Research On How AI And Deep Learning Are Changing the Healthcare Industry

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Abstract

A wide range of fields, including medicine, have benefited greatly from advances in artificial intelligence (AI) and machine learning (ML). To put it another way, AI refers to computer systems that mimic and simulate human intellect, such as the way a person approaches problem solving or his capacity to learn. A subset of artificial intelligence, machine learning (ML) is also included. Automatically, it discovers patterns in the data. It has been a decade of incredible progress in artificial intelligence, particularly in the field of machine learning, and in particular deep learning. In the medical industry, significant resources are increasingly devoted to challenges, but disregarding disadvantaged areas and their specific context has the potential to widen the digital divide.

Keyword

artificial intelligence (AI); machine learning (ML); diagnosis; treatment; medicine

Introduction

As opposed to the intelligence of humans or other living animals, artificial intelligence (AI) refers to machines' intellect. When we talk about "intelligent agents," we're referring to anything or anybody that has the ability to observe and comprehend their environment, as well as act appropriately to maximise their chances of attaining their goals [1]. Machines that can learn and analyse like human brains are also known as artificial intelligence (AI). Machine learning (ML) is another term for this type of intelligence [2].

In 1976, a computer algorithm was used to detect the causes of acute abdominal pain, which was the first time AI was employed in medicine. 1 In the years thereafter, there have been a variety of AI-based medical applications presented. ML-based algorithms developed during the COVID-19 pandemic were a prime example of this, as they helped detect skin cancers in dermatology and diabetic retinopathy in ophthalmology2. They also improved pathology

classification, such as classifying scans in radiology or delineating electrocardiogram features in cardiology2. [3]

Human judgement and scientific evidence have always been intertwined in healthcare. Artificial intelligence (AI) advancements are bringing these two aspects closer than ever before, and the industry is suffering the effects of this. AI stands for artificial intelligence. Data-based artificial intelligence is defined as "computer systems capable of performing activities that generally require human intelligence," and it uses algorithms to learn how to accomplish jobs without being explicitly programmed. [4] As AI in healthcare proves to be a vital component in diagnosis, treatment, care delivery, outcomes, and cost, that capability is causing waves of change.

Big Data, ICT, and AI/machine learning (ML) have also had a major impact on healthcare, allowing for greater precision and speed. Helped doctors and healthcare workers with their day-to-day working and testing the effect of biomedicine on humans using simulations. Patients' medical histories, prescriptions and test results are all documented by doctors, along with other information such as X-rays, MRI scan findings and diagnostic images. [5] There is a great amount of data that may be mined for new insights into therapy, useful ideas and recommendations in diagnosis, and correlations between diseases that may lead to novel treatment procedures, among other things.

Machine Learning (ML) in healthcare

There are ML algorithms that can be employed in the treatment of stroke. The recognition of human activity and the subsequent detection of the onset of a stroke are necessary steps in the detection of a stroke. Patients' movements can be monitored, and any variation from the normal pattern should serve as a warning sign for a stroke. Wearable gadgets based on the (IoT) can also be used to gather information about patients. It is possible to use this information and its analysis to forecast the risk of stroke. [6] A Markov model can be used to acquire data and model the data, as well. Support vector machines can also be used for modelling. Because of this, it is possible to categorise patients at danger and those who are not.

To begin, let's define artificial intelligence as the process of teaching a computer or other machine to reason and make conclusions in a manner similar to that of a human being. Deep learning is a subset of AI that makes use of neural networks – computer algorithms that comprise layers of neurons and learn from input

data before generating an output based on what it has learned – to amass massive amounts of information and solve difficult problems.

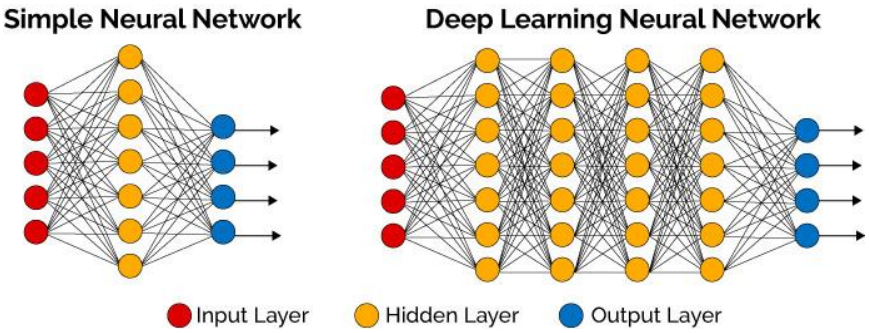


Figure 1: Deep Learning Network

Integration of AI and ML in Healthcare

One of the most well-known applications of artificial intelligence (AI) is the ability of machines to execute tasks often associated with human cognition, such as problem solving. In contrast, the usage of AI in specific areas, such as healthcare, is rather well.

Neuroimaging techniques and processes, such as MRI and CT scans, allow for the integration of many technologies. The results of these methods can be examined with the use of modern technology. One method of identifying patients at risk of stroke is through the use of support vector machines (SVM) Bayes classification may be used to detect stroke lesions, according to the results of recent investigations. 3D convolution neural networks can also be used to determine the segmentation of lesions in many brain models. [7]

Review of Literature

Healthcare in low and middle-income countries is fundamentally different from that in high-income countries, as Dr. Mitchell had advised and as we discovered personally. Due to a lack of healthcare and food insecurity, as well as a lack of stability in the economy, patients may encounter difficult medical concerns. These conditions are rarely found in more wealthy areas. Particularly in LMIC settings, many common medical diagnoses and treatments are prohibitively expensive and there are chronic shortages of medical expertise and staffing at all levels of care. Malawi, for example, had just five OBGYNs in 2011 to care for a population of 14 million people (Thorp, 2011). [8]

The use of AI-based solutions can help ensure that task-shifting is both safe and effective for patients. Targeted AI applications based on locally obtained data

could improve the individualization of treatments for each patient because many diseases are specific to low-resource settings where disease characteristics and prevalence are unique (Kaplan, 2010) [9]. In order to employ AI in these situations, governments and non-governmental organisations (NGOs) must first examine the potential uses, the risks, and the stakeholders that may be affected.

For healthcare delivery challenges, universities and (medical) technology businesses are the places to find new ideas, approaches, and strategies. Opportunities and obligations flow from having this skill set at one's disposal. In the first section of this paper, we discussed the possibilities that exist. These entities have a duty to suggest solutions that address local issues without generating unexpected consequences. In order to be considered a "global health" issue, remedies created in a lab environment or in a specific socio-economic or cultural context cannot be applied in other locations. If a method or technique that works well in the lab or in a high-income country setting is used with a significantly different patient population, additional validation and possibly supplemental training may be required, for example, algorithms for diagnosing cancerous skin lesions need to be sensitive to variations in presentations by skin colour (Bradford, 2009; [10] Kundu, 2013[11]).

Objectives

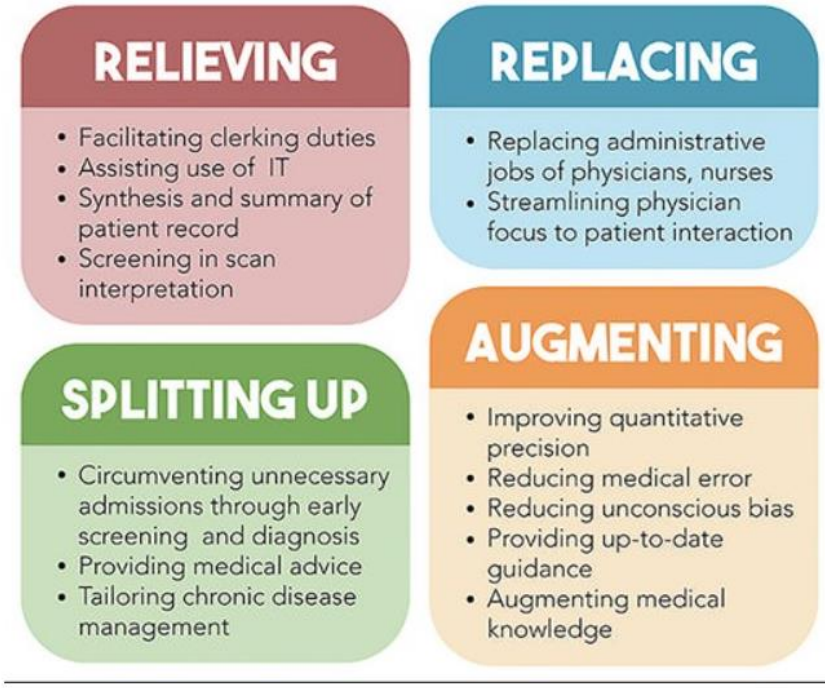
- A focus on artificial intelligence (AI) and machine learning in healthcare
- To examine the advantages of AI in healthcare.
- To investigate potential healthcare-related ML applications
- To investigate the challenges of implementing ML in healthcare.

Research Methodology

Methodology is the systematic, theoretical investigation of the procedures used in a given field of study. Theoretical analysis of a branch of knowledge's methodologies and principles is included. Parameters like paradigm, theoretical model and phases are typically included in this type of research. It is necessary to do extensive study into secondary sources in order to use analytical and descriptive methods. Secondary materials must be analysed closely in order to expand the textual analysis, which necessitated attentive study of a few secondary materials.

Result and Discussion

Relieving, splitting up, replacing, and supplementing are four ways to think about AI's impact on the workforce and healthcare, as seen in fig 2[12].



The advantages of AI in healthcare are summarised in Figure 2.

There is a plethora of medical applications for machine learning (ML). Disease classification, risk assessment, and treatment plan selection are a few examples of these uses. Fig 3 shows several ML applications in healthcare [13].

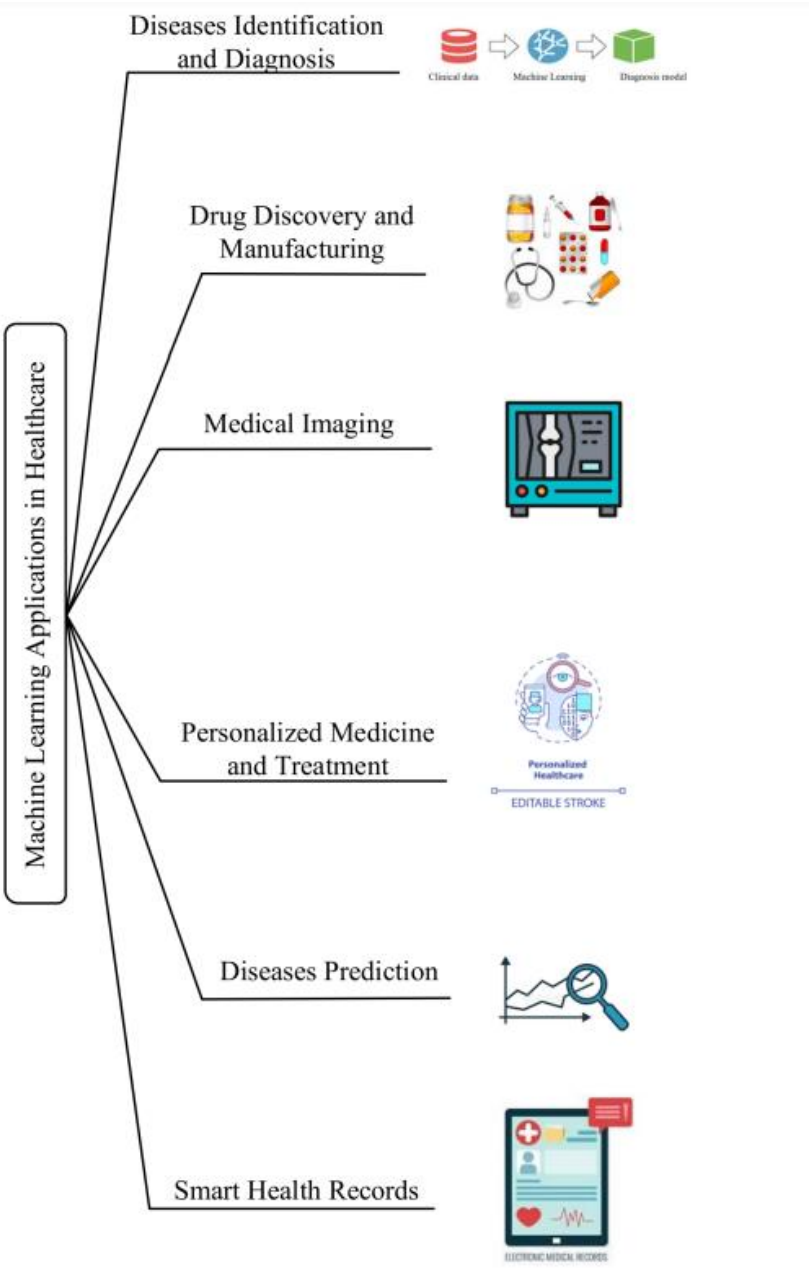


Fig. 3 shows a variety of ML-based healthcare applications.

AI and ML are proving to be difficult to employ on a large scale. The healthcare industry's use of ML-based software and technologies is hampered by a variety of issues, including poor data quality and concerns about patient safety. [14-15]

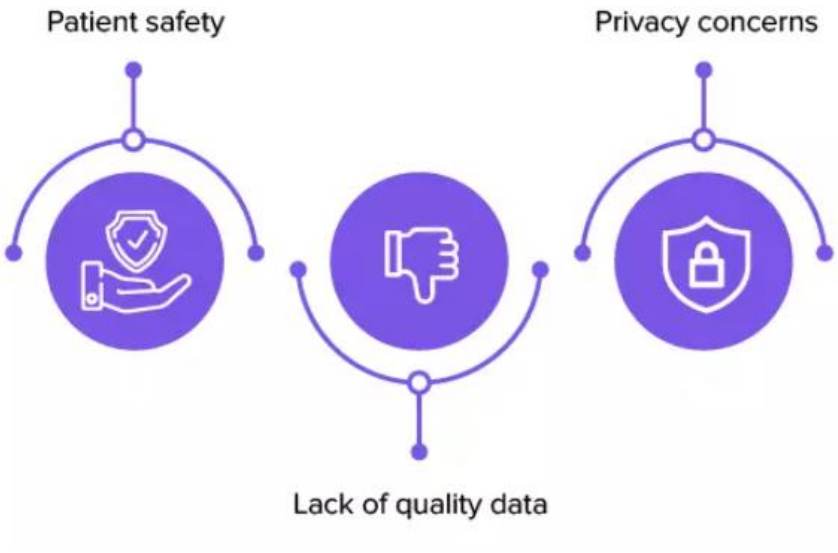


Fig. 4 illustrates the difficulties of implementing ML in healthcare.

The fact that imaging analysis utilises deep learning to its fullest extent is illustrated in fig. 5, and this makes sense given that images by their very nature are complex and rich in volume.

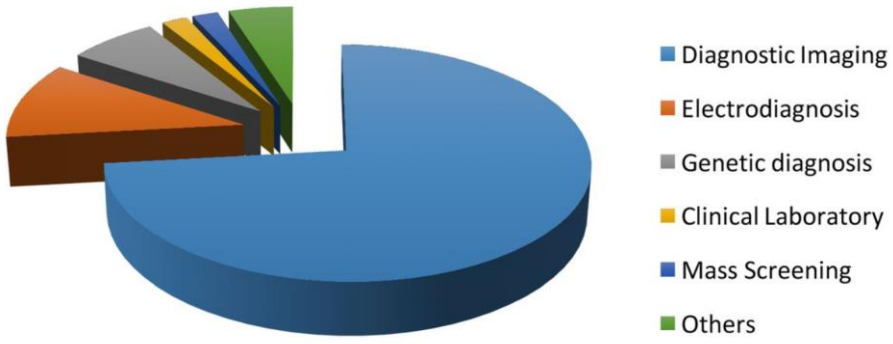


Fig. 5 depicts the many machine learning algorithms that have been applied in the medical field. Searching for machine learning algorithms in healthcare generates the data.

Conclusion

There is no doubt that AI has great promise for the healthcare industry. AI could reduce the burden on healthcare personnel and improve the quality of their work by reducing errors and boosting precision if used correctly. It has the potential to empower people to take charge of their own health and cut down on the number of trips to the hospital. As a result, present clinical guidelines

could be improved upon, as well as the scope of medical knowledge. However, there are substantial difficulties that come along with it. Adequate data is a never-ending effort that necessitates a shift in mindset toward data sharing to aid technological advancement. Clear rules and study on the capabilities and limitations of AI are required, as are clear criteria for the safe implementation and assessment of AI technology.

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