

ARTIFICIAL INTELLIGENCE IN HEALTH SECTOR

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1

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ARTIFICIAL INTELLIGENCE IN HEALTH SECTOR

ABSTRACT

Healthcare services could be significantly improved by the emerging fields of machine learning and artificial intelligence (ML/AI). Artificial intelligence simulates human intelligence and carries out intricate automated tasks using computers and machine processes. Artificial intelligence (AI)-enabled machines aim to mirror human intelligence, but they can also surpass it in several domains, most notably in efficiently sorting through massive amounts of big data to find patterns, anomalies, and trends. AI/ML techniques have been used in many areas of clinical practice, scientific research, and healthcare management. The primary categories included are palliative care, support for clinical decision-making, gastroenterology, pathology, and radiology diagnostic services, as well as screening and daily fitness monitoring. However, there are several barriers that prevent AI/ML from being widely used in healthcare. These include increased installation and maintenance costs, medical errors that could be hazardous, a lack of ethical frameworks for AI, unemployment, and a decrease in the development of human worker capability. The subject of healthcare AI/ML innovation has recently seen the creation of numerous business projects.

Keywords: Artificial Intelligence, machine learning, health, robotics.

ARTIFICIAL INTELLIGENCE IN HEALTH SECTOR

WHAT IS ARTIFICIAL INTELLIGENCE (AI)?

In simple terms, artificial intelligence (AI) is the science and engineering of creating intelligent machines by programming them to follow an algorithm or set of rules that simulate cognitive processes like learning and problem solving. Artificial intelligence (AI) systems are capable of anticipating problems or addressing them as they arise, allowing them to function in a deliberate, intelligent, and adaptable way. The strength of artificial intelligence (AI) lies in its capacity to identify patterns and relationships from vast multidimensional and multimodal datasets. For instance, AI systems have the ability to convert a patient's whole medical record into a single number that indicates a probable diagnosis. AI systems are also dynamic and autonomous, learning and changing in response to new data (Shukla 2013, Deng 2009, Quinn 2021).

ARTIFICIAL INTELLIGENCE AND HEALTHCARE

Due to its potential to harness the power of big data, gain insight, and support evidence-based clinical decision-making in order to achieve value-based care, artificial intelligence (AI) is rapidly advancing in the healthcare industry. Health leaders must be aware of the current state of AI technology and how it can be applied to enhance the effectiveness, security, and accessibility of healthcare services while facilitating the digital transformation of the industry.

Healthcare is starting to use artificial intelligence (AI) and related technologies, which are becoming more and more common in business and society. Numerous facets of patient care as well as administrative procedures in payer, provider, and pharmaceutical organizations could be revolutionized by these technologies. The "quadruple aim" of healthcare, which is to improve population health, patient and caregiver experiences, and lower the ever-increasing cost of care, presents formidable challenges to healthcare systems around the globe (Berwick 2008, Bodenheimer 2014, Feeley D). Numerous studies have already indicated that AI is capable of performing as well as or better than humans in critical healthcare tasks like disease diagnosis. Algorithms currently outperform radiologists in identifying malignant tumours and in assisting researchers with cohort construction for expensive clinical trials. However, we think it will be many years before AI completely replaces humans in broad medical process domains, for a variety of reasons. In this piece, we discuss some of the obstacles to the quick adoption of AI in healthcare as well as the potential that technology offers to automate certain parts of patient care. Artificial intelligence (AI) is the term used to describe computational technologies that mimic human intelligence-assisted systems, such as thought, deep learning, engagement, adaptation, and sensory comprehension (Secinaro 2021).

It is clear that artificial intelligence (AI) is starting to impact nearly every facet of healthcare, including real-world drug research, patient self-management of chronic illnesses at home, and clinical decision support at points of care. However, the creation and application of AI technology is difficult and expensive. AI in health organizations faces a number of obstacles that must be overcome. These difficulties consist of the following: (1) a lack of knowledge about the capabilities of various AI technologies; (2) a lack of well-defined plans for incorporating various AI technologies into the

current healthcare systems to successfully address the most urgent issues facing health organizations; (3) a shortage of personnel qualified to implement AI; (4) incompatibility of AI technologies with legacy infrastructure; and (5) lack of access to high-quality, diverse medical data for Machine Learning (ML) algorithm training. (Chen 2019, McKinsey and Company 2018)

THE EVOLUTION OF MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

The goal of artificial intelligence (AI), a broad scientific field with roots in computer science, philosophy, and mathematics, is to comprehend and create systems that exhibit intelligence-like qualities (Panch 2018).

Machine Learning

It is a branch of artificial intelligence (AI) wherein computer programs, or algorithms, are taught associations with predictive power through data examples. The simplest definition of machine learning is the computer-assisted application of statistical models to data. A wider range of statistical methods are employed in machine learning than are commonly found in medicine. More sophisticated data can be handled by more recent methods like Deep Learning because they are built on models that make fewer assumptions about the underlying data.

Deep Learning

Using deep learning techniques, a machine can be trained with vast amounts of unprocessed data and trained to find the representations required for classification or detection. Deep learning techniques rely on multiple layers of data representation, each with a series of changes that suppress irrelevant variations and amplify key components of the input for discrimination. Deep learning can be done under supervision or without it. A large number of the most important recent developments in machine learning can be attributed to deep learning techniques. (LeCun 2015)

Supervised learning

Training computer programs to analyze outputs of interest that are defined by a supervisor (usually a human) in order to discover associations between inputs and outputs in data. Future examples can be predicted using associations that have been learned from data that has already been collected. With several applications both inside and outside the healthcare industry, this is one of the most well-established fields of machine learning.

Unsupervised learning

It includes computer programs that learn associations in data without external definition of associations of interest. Unlike simply relying on known associations, unsupervised learning can find predictors that have never been found before (s30).

Learning by Reinforcement

Actions are taught by computer programs according to how well they can maximize a predetermined reward. This strategy, which draws inspiration from behavioural psychology, has been used to great effect in the gaming industry, where

there is an abundance of options, perfect data, and no real-world cost associated with failure.

AI AND DECISION MAKING IN HEALTH SYSTEMS

Like the delivery of healthcare or public health, effective management of health systems is essentially a lattice of data-processing tasks. To achieve system goals and health system outputs (public health and healthcare services), policy makers adjust the organization, finance, and resource management aspects of the health system. Two primary information processing tasks are involved in the delivery of health care: first, screening and diagnosis, which is the categorization of cases according to history, examination, and investigations; and second, treatment and monitoring, which is the organizing, carrying out, and overseeing of a multi-step procedure to produce a desired future state.

The creation, testing, and application of hypotheses are fundamental to these processes in both the management of the health system and the delivery of care. By exposing previously unnoticed trends in data, machine learning has the ability to enhance tasks related to hypothesis generation and testing within a health system. As a result, it has the potential to have a significant impact on both the system and the individual patient. (Atun 2013)

By using techniques that do not rely on presumptions about the distribution of the data, machine learning builds upon current statistical techniques (Beam 2018). It can identify patterns in the data that can be used to develop hypotheses and hypothesis tests. As a result, even though models based on machine learning are harder to understand, they can include a lot more variables, can be applied to a wider range of data types, and can generate outcomes in more challenging scenarios (Henglin 2017).

AI APPLICATIONS IN HEALTH CARE

Artificial intelligence (AI) technology is novel because it affects more psychological domains like experience, intelligence, and expert judgment than traditional technologies that deal with physical realms. Specifically, since the advent of deep learning technology, which dramatically enhanced the efficiency of machine learning algorithms for pattern recognition, the capacity of AI technology to analyze data patterns has surpassed the average human capacity for certain tasks (for example-image recognition and speech recognition) (Erickson 2017).

Deep learning algorithms are being actively used in tasks involving medical data because they are based on artificial neural networks, which mimic the network of neurons in the human brain and are capable of understanding very complex non-linear relationships (Hu 2019). As a result, several research projects examining the application of artificial intelligence (AI) based technologies in healthcare are presently underway (Table 1).

Natural language processing

Natural language processing is the automated analysis and representation of human languages, primarily in text format, using computational techniques. Lately, machine learning techniques have been integrated with natural language processing (NLP) to achieve remarkable outcomes in speech recognition, classification of text, question

answering, sentiment analysis, data extraction, and search engine optimization. A significant amount of unstructured textual data is used in healthcare in the form of prescription orders, discharge instructions, test results, lab reports, and doctor's notes. From such rich descriptive data, natural language processing techniques can be used to extract vital information about patients, enhancing diagnosis and treatment recommendations (Chen 2020).

Artificial intelligence voice technology and assistants

The most logical, instinctive, and common way for people to communicate is through voice. The way that humans and machines communicate is evolving due to artificial intelligence voice technology, which also makes it much simpler for people to access, comprehend, use, and keep health information. Voice technology is being used extensively in a number of industries, including healthcare, to help with information challenges that patients and healthcare providers may encounter. Many EHR vendors and healthcare providers are integrating voice technology into their EHR systems to streamline the clinical documentation process because the current EHR systems are complicated and difficult to use. Artificial intelligence (AI) assistants, such as Alexa, Siri, Cortana, and Google Assistant, have acquired the “skills” necessary to carry out certain mundane and easy tasks in the context of healthcare, like reminding patients when to take their medications and making appointments. These AI voice assistants are currently limited in their ability to respond to inquiries about health in a trustworthy manner. It appears that text-based chatbots like Babylon, Ada, and Buoy have been more successful commercially because they are more dependable (Bickmore 2018).

Medical Robotics

All of the previously discussed AI technologies are demonstrated by medical robots. Medical robots can support a variety of tasks, including assisted living, social interaction, surgery, and rehabilitation. AI-assisted surgical robots, which can evaluate information from preoperative health records to physically guide a surgeon's instrument in real time during a procedure, are among the most widely used medical robots. These surgical robots can be controlled remotely or locally and are widely utilized in orthopedic, laparoscopic, and neurologic procedures. Robot-assisted surgery is less invasive than traditional surgery and has the potential to lower hospital stays, complications, and errors. Also, robots have been utilized to assist the stroke patients' rehabilitation, to help with the elderly care, and to transport medical supplies and equipment. It is appropriate to assume that in the future, robots will be able to keep an eye on a patient's vital signs and respond appropriately when necessary (Crawford 2016).

CONCLUSION

Researchers and medical professionals are paying attention to artificial intelligence (AI) in the healthcare industry. The application of AI, ML, and automation processes, along with other technological innovation, has a profound impact on the pharmacy sector. India's pharmacy sector operates more efficiently thanks in part to the Smart Factory Revolution. Accurate and analytical forecasting contributed to the global expansion of

marketing. AI research and machine learning systems are able to forecast the difficult circumstances facing the pharmacy sector. It contributes to India's declining mortality rate. It is anticipated that these technologies will help medical professionals make better treatment decisions by supporting them in the process. However, there are currently a number of privacy, dependability, safety, and liability concerns with AI-based health care technologies. In addition to technical breakthroughs, raising public awareness of AI, creating uniform standards, and making methodical advancements will be necessary in the future for artificial intelligence (AI) technologies to be used more extensively in healthcare.

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Table 1: Current applications of artificial intelligence in health care(Park 2020)

Technology	Application scheme	Application area
Robotics	Provide high-quality treatment by improving the precision and accuracy of the surgical procedures.	Medical device, Health IT
Digital secretary	Find the golden hour of appropriate intervention by continuously monitoring the patient condition indicators and alerting the nurse when necessary.	Medical device, Health IT
Machine learning	Predict and analyze patterns based on the data affecting treatment results. Reduce the uncertainty in the medical treatment decision-making by processing large volumes of diagnostic medical images through self-learning.	Diagnostic medical image, Health IT
Image processing	Quickly process large amounts of medical images and apply the findings in judging the disease type and negative and positive test results.	Diagnostic medical image, Health IT
Natural language processing	Convert long unstructured text data, such as medical charts, to be easily read and interpreted.	Medical device, Health IT
Voice recognition	Capture patient voice and language and store important information in electronic medical records.	Medical device, Health IT
Statistical analysis	Predict patient treatment results through rapidly analyzing large amounts of patient health record data.	Medicine, Health IT

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