

USE OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE AND MEDICINE

DEEKSHAA KHANNA

Dept. of Computer Engineering, VIT Bhopal University, Bhopal, India

ABSTRACT

Artificial Intelligence is a field of computer science that mimic human cognitive functions. It has brought a paradigm shift in the medical field mostly due to the increase in healthcare data and rapid increase of analytical techniques [1]. In recent years AI has surpassed human performance in several medical field areas, and this is a great adoption in healthcare. Also, through the use of analytical techniques, AI has the capabilities to prevent, detect, diagnose, and treat a wide range of diseases. This research paper will discuss different types of Artificial Intelligence techniques and how AI has been used in healthcare. Also, it will provide a view of the future of Artificial Intelligence in healthcare.

INTRODUCTION

Artificial Intelligence (AI), has been playing a vital and growing role in the world in the past few decades. In fact, many people do not realize the form in which artificial intelligence can present itself in their daily life. When logging into email accounts, shopping using online platforms, requesting for car riding services, etc., all these uses artificial intelligence algorithms to improve user experience. But the most important field where AI is growing rapidly in the medical field, especially in treatment management and diagnostic [2]. This has created tension of Artificial Intelligence surpassing human tasks and ability. Several research papers have shown that in future Artificial Intelligence can support human judgment, aid in clinical decisions, and increase treatment efficiency.

In 2014, the AI sector in the United States was valued at about \$600 million, showing that it is one of the highest growth industries in the world [7]. Today, Artificial Intelligence is greatly used in many healthcare centres in the world since it has simplified the lives of patients and doctors by performing complex and important tasks in less time and at a fraction of the cost. Therefore AI has countless applications in healthcare that is, from finding links between genetic codes to driving robots used in surgery process, in fact, it is reinventing, and it has been a boon to the healthcare industry.

The growth of AI in healthcare relates to the complexities of modern medicines which requires a copious amount of information to analyse, and also there are limited numbers of clinicians to handle that need with human intelligence. Due to this, AI applications have been using advanced computing to overcome human intelligence limitations in the medical field using several techniques to assist clinicians in healthcare centres. One of the common technique is the use of expert systems that are based on rules which outlines the steps involved in transforming the inputs into actionable outputs [3].

MOTIVATION

The idea behind the success of AI in the medical field is due to the following reasons. First, AI can use sophisticated algorithms that are being used to learn various features from a large volume of healthcare data same as it being used in software engineering for various uses cases [4]. Then the obtained insights are analysed to assist in clinical practices. Also, the algorithms can be equipped with self-correcting abilities and improved learning techniques to increase their accuracy. Another motivation is that medical AI systems are implemented to hold or store information about journals, clinical paper to inform proper patient care, and medical textbooks. Therefore the systems are widely used because they assist physicians with updated medical information to address a specific patient's problem. In addition, Artificial Intelligence helps to reduce diagnostic and therapeutic errors that are common in human clinical practices. Moreover, when a medical system is implemented with AI techniques, then it collects a large volume of medical data more so from patient's population for learning purposes. The systems can also use the information to assist in making real-time inferences for health outcome and health risk alert prediction.

HEALTHCARE DATA

Artificial Intelligence algorithms are usually trained on a large volume of data that is generated from health activities such as treatment assignment, diagnosis, etc. Learning from a large dataset will enable the algorithm to learn similar groups of objects and association between subject features and outcomes of the interest. Therefore a medical dataset will contain different kinds of information such as medical notes, physical examinations, images and clinical laboratory, recordings from medical devices, and demographics. In the diagnostic stage, AI algorithms require to analyse a substantial portion of data from diagnostic imaging and genetic testing. For example, researchers Topol and Jha advised radiologists to adopt AI technologies in order to analyse diagnostic images that contain large information data effectively.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

In a medical dataset, there are two categories of data which are structured data and unstructured data. Therefore there exist different types of techniques that are used to meet healthcare requirements. Machine Learning techniques, Neural Network systems, and Modern Deep Learning techniques ensure that structured data such as genetic and imaging data is analysed [6]. It is necessary to understand that healthcare application uses Machine Learning procedures to try clustering patients' traits or infer the probability of the disease outcomes. Therefore the patient outcomes are determined Machine Learning. The commonly used type of machine learning in a clinical setting is supervised learning. It uses the physical traits of a patient with the help of dataset with healthcare information to provide a more targeted outcome. Modern Deep Learning is another type of learning that takes machine learning as the inputs and then feed it into a computerized neural network which simplifies the outcomes [8]. This is useful to clinicians, especially where there are multiple possible diagnoses, modern deep learning will narrow down to one or two outcomes.

Natural Language Processing methods are used to extract information from unstructured data, including medical journals and clinical notes. Natural Language processing procedures convert texts into readable structured data by machines, which is then analysed by Machine Learning techniques. During the diagnosis process, Natural Language Processing and the Cloud Computing [9] uses a historical database to aid in the decision-making process using relevant keywords concerning a specific disease. Therefore using these techniques, the practitioners will obtain a more accurate and efficient diagnosis for a patient hence speeding up the treatment process.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

DRUG CREATION

Every system that adapts Artificial Intelligence has an added advantage of accomplishing its task within a short period. In healthcare, analysts have been taking longer to generalize findings, but with health systems that have Machine Learning algorithms are used to decrease drug discovery times. For example, developing pharmaceuticals using clinical test methods will take clinicians and analysts many years and huge cost [5]. Therefore employing the use of AI to restore parts of the discovery process of a drug will be cheaper, quicker, and safer. However, it might not be possible to employ AI technology in all the drug discovery processes. Rather it assists with stages such as the process of discovering new compounds that can be possible drugs. Also, AI can be used to identify the application of compounds stored in the laboratory that were previously tested. For example, after the outbreak of Ebola in West Africa, Artificial Intelligence technology was used to scan accessible medicines that might be redesigned to fight the disease [10]. Two medicines were discovered within one day, yet similar analysis conducted by human intelligence takes months to years. Therefore the future of AI in drug creation is the integration of in-memory computing technology together AI platforms in order to increase the capacity to offer accelerated drug discovery and development [11].

TREATMENT DESIGN

Advanced treatment in healthcare has resulted from the adoption of AI technology, which has upgraded the treatment tactics and aiding the analysis process that provides a satisfying treatment strategy as well as monitoring treatments. Also, Artificial Intelligence has the capabilities of analysing and accurately recognizing signs and symptoms of medical images such as X-rays, CT scan, MRI, and ultrasounds. This makes there to be faster diagnostics, thereby reducing the period at which a patients waits for diagnosis from

months to hours. Also, AI has facilitated the invention of medical assistant systems such as Modernizing Medicine which gathers information about a patient, record diagnosis, aid in the testing process, and arrange billing information using the cloud computing [12]. Also, the technique of using a public database that holds information from many patient and doctor cases, assists physicians to arrive at better-personalized treatments or discover similar cases using AI technology to extract data. In future, clinicians will be required to adopt more extensive AI techniques to cater for better care design and to satisfy patients with long their long haul treatment program.

MANAGING MEDICAL DATA AND RECORDS

Data management is the vital role of Artificial Intelligence in healthcare where it is responsible for collecting or gathering, storing, normalizing, and tracing the source of the data. Compiling and investigating data are the essential steps in healthcare, therefore data management the widely used technique in Artificial Intelligence. Furthermore, healthcare data is generated in large volumes every day; this has made more data analytic tools to be implemented. These tools have helped healthcare organizations to collaborate with patients and make informed decisions on large data and storing it to reduce wastage [13]. Artificial Intelligence allows simulation of smart behaviour in a computer system, and this can increase the quality of patient care since the simulation will coordinate the experience, information and human contact of clinicians with the power of AI.

FUTURE OF ARTIFICIAL INTELLIGENCE

AI has a positive impact on doctors and patients in healthcare because of the ability to gather and analyse a large amount of medical data yielding quicker and more accurate diagnoses of a large section of the population. Therefore if there are a portion of people who are not able to access specialized healthcare, then they might achieve the advantage through Artificial Intelligence. Also, another important expectation is that healthcare expenses will continue falling due to more accurate diagnoses [14]. As AI technology is widely used in healthcare, the doctors will change the way they treat patients whereby they will broaden the possibilities to predict and treat diseases [14]. This will reduce healthcare expenses, and it will now be easier to progress medical care in rural areas where access to healthcare is limited.

CONCLUSION

Artificial Intelligence requires a large amount of healthcare data to train and learn from in order to provide more accurate clinical decision and increased treatment efficiency. There are different types of Artificial Intelligence techniques that are applied to analyse structured and unstructured data from healthcare data stores. These techniques provide a more accurate and efficient diagnosis for a patient, and the faster and more targeted the diagnosis is, the sooner a patient can recover. AI has been applied in many areas in the medical field, including managing healthcare records and data, drug creation, treatment design etc. Furthermore, AI is allowing clinicians to make more efficient and accurate decisions which in turn betters the care of a patient as a whole.

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