 63% of the companies surveyed were using machine learning in their operations [12].One of the most prevalent applications of artificial intelligence in healthcare is machine learning. There are numerous variations of this broad technique, which is at the foundation of various approaches to AI and healthcare technology [13].

By enabling the application of artificial intelligence in medical diagnosis and treatment, machine learning has changed the way the healthcare system operates. With higher precision than ever before, machine learning algorithms can quickly analyse massive quantities of clinical paperwork, spot trends, and make predictions about medical outcomes. The data science behind machine learning is assisting healthcare practitioners in improving their treatments and lowering costs by analysing patient records and medical imaging in addition to developing new remedies [14].

Doctors can more correctly identify illnesses and tailor therapies to the needs of specific patients by utilising AI technology like machine learning for activities like disease diagnostics or medication research and development. Additionally, the use of artificial intelligence in healthcare, such as machine learning, enables professionals to find previously unknown correlations between diseases in healthcare data or identify small changes in vital signs that could point to a potential issue [15].

B. Natural Processing Language:A type of artificial intelligence known as natural language processing (NLP) enables computers to comprehend and utilise human language. Many industries, particularly the healthcare sector, have seen radical change as a result of this type of technology. NLP is being used in the healthcare industry for many different health data applications, including enhancing patient care by increasing the accuracy of diagnoses, expediting clinical procedures, and offering more individualised services [16].

Rule Based Expert System: In the 1980s and later decades, expert systems based on various "if-then" rule variations were the most widely used AI technology in healthcare. Even now, clinical decision support uses of artificial intelligence in healthcare are very common. A collection of rules is currently made available with many electronic health record systems' (EHRs') software options. In order to create a comprehensive set of rules in a particular knowledge area, expert systems typically involve engineers and human specialists. They are simple to follow and process and work well up to a point [17].

C. Deep Learning: Deep learning is also increasingly used for speech recognition and, as such, is a form of natural language processing (NLP), described below. Unlike earlier forms of statistical analysis, each feature in a deep learning model typically has little meaning to a human observer. As a result, the explanation of the model's outcomes may be very difficult or impossible to interpret [18].Deep-learning models outperform many traditional ML techniques because they can scale to big datasets, in part because they can run on specialised computing gear, and because they get better with more data. Deep-learning algorithms can take in a variety of data types, which is a feature that is very relevant for heterogeneous healthcare data [19].

D. Computer Vision: Deep learning has achieved some of its greatest triumphs in the area of computer vision (CV).In order to determine whether a patient's radiograph has malignant tumours, object categorization, detection, and segmentation are among the tasks that are covered by CV, which focuses on interpreting images and videos. Convolutional neural networks (CNNs), a subset of deep learning algorithms created to analyse data with inherent spatial invariance (such as images whose meanings are unaffected by translation), have become indispensable in this area [20].

SWOT

Some of following analysis of AI in healthcare have been discussed below:

Strength

A. Access to Real-Time Data: The prompt gathering of reliable information is a crucial aspect in diagnosing and treating medical problems. Healthcare workers can use artificial intelligence to accelerate and optimise critical clinical decision-making by utilising real-time, precise data. AI produces results more quickly and realistically, which leads to better preventative measures, financial savings, and shorter patient wait times. A real-time update may enhance interactions between doctors and patients. If crucial medical data is made accessible via mobile devices, patients will be more involved in their treatments. Mobile notifications can notify medical professionals of critical changes in a patient's condition [21].

B. Accelerated Task: Healthcare practises have already seen a considerable transformation due to artificial intelligence. It now performs a variety of tasks, including making treatment recommendations, interpreting clinical information, monitoring patient histories, and scheduling appointments. Healthcare institutions may now automate more time-consuming and delicate activities thanks to technology. For instance, intelligent radiology equipment may recognise critical visual cues, expediting a thorough inquiry [22].

C. Time and Resources: Healthcare practitioners now have more time to evaluate patients and make diagnoses as AI replaces laborious human work with sophisticated algorithms and automates more crucial activities. Time is money, and AI is saving the business sector a tonne of money. Each year, the healthcare sector wastes over $200 billion. A sizable percentage of these wasteful expenditures can be attributed to administrative burdens including filing, evaluating, and settling accounts. Hours of patient information and history review are often required to determine medical necessity. Physicians can analyse hospital situations and prevent rejections with the use of new natural language processing and deep learning technologies. This offers medical staff more time to help patients and communicate with them [23].

D. Decision Making: Because AI has the ability to employ enormous volumes of data, specialties that rely on data, including radiology, pathology, ophthalmology, and others, have already embraced its usage. Additionally, the usage of AI facilitates and accelerates decision-making in the Entity Relationship Diagram, where precise, accurate, and quick decisions must be made based on data. This enhances the patient's treatment outcomes [24].

E. Precision Medicine: Precision medicine is a method of illness treatment and prevention that considers the genetic, environmental, and behavioural variability of each patient. Precision medicine can advance thanks to AI, which can improve accuracy and result prediction by mining huge amounts of clinical, social, lifestyle, genetic, and preference data [25].

AI can forecast future patients' likelihood of contracting a disease in addition to forecasting the results of present patients.

F. A unique and effective service: In robotics applications, artificial intelligence development has advanced significantly. The use of machine learning in surgery is the same. There are specialised AI surgical systems that are 100% accurate and can carry out the smallest motions. This implies that we may do complicated procedures effectively with less risks of adverse effects, blood loss, or discomfort. In a similar vein, recuperation from surgery is quicker and simpler [26].

Weakness

A. Social Variables: There are no two identical patients. Social, historical, and economic factors may have an impact on what suggestions are appropriate for a certain patient. The socioeconomic background of a patient is not taken into consideration by AI's algorithms [27].

B. Human Surveillance: Artificial intelligence (AI) in healthcare has long caused humans to worry about losing their employment. Due of the

possibility of being replaced, some people have negative attitudes towards AI-based initiatives. But this viewpoint is mostly based on an incorrect understanding of AI in all of its forms. Even if we disregard the amount of time required for AI to advance to the point where it can successfully replace healthcare professionals, the advent of AI does not indicate that jobs would become obsolete; rather, they will need to be redesigned. Although it makes an attempt to simulate the way the human brain works, a qualified doctor's skilled intelligence cannot be discounted. There's little doubt that a machine-learning system cannot replace human intuition and experience [28].

C. Chance of Inaccuracies: The diagnosis data accumulated from millions of categorised instances is what medical AI uses to make decisions. A mistake is absolutely possible when there is little information available on certain illnesses, demographics, or environmental variables. When recommending a certain medication, this is very crucial [29].

D. Security Risks: AI's vulnerability to security and data privacy breaches is one of the main issues with the field of medicine. AI systems are often vulnerable to security issues because to their reliance on data networks [30].

E. Ethical Issues: Since it was originally proposed, artificial intelligence has been the subject of ethical debate. The challenges with data privacy and security are not the key problems; rather, accountability is. The existing system demands that when incorrect judgements are made, particularly in the medical area, someone be held accountable because of the seriousness of the repercussions. Since it may be difficult to understand how an algorithm arrived at a certain result, many people view artificial intelligence (AI) as a "black box," according to academics. For algorithms employed in lower-risk applications, such as those that aren't medical and instead prioritise efficiency or improving operations, some have stated that the "black-box" problem is less of an issue [31].

4.3 Opportunity and Threats: Artificial intelligence has the power to transform healthcare and other aspects of wellbeing, but the ethical ramifications are getting more complicated. When choices directly affect people's lives and are frequently sensitive. AI may be employed to analyse imaging data from X-rays and MRIs to assist medical professionals in diagnosing disorders and formulating treatment plans. AI may be used to analyse patient data, including electronic health records, to identify patients who are most likely to experience particular illnesses. In addition to enabling healthcare organisations to more efficiently distribute resources, this may enable clinicians to act quickly before a problem worsens.AI may be used to analyse medication interaction and side effect data, as well as to forecast which drugs will be the most successful in treating specific ailments. This may hasten the process of discovering and developing novel drugs, which might ultimately result in new patient therapies. [32].

Artificial intelligence (AI) is a terrific tool for academics to make sense of enormous volumes of data and can drastically speed up administrative operations. Intricate clinical applications like diagnosis and care delivery are expected to have the most dramatic effects. Individualised treatment plans may be developed and carried out using AI using a variety of complicated datasets. Doctors won't be replaced by AI. Similar to how biochemical analyzers cannot replace laboratory scientists, doctors are unaffected by the use of AI. Instead, it will encourage redefining the role of the doctor. AI research should focus on the nature of illnesses, such as their aetiology and pathophysiology, and should advance our understanding and knowledge of biology rather than being restricted to the accuracy and sensitivity of the report. [33].According to medical experts from the UK, US, Australia, Costa Rica, and Malaysia who published their findings in the journal BMJ Global Health, the growth of artificial intelligence may potentially have a negative influence on health [34].

Conclusion

In the fields of healthcare and research, artificial intelligence (AI) technologies are being utilised or tested for a variety of tasks, including the

detection of disease, the management of chronic disorders, the provision of healthcare services, and drug development. Although AI technologies have the potential to address significant health concerns, their use may be constrained by the quality of the health data that is currently available and by its inability to fully replicate human traits like compassion.

It is the key capability driving the creation of precision medicine, which is universally acknowledged as a critically needed improvement in healthcare. Precision medicine is primarily enabled by machine learning. We anticipate that AI will eventually be able to excel in that field as well, notwithstanding the difficulties encountered in early attempts to provide diagnosis and treatment recommendations. The majority of radiology and pathology images will probably be reviewed by a machine at some point given the tremendous advancements in AI for imaging analysis. Already used for interacting with patients and recording clinical notes, speech and text recognition will become more prevalent.

The biggest issue facing AI in many healthcare sectors is not whether the technologies will be effective, but rather how to ensure their adoption in routine clinical practise. Regulators must approve AI systems before they can be widely adopted, and they also need to be integrated with EHR systems, sufficiently standardised so that similar products function similarly, taught to clinicians, paid for by public or private payer organisations, and updated over time in the field.

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