Review: Current Trends in Artificial Intelligence on Healthcare

Shamini Janasekaran, Anas Zeyad Yousef, Amares Singh, and Nashrah Hani Jamadon

Abstract Artificial intelligence (AI) is a technique developed for learning how to interpret data following the operation of the brain neural network sand which uses a number of knowledge layers—including equations, patterns, laws, deep learning, and cognitive computation. In the area of healthcare, the use of artificial intelligence will grow. Healthcare companies and life science organizations are now using various forms of AI. The main implementation areas include guidelines for diagnosis and treatment, patient care and adherence; these are assisted by the increasing proliferation of clinical data, which contributes to improvements of paradigms in healthcare. AI-friendly solutions can define significant raw data relationships and have implementation value in virtually all areas of medicine, including medication growth, clinical decisions, patient care, and financial and organizational decisions. Healthcare practitioners may overcome difficult problems which alone cannot be solved or which artificial intelligence takes a long time. Artificial intelligence can be a powerful asset for medical professionals, allowing them to make greater use of their capabilities and create health value.

Keywords Artificial intelligence · Healthcare · Clinical decision support · Machine learning

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1 Introduction

Artificial intelligence (AI) in healthcare has made massive advances in recent times, leading to research and discussion about the possibility of AI replacing human physicians in the future [1]. The truth is, human physicians will not be replaced, although in some practical areas of healthcare such as radiology, AI will certainly help clinicians to make informed clinical choices or even replace human decision [2]. The recent popular applications of AI in healthcare are made possible by the increasing abundance of healthcare data and the rapid growth of big data analytics tools [3]. Effective AI strategies, driven by relevant clinical questions, can uncover clinically relevant information found in an abundance of evidence, which in turn can support clinical decision-making [4]. The current situation of artificial intelligence in healthcare is discussed here, in addition to its prospects, starting with the reasons for applying artificial intelligence in healthcare to the data that are analyzed by Ai systems and the mechanisms that cause important clinical results by AI systems and the types of diseases that are treated by AI societies [5].

2 Artificial Intelligence Trends in the Healthcare

Artificial intelligence is a group of multiple technologies which are related to the healthcare field and support them widely [6]. Some of the special AI technologies of high importance for healthcare will be explained in this review paper.

2.1 Machine Learning Technology, Neural Networks, and Deep Learning

Machine learning is a mathematical methodology for data matching models and "learning" by data training models. One of the most common examples of artificial intelligence is machine learning. The center of many AI techniques is a wide-ranging technology, and there are many forms of it [7]. Precision medicine is the most common application of traditional machine learning in healthcare, where the prediction treatment protocols are effective on a patient on the basis of different patient attributes and the situation of treatment [8]. The large volumes of data for machine learning and precision medicine require a dataset of training for which the result factor is recognized; this is known as supervised learning [9]. One of the most complex types of machine learning is the neural network—the most significant application is a classification system, such as deciding if a patient is likely to have a certain disorder. Issues are seen in forms of inputs and outputs and factors or 'tools' values that bind inputs to outputs [10]. The way neurons interpret signals has been compared, but the relation to brain activity is comparatively small. Machine learning

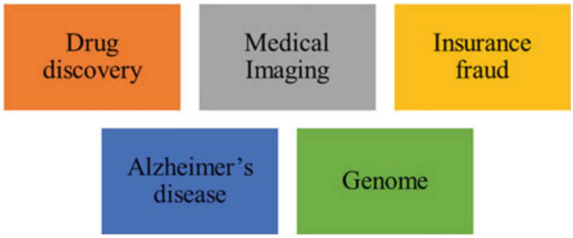

Fig. 1 Application of deep learning in healthcare [14]

requires deep learning, with several layers of functionality or variables that forecast performance, or neural network models. In such models, there could be thousands of features concealed, which are exposed by the faster processing of GPUs and cloud architectures of technology [11]. Identifying suspected precancerous lesions on radiographs is a popular use of deep learning in healthcare. In oncology-oriented image processing, radiology and profound learning are generally seen. It seems that integrating them promises greater diagnostic precision than the previous generation of automatic image processing systems [12]. For speech recognition, deep learning is often increasingly used, and as such it is a type of natural language processing (NLP). Any function as of a deep learning model typically has no significance to the human observer, unlike previous modes of statistical analysis. As a result, decoding model findings can be very difficult or impossible to understand [13]. Figure 1 shows some of the applications that need deep learning in healthcare.

2.2 Natural Language Processing

Since the 1950s, learning human language has been a target of AI researchers. This area, natural language processing (NLP), involves language-related applications such as speech recognition, text processing, translation, and other objectives. Two fundamental approaches to this are NLP and statistical semantic. Statistical NLP depends on machine learning in particular, deep learning neural networks and has related to the recent improvement in the precision of recognition. It entails a "large group" or a huge contingent of languages to learn from [15]. In healthcare, the development, interpretation, and classification of clinical records and published research are predominant applications in NLP. NLP programmers can interpret unstructured medical clinical notes, generate information [16]. From the clinical viewpoint, study trials are generally modeled and analyzed at a patient or population level, such as forecasting how a group of patients may respond over time to particular therapies or patient surveillance. Although predictions at the person or group consumer level are considered by some NLP tasks, these tasks still constitute a minority [16]. Table 1 lists some natural language processing actionable suggestions.

Table 1 Challenges and actionable suggestions on the challenges faced [17]

Challenges	Actionable suggestions
Data availability	(NLP development) synthetic note generation, alternative governance
Evolution workbenches	Extrinsic evolution (performance effects in downstream task), Automated calibration methods (where is adaption needed)
Reporting standers	Report key development and evaluation details

2.3 Physical Robots

Robots execute fully functions in environments like factories and warehouses, such as moving, repositioning, welding or assembling items, and distributing medical supplies. Robots have been friendlier with humans in recent years and can be more effectively conditioned by pushing them through the appropriate mission [18]. They are getting smarter, as their "brains" integrate other AI capabilities (in fact, their operating systems). As time goes, the intelligence from other AI fields will be implemented into physical robotics [19]. Robotic surgery offers 'superpowers' to doctors, boosts their capacity to see, makes incisions that are minimally painful and minimally invasive, stitch wounds, etc. Even so, crucial choices are always taken by surgeons. Gynecological surgery, breast surgery, and head and neck surgery are typical surgical practices that use robotic surgery [20].

2.4 Robotic Process Automation

For administrative purposes, this technology executes organized digital functions, some requiring information structures, as if they were a human user following a script or rules. These are affordable, easy to the programmer and straightforward in their behavior, relative to other types of AI [21]. The automation of robotic processes (RPA) does not actually include robots, just computer programmers on servers. To function as a semi-intelligent user of the applications, it depends on a mixture of workflow, organization rules, and 'presentation layer' integration of information systems [22]. It is used in hospitals for routine procedures such as advance consent, hospital history updating, or billing. They can be used to retrieve data from, for example, faxed images and paired with other technology such as image recognition to input it into transactional structures [23].

3 Benefits of Artificial Intelligence in Healthcare

In the medical literature, the effects of AI have been extensively questioned. In order to read the attributes and characteristics of a large volume of healthcare data, AI implements complex algorithms, thus utilizing these observations and the data collected to assist clinical practice. Based on reviews, it can be fitted with learning and self-correcting capability to increase its performance [24]. By presenting the latest medical data from journals, manuals, and professional procedures to advise effective healthcare, an AI device may support clinicians [25]. In comparison, in human clinical practice, an AI system may help to reduce diagnosis and procedure mistakes that are unavoidable [26]. In addition, the AI system collects valuable knowledge from a vast variety of patients to help draw real-time conclusions on health risks and forecast health outcomes [27]. Table 2 shows the advantages of AI in healthcare for improvement in lifestyle.

3.1 Healthcare Data

In healthcare applications, AI systems should be equipped by data created from clinical practices, such as screening, diagnosis, and assignment of treatment to learn similar sets of subjects and correlations between subject characteristics and outcomes of interest [29]. In the form of demographics, patient reports, electronic recordings from medical instruments, physical tests, clinical labs, and images, such clinical data are also included but not limited [30]. Specifically, a significant majority of the AI literature analyses evidence from medical imaging, genetic testing, and electro-diagnosis at the diagnostic level [31]. The two primary types of data are physical examination notes and clinical laboratory results. The data are distinguished as they contain significant portions of unstructured narrative texts, such as clinical reports,

Table 2 Advantages of artificial intelligence in healthcare [28]

Benefits	Description
Fast and accurate diagnostic	AI helps in integrating information such as records with operating metrics which can assist physicians
Reduce human errors	Human errors may threaten patient safety due to lack of activeness. To overcome this AI as a superhuman spell checker will assist doctors by eliminating human errors
Cost reduction	With artificial intelligence the patient can get the doctor assistance without visiting hospitals which results to reduce the cost
Virtual presence	Using a remote presence robot, doctors can easily coordinate with their staff and patient in the hospitals and assist their queries

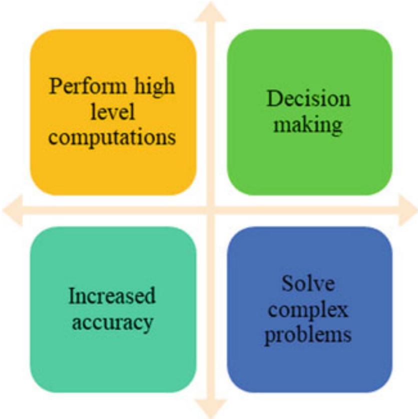

Fig. 2 Potential benefits of machine learning and AI in healthcare

which cannot be specifically analyzed, with photographs, genetics, and electrophysiology details [32]. As a result, the subsequent AI programs concentrate on first translating the unstructured document into an integrated electronic detailed medical record (EMR). For instance, artificial intelligence tools have been used to derive phenotypic characteristics from case records to increase the accuracy of diagnosing congenital abnormalities [33]. Figure 2 shows the types of AI data systems [34] where AI and machine learning can potentially benefit humans.

4 Conclusion

There are still many problems surrounding the use of artificial intelligence in the healthcare industry, including some related to safety and those related to the poor efficiency or prejudice of the healthcare sector [35]. Nevertheless, in healthcare and disease diagnostics, AI certainly carries tremendous benefits, especially in high-disease or low-resource settings. It is still a medical instrument, though and is still far from hitting a point close to how human doctors do for this sort of job which is highly dependent on empathy and connection, which is what AI lacks. In the healthcare sector, empathy is an essential instrument [36]. In comparison, AI has no capacity to develop this relationship of empathy [37]. Therefore, artificial intelligence is unlikely to replace the doctor in diagnosing diseases any time soon, and instead, it will play a supportive role by providing signals and clues that help the doctor interpret the patient's symptoms, speed up the diagnosis process, and develop an early treatment plan [38].

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