

# ARTIFICIAL INTELLIGENCE IN MEDICINE AND HEALTH CARE

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## **ABSTRACT**

Artificial intelligence (AI) has the implicit to ease the mortal coffer extremity in healthcare by easing diagnostics, decision- timber, big data analytics and administration, among others. The mortal resource extremity is widening worldwide, and it's egregious that it isn't possible to give care without pool. The pledge of artificial intelligence( AI) in health care offers substantial openings to ameliorate case and clinical platoon issues, reduce costs, and influence population health Current data generation greatly exceeds mortal cognitive capacity to effectively manage information, and AI is likely to have an important and reciprocal part to mortal cognition to support delivery of substantiated health care. In this composition we give information about the 1. Part of AI in healthcare and drug, 2. Advantages and disadvantages of AI, 3. Operations of AI, 4. Processing housekeeper of AI and benefits of AI.

**Keywords:** Artificial Intelligence, Virtual Branch, Physical Branch, Healthcare and Medicine

## INTRODUCTION

Artificial intelligence (AI) is the name given to the use of computers and other technologies to replicate intelligent behaviour and critical thinking that is comparable to that of a human being. In 1956, John McCarthy coined the term AI and defined it as the science and engineering of creating intelligent robots (11). One of the pioneers of modern computers and artificial intelligence was Alan Turing (1950). The "Turing test" was founded on the idea that an intelligent computer would be able to execute cognition-related activities at a level comparable to a human. Interest in AI increased dramatically in the 1980s and 1990s. Several clinical settings in the field of medicine have made use of artificial intelligence techniques such as fuzzy expert systems, Bayesian networks, artificial neural networks, and hybrid intelligent systems. Compared to other industries, the healthcare industry received the largest share of investments in AI research in 2016. (12, 24).

Artificial intelligence in medicine can be divided into two categories: virtual and physical. The virtual component includes tools like electronic health record systems and neural network-based treatment decision support. The physical portion focuses on robotic surgical assistants, adaptive prosthetics for the disabled, and senior care (25).

### The Virtual Branch:

Virtual and physical applications of AI are the two primary categories. Machine learning, also known as deep learning, is a representation of the virtual component and consists of mathematical algorithms that enhance learning via experience.

Three different categories of machine learning algorithms exist:

- 1) unsupervised (ability to find patterns)
- 2) Under supervision (classification and prediction algorithms based on previous examples)
- 3) Reward-based learning (use of sequences of)

### The Physical Branch:

The second type of AI use in medicine involves physical things, medical equipment, and more advanced robots that are involved in the provision of treatment. The usage of robots as helpers is perhaps the most promising strategy; an example would be a robot companion for the elderly population who are experiencing cognitive decline or limited mobility. Big data and machine learning are influencing the majority of facets of contemporary life, including entertainment, business, and healthcare. There is a lot of hope that the use of artificial intelligence (AI) would significantly advance every aspect of healthcare, from diagnosis to therapy. There is already a lot of evidence that AI systems are performing on par with humans or even better in a variety of jobs, such as evaluating medical photos or connecting the characterisation and prognosis of the disease to symptoms and biomarkers from electronic medical records (EMRs) (8).

There is a global scarcity of healthcare professionals, particularly physicians, as a result of the rising demand for healthcare services. Healthcare organisations struggle to keep up with both the rapid advancement of technology and the high standards that people have for service and results (27). The use of AI-powered technologies in the next-generation of medical technology

is becoming more and more apparent in the healthcare ecosystem. It is thought that AI can enhance any procedure used in the operation and provision of healthcare. AI-based technology will play a significant part in assisting individuals in maintaining their health through ongoing coaching and monitoring, as well as ensuring earlier diagnosis, customised treatment, and more effective follow-ups (28).

In the last ten years, the fields of AI and data science have seen a lot of technological advancements. Despite decades of ongoing research in AI for a variety of applications, the present wave of AI hype is distinct from earlier ones. The development of AI tools and technologies, including within the healthcare industry, has been made possible by a perfect trifecta of faster computer processing, greater data collection data libraries, and a vast talent pool for AI (13).

The modern way we view AI tools has been influenced, in particular, by the development of deep learning (DL), which is also the main driver of the contemporary excitement surrounding AI applications. DL makes it possible to identify relationships that were too complicated for earlier machine learning algorithms to represent. Since DL networks have more than 10 layers of connections, they have more layers of connections than prior neural networks, which only had 3-5 levels of connections. This translates to a simulation of millions of artificial neurons (14).

The deployment of autonomous robots in medical treatments, often known as robotically assisted surgery, is progressing more slowly than in the physical branch, even though many biomedical laboratories have deployed AI-controlled robotic systems in manufacturing lines. The U.S. government-approved da Vinci surgical system for minimally invasive treatments is one example of robotic surgery that still requires a surgeon to direct movement, as does a supervised autonomous robotic system for sewing an intestinal anastomosis or other autonomous robots for cochleostomy. More automated medical procedures are likely in the near future because to ongoing research on pre-programmed, image-guided, and teleoperated surgical robots.

In general, by combining the technologies and the doctors, diagnostic confidence and surgical procedures would improve consistently, leading to fewer medical errors, more optimised care trajectories for patients with chronic diseases, precision therapies for complex illnesses, and increased subject enrolment in clinical trials (15).

Throughout the past 50 years, AIM has undergone a significant evolution. Applications of AIM have grown since the development of ML and DL, opening doors for individualised care rather than algorithm-only-based therapy. In the future, preventative medicine may also utilise predictive algorithms to diagnose diseases and predict the therapy response. 7 AI has the potential to enhance clinical operations and provider workflow efficiency, enable improved disease and treatment monitoring, and enhance procedure accuracy and patient outcomes. The steady expansion of the AI platform in medicine is chronicled below and organized by specific time periods of seminal transformation (7).

Artificial intelligence is being used in medicine and healthcare to describe the application of numerous automated technologies in the diagnosis, treatment, and outcome prediction of patients who require various sorts of health services. Even though diagnosis and treatment may appear straightforward, they frequently involve substantial professional training, expertise, and

logical thought. In a nutshell, the following steps are involved in the diagnosis and treatment processes:

- Gathering patient information and conducting physical exams and laboratory tests
- Examining the data and outcomes gathered
- Making a diagnosis based on the information gathered and comparing it to knowledge and information already known
- Choosing appropriate treatment plans based on the diagnosis
- Administering the treatment plans to patients
- Keeping track of treatment responses and re-evaluating the diagnosis and treatments (19).

#### Role of AI in healthcare and medicine:

The healthcare system is quickly changing as a result of artificial intelligence (AI). Robots, big data, and artificial intelligence (AI) have altered the globe and created previously unimaginable prospects and potentials in the healthcare sector. Data and analytics are crucial to the improvement of therapies and procedures in a knowledge-intensive sector like the healthcare business. The variety of medical data that has been gathered in recent years has greatly expanded and now includes clinical, genetic, behavioural, and environmental data. Every day, a variety of devices used by healthcare providers, biological researchers, and patients generate enormous volumes of data.

Healthcare is experiencing dramatic developments brought on by AI technology that have never even been imagined. Electronic health records (EHRs), diagnosis, treatment protocol development, patient monitoring and care, personalised medicine, robotic surgery, and health system management will all be significantly impacted by medical AI technology in the future, even though the work done today cannot be entirely replaced by AI robots or technology (3).

AI in healthcare is anticipated to significantly alter how we analyse healthcare data, identify diseases, create remedies for them, and possibly even stop them from occurring entirely. Medical personnel can save time, money, and improve medical record management overall by adopting artificial intelligence in the healthcare industry to help them make better decisions based on more accurate information. AI in healthcare is poised to revolutionise the industry, paving the way for a time when patients receive high-quality care and treatment faster and more precisely than ever before, from discovering novel cancer cures to enhancing patient experiences.

Many management applications are available for AI in healthcare. Less ground-breaking than in-patient care in the medical field is AI. AI simultaneously saves time and money when it comes to running a hospital. Billing, clinical documentation, revenue cycle management, and medical record administration are all areas where artificial intelligence is used in healthcare (1).

#### Advantages of AI in healthcare and medicine:

- In order to properly diagnose and treat medical issues, accurate information must be obtained quickly. Physicians and other medical practitioners may use AI to accelerate and enhance critical therapeutic choices by using real-time, precise data.
- It is possible to produce more immediate and realistic results in order to improve preventative actions, save costs, and decrease patient wait times. Real-time analytics can help to improve

doctor-patient relationships. Important health information can be made available via mobile devices, which can increase patients' interest in their treatments.

- Mobile notifications can notify doctors and nurses of life-threatening changes in patient status and emergencies. The use of artificial intelligence in medicine has already significantly changed how healthcare is provided globally. The advancements include recording patient histories, translating clinical facts, and arranging appointments.
- Healthcare facilities are now able to automate more labour-intensive and precise tasks thanks to artificial intelligence. Other automated systems may be used to automate appointment scheduling, patient tracking, and therapy suggestions. Due to the automation of increasingly essential tasks, medical personnel have more time to examine patients and diagnose illnesses and conditions.
- Medical facilities are able to save significant production hours because to the speeding up of operations made possible by artificial intelligence (AI). Every industry understands that time is money, so AI has the potential to save a lot of money. An enormous amount of money is thought to be spent annually in the healthcare sector. These unnecessary costs are largely attributable to administrative constraints including filing, assessing, and account settlement. The process for assessing medical necessity also needs to be improved. Moreover, artificial intelligence-based early disease diagnosis has been used to analyse and categorise symptoms. The stress that doctors go through might be reduced by AI. More than half of primary care doctors report feeling pressure from deadlines and other work-related problems (4).

#### Disadvantages of AI in healthcare and medicine:

- Because of the intricate equipment designs, repairs, and upkeep that AI requires, its introduction is extremely expensive. Software programmes in the machine frequently need to be updated. Reinstalling and recovering the machine costs a significant amount of time and money. To design one AI machine, the R&D department needs a lot of time. Hence there is greater usage of money.
- No Replicating Humans - Robots with AI technology have the ability to think like humans, but without the disadvantage of having morals or feelings. As a result, they complete the activity as instructed and are unable to use judgement. It can occasionally cause serious issues. Robots are unable to make decisions when faced with unknown problems. At that point, individuals either make a fake report or experience a breakdown.
- No Improvement with Experience - AI-enabled machines are not capable of improving over time like humans do. Robots don't have feelings of worry, belonging, or community. They fail to distinguish between the hard-working and idle person.
- Machines lack emotional intelligence and sensibility, which distinguishes them from humans. Humans have the ability to hear, see, feel, and think that machines do not. Humans are creative, while machines are unable to comprehend human thought. There is no way to imitate the fundamentally human inherent abilities.
- Unemployment – If machines take the place of people in all sectors, there will be a significant increase in unemployment. Humans have a significant tendency towards reliance. As a result, people stop being creative and start being sluggish (9).

Benefits:

- The following list includes the various advantages of AI in several medical fields:
- To examine anomalies and recommend medical intervention
- To anticipate impending diseases
- Accurate and effective diagnosis
- Assistance with difficult and novel treatments
- proper patient monitoring
- balancing the patient's blood/glucose levels
- Comfort for both doctors and patients.
- Medical students need appropriate instruction.
- Increase hospital safety Gather information throughout surgery to help with future procedures
- Beneficial medical results
- Enhancing the doctor/surgeon experience will also improve medical outcomes, enhance pathology results, lower diagnostic costs, maintain clinical records, and give patients outstanding care (10).

Applications:Opportunities Involved in AI Applications in Healthcare:

The increased use of AI-based technology in the healthcare sector has created a wide range of new prospects. Below we explore a few of the significant ones.

More Improvement in Medical Care:

AI has been shown to be especially effective with a large volume of radiology data to improve the quality of care services with medical imaging, and IBM Watson's introduction marked a significant beginning of the era of data-based medical research that sparked public interest in the advantages of applications of advanced digital technologies to improve public health and patient care quality (22).

Patients as well as medical staff's job will benefit immensely if AI-based technologies can increase the precision of patient diagnoses. For instance, it is a simple procedure, but it takes a lot of time to analyse the frequency of mitosis in cancer cells using pictures or a microscope. The medical personnel will benefit from having this duty completed more quickly and accurately by AI software, which will also free up some of their time for other important activities. When more data is acquired and new medical research is published, AI-supported medical software can get smarter. This assertion is confirmed by the fact that medical software powered by AI is now more accurate in identifying illnesses than human doctors, if not outperforming them.

The ongoing study of artificial intelligence (AI) systems will significantly improve the job of medical personnel since they can notify some areas that people frequently miss or assist decrease medical blunders while treating patients.

Patient Engagement and Involvement Have Improved:

A diet app with comprehensive mobile diabetes prevention capabilities is Noom, one of the most well-known smartphone-based health coaching applications (29)

.Patients who learn about the potential for quicker and more accurate diagnoses, fewer medical errors, and lower medical costs from the media or their attending physician are more likely to

engage in the system-supported treatment process even if they are unfamiliar with AI or AI-supported medical systems. Healthcare systems should establish methods to educate and inform patients and family members about the benefits and hazards of the new systems in light of the rapid advancements in AI and AI-integrated medical systems. Customers that are well-informed will be more receptive to using AI medical systems, increasing the flexibility of their treatment options (16).

#### Improved Medical Error Reduction and Service Quality:

AI assisted colonoscopy screenings allowed doctors to find 20% more polyps than those without it. The AI-supported approach can detect early-stage or very tiny polyps (5 mm in size or smaller), which many gastroenterologists frequently overlook during colonoscopy examinations. As a result, AI systems help clinicians by assisting in the removal of troublesome tiny polyps that may result in future issues, enhancing patient care, and decreasing the likelihood of medical errors (17).

#### Improved Operational Efficiency and Reduction of Medical Cost

As mentioned above, AI-supported medical systems are capable of managing numerous diagnostic tasks without the need for human participation. For instance, an AI-integrated pill-cam can replace the time-consuming upper endoscopy procedure used to check for stomach cancer (20).

AI systems are not just for use in medicine. Certain artificial intelligence (AI) technologies are intended to enable operational innovations that add to or bring new value to the healthcare organization's value chain. When it comes to managing maintenance systems, accounting, and information enquiry, AI systems can execute basic operational tasks considerably better and faster than human personnel. The effectiveness of operational operations may be considerably increased by using AI-enabled chatbots and nursing robots (2).

### **CONCLUSION**

AI technologies are expected to bring innovations to the existing medical technologies and future health care. The currently available AI-based health care technologies have shown outstanding results in accurately diagnosing and classifying patient conditions and predicting the course of diseases by using the accumulated medical data. Accordingly, these technologies are expected to bring contributions in assisting the medical staff in the treatment decision-making and in the process improving the treatment results. However, AI-based health care technologies currently have various issues regarding privacy, reliability, safety, and liability. For the AI technologies to be more actively applied in health care, general public awareness of AI, establishment of standardized guidelines, and systematic improvements will be required in the future in addition to the technological advancements.

### **CONFLICT OF INTEREST**

The above study tells to clinicians, nurses, pharmacists, and other healthcare professionals is available AI-based health care technologies have shown outstanding results in accurately diagnosing and classifying patient conditions and predicting the course of diseases by using the accumulated medical data.

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**TABLES**

Technology	Application scheme	Application area
Robotics	By enhancing the surgical operations' accuracy and precision, high-quality care may be provided.	Medical device, Health IT
Digital secretary	By continually keeping an eye on the signs of the patient's state and notifying the nurse as needed, you can determine the ideal time for action.	Medical device, Health IT
Machine learning	Using the data influencing treatment outcomes, forecast and analyse patterns. By analysing a huge number of diagnostic medical pictures through self-learning, one may decrease the uncertainty in the decision-making process for medical therapy.	Diagnostic medical image, Health IT
Image processing	Use the findings in evaluating the illness type and both positive and negative test results after quickly processing a large number of medical photos.	Diagnostic medical image, Health IT
Natural language processing	Restructure lengthy unstructured text data, like medical charts, to make it easier to read and understand.	Medical device, Health IT
Voice recognition	Record patient speech and language, and save significant data to electronic medical records.	Medical device, Health IT
Statistical analysis	Predict patient treatment outcomes by quickly	Medical device, Health IT

	analysing a sizable volume of patient health record data.	
Big data analysis	Processing vast volumes of data held by healthcare organisations will enable the provision of individualised recommendations to patients and medicines.	Medicine, Health IT
Predictive modelling	Use mathematical models to forecast treatment results, including the onset of dangerous illnesses.	Medicine, Health IT

Table.1: Current application of AI in health care (5)

Diagnosis and case identification	Prognosis and prediction
Waveform analysis:	
Obstetrics – intrapartum monitoring	cardiovascular risk assessment
Neurology – remote monitoring of gait	Estimating the survival rate of breast cancer
Image analysis:	
Pathology – breast cancer lymph node metastasis detection	outcome forecasting for colorectal cancer
Dermatology – categorization of skin cancer, diagnosis of a fungus infection, and differentiation between benign and malignant tumours	survival forecasting for non-small cell lung cancer
Ophthalmology - the diagnosis of diabetic retinopathy and the classification of macular degeneration	Heart disease-related hospitalisation forecast
Cardiology – using remote patient monitoring, diagnose acute coronary syndrome and determine heart failure state	Predictive modelling of primary care use
Radiology - chest x-ray for the diagnosis of pneumonia and mammography	Sepsis forecasting in the emergency room, critical care unit, and throughout the hospital

Electronic health record analysis:	Prediction of infections and deaths related to central lines
Detection of sepsis in the emergency department; Prediction of inpatient diagnosis; Detection of cases of heart failure; Breast cancer symptom identification; study of ICU data to determine the patient phenotype; medical subdivisions are identified in clinical notes; Taking ICD-10 numbers off of death certificates and autopsy reports	Prediction of the course of therapy for social anxiety
Claims analysis:	Psychiatric readmission forecasting from discharge summaries

Table.2: Applications of artificial intelligence in diagnosis and prediction (23)

**FIGURE**

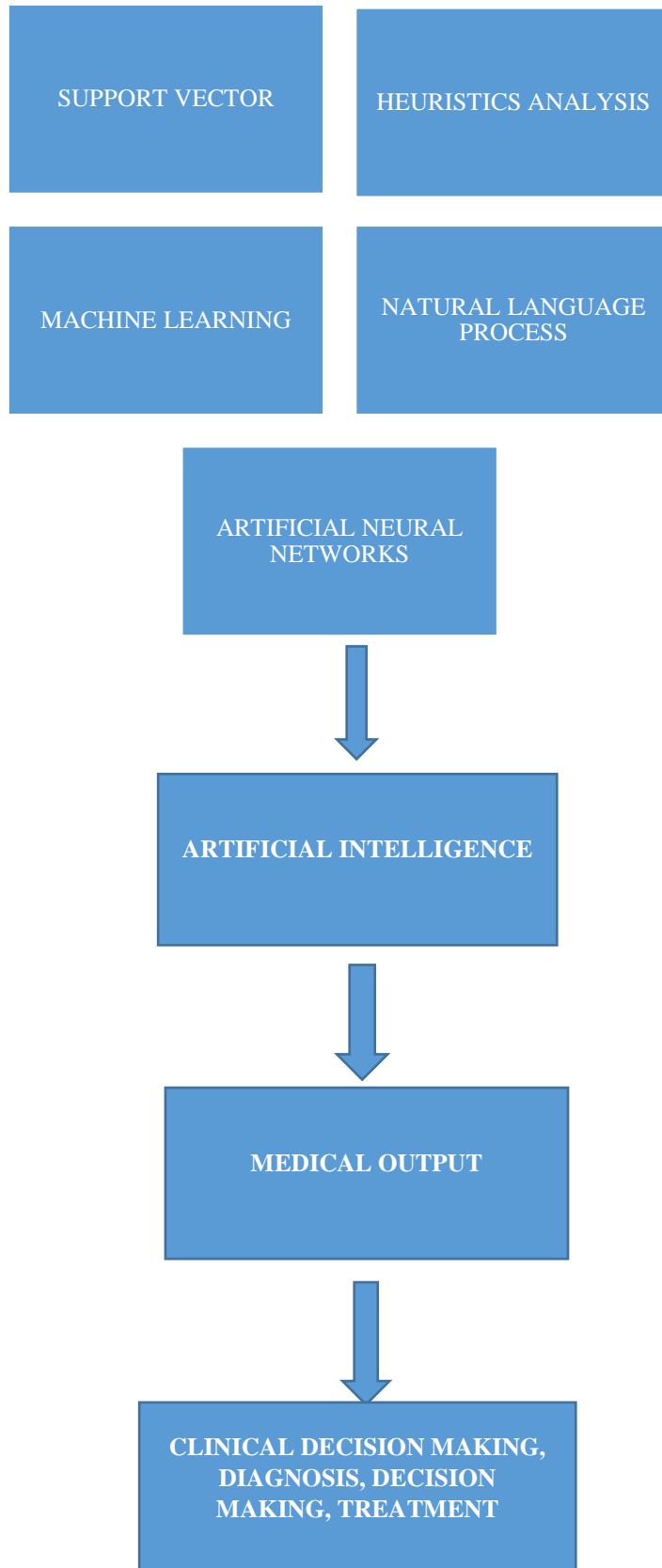


Fig. 1: Processing chart of AI (18)