

## SIGNIFICANCE OF ARTIFICIAL INTELLIGENCE AND INNOVATION IN MEDICAL INDUSTRY

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### **Abstract**

*The development of artificial intelligence (AI)-based technologies is moving at a breakneck pace, especially in the field of health. Deep neural networks, natural language processing, machine learning, robotics, and medical imaging are just few of the artificial intelligence-related fields that have seen significant advancements in the last year as part of a comprehensive research initiative. In the future years, it is anticipated that artificial intelligence will be able to take over the delivery of a significant portion of the medical services that are now carried out by doctors and administrators. AI technologies and tactics are advantageous in practically every element of behavioral and healthcare, including clinical-decision making, healthcare management, interventions, patient monitoring, research, and a variety of other domains. Within the context of the medical device and healthcare industries, this article will focus on the significance of artificial intelligence (AI).*

**Keywords:** Artificial intelligence (AI), Medical Imaging (MI), Machine Learning (ML), Deep learning (DL), Natural language processing (NLP), Medical Robotics.

### **INTRODUCTION**

The science and engineering of generating intelligent machines, in particular intelligent computer programs, is referred to as artificial intelligence (AI). AI may involve a range of approaches that rely largely on decision rules, such as machine learning, statistical methods, or expert systems. AI is characterized as the science and engineering of making intelligent machines.

Artificial intelligence (AI) software comprises of computer programs that are able to learn and make judgments in the same manner that people are able to. This technique is becoming more used in the pharmaceutical, medical device, and healthcare sectors as a tool for assisting with various phases of research and development as well as the treatment of patients.

Technology that deals with information and communication is known as information and communication technology (ICT), and it is an essential part of digital enterprises that may boost both operational efficiency and competitiveness. The current era, known as the Fourth Industrial Revolution (4IR), sees widespread adoption of cutting-edge digital technology and gadgets across all sectors in order to foster innovation and the creation of new forms of value. To improve care quality and operational performance, hospitals and other care providers around the world are rapidly adopting digital technologies such as artificial intelligence, machine learning, smart sensors, robotics, big data analytics, and the Internet of Things (IoT). This trend is especially prevalent in developing economies. A survey that was carried out by Aruba, which is a business that is owned by Hewlett-

Packard Enterprise, found that more than sixty percent of hospitals all around the globe had implemented IoT in their facilities. As a consequence of this, it is essential to investigate how modern digital gadgets are affecting the interactions that take place between patients and medical professionals in the healthcare sector. During the annual conference of the Radiological Society of North America, which took place in Chicago in December 2018, hundreds of imaging device startups and established firms presented their artificial intelligence (AI) projects. These AI initiatives encourage accurate and trustworthy diagnosis as well as appropriate care for patients based on data received from clinical tests.

In recent years, artificial intelligence has become more important in the field of healthcare. The use of AI methods in the medical field has produced excellent results. There is also a lively discussion going on around the topic of "Will AI replace Doctors in the future eventually." Nevertheless, it does not seem likely in the near future. It may assist with settling on superior clinical choices in certain areas. Medical care information and the quick development of massive data investigation instruments have aided continuing appropriate Artificial Intelligence applications in medical services. This has helped suitable Artificial Intelligence applications in medical services continue. When driven by relevant clinical queries, practical AI algorithms may be able to identify clinically important information hidden inside large volumes of data, which may aid in the process of clinical decision-making. The evolving demographics, logistical requirements, faculty shortages, and rising morbidity, as well as the advances in data innovation interest and standards, have placed an unprecedented amount of demand on medical professionals and wellness administrations.

Increasingly, it is becoming clear that artificial intelligence might have a number of applications in clinical research as well as medical treatment. At this time, governments and organizations that promote innovation are combining their efforts to invest resources in the use of AI for therapeutic advantages. The Food and Drug Administration in the United States plans to increase patient access to therapeutic devices that are assisted by AI. The organization of medical services, clinical decision help, patient follow-up, and medical care interventions are the four areas that are likely to be impacted by AI-enabled medical service delivery. The use of cutting-edge technology like cloud computing, the Internet of Things (IoT), and artificial intelligence (AI) to build a more productive, helpful, and individualized medical services framework is the definition of innovative healthcare services. It is now possible for people to take responsibility for their own health thanks to technological breakthroughs that enable continuous monitoring of health data via software on mobile phones or wearable devices. When integrated with AI, the data on a patient's health that is acquired at the patient level may be sent to physicians for further analysis and used for health screening, early disease identification, and treatment plan assurance.

The term "artificial intelligence" (AI) refers to computer programs that have the capability to carry out activities that are comparable to the processes of learning and decision-making in humans. The pharmaceutical industry, the medical device industry, and the healthcare industry are all making greater use of this technology in order to assist in the many phases of research and development, as well as the treatment of patients. AI software, and in particular software that combines machine learning, which gives the capacity to learn from data without the need for rule-based programming, may be able to speed the process of converting a molecule from its first conception to a product that is ready for sale on the market.

The process of drug discovery may take a very long time and be extremely expensive; thus, any technology that can improve the effectiveness of the process of drug development is always desired. In addition, giving businesses the ability to analyse and examine huge volumes of data collected after a product has been introduced

to the market may result in improved insight into how an innovative product functions in the real world, which in turn improves both the knowledge base and the precision of treatment options. In light of the fact that the biological, physical, and mathematical sciences are converging, the recent breakthroughs in technology can provide substantial legal and regulatory policy difficulties. This is due to the fact that the industry is heavily regulated. In the following, we will outline how artificial intelligence (AI) may contribute to the research and development of health goods, to the care and treatment of patients, and to the associated legal and regulatory challenges that surround technological developments.

The use of artificial intelligence in the medical area The potential roles these techniques might play in the delivery of healthcare and in medical research are becoming increasingly evident. A number of research have been carried out to illustrate the usefulness of AI-enabled health applications as well as their potential. These technical developments are now being matched by large expenditures in the uses of artificial intelligence (AI) in healthcare made by governments and technology corporations throughout the world. In addition, the Food and Drug Administration in the United States is actively helping to facilitate the entry of AI-enabled medical devices to the market. We believe that healthcare administration, clinical decision support, patient monitoring, and healthcare interventions are the four primary areas that stand to benefit the most from AI being integrated into the delivery of healthcare the most.

Due to the fast evolution of AI software and hardware technologies, artificial intelligence has been employed in a wide number of technical domains. These sectors include computer vision, autonomous driving, natural language processing, robotics, and the internet of things (IoT). Most notably, biomedical researchers have been actively striving to employ AI to improve analysis and patient outcomes, which would ultimately lead to an increase in the efficiency of the healthcare system as a whole. The number of publications that have been made in this area throughout the course of the last 20 years is shown in Fig.1 and ranges from 1998 to 2019. It is clear that there has been, particularly in the last five years, a surge in interest, and more expansion may be anticipated. A number of decades ago, researchers recognized the benefits that AI may bring to the field of medical [5]. According to Accenture, artificial intelligence-related technologies will be available by 2021. "AI applications could build up to \$150 billion in annual savings for US healthcare by 2026," Safavi and Kalis (estimate).

As a result of the fact that AI-assisted technologies learn and diagnose from a great quantity of medical literature and patient care data, they play a vital role in supporting medical professionals in making diagnostic judgments. According to Shiraishi et al.'s research (p.449), "AI technology has also been stated to be able to diagnose skin cancer more accurately than a trained dermatologist." It is possible to process the diagnosis more quickly and efficiently since it is based on information that was acquired from a wide body of knowledge and data. Additionally, sophisticated virtual human avatars are being employed to conduct the essential talks for the purposes of diagnosing and treating people who suffer from mental diseases.

Support for clinical decision-making "Any program designed to specifically assist in clinical decision making by matching the characteristics of particular patients to a computerized knowledge base in order to generate patient-specific assessments or recommendations for clinicians to consider," the definition of a clinical states. "Any program designed to specifically assist in clinical decision making by matching the characteristics of particular patients to a computerized knowledge base in order to generate patient-specific assessments or recommendations."

## Decision Support System

In the end, decision makers would be supplied with resources that will allow them to accomplish substantial increases in efficacy, reduce the knowledge/practice gap, and enhance safety if decision support is provided by way of an information system. Preferably, an electronic medical record would serve as the medium for providing these resources. Clinical decision support systems have been commended for their potential to increase the quality and dependability of healthcare while also reducing the number of mistakes that occur in the medical field.

Medical treatment as an intervention AI is now undergoing a revolution in the healthcare sector. AI is currently being employed in several domains of medicine, including diagnostics, customized medicine, and the pharmaceutical industry. This is causing a revolution in the healthcare industry.

In a recent study, for instance, it was shown that the efficacy of the AI system in breast cancer screening was comparable to that of a radiologist (the area under the curve was 61.4% percent greater than that of the radiologists). These days, mobile-based medical gadgets are developed largely for monitoring various bodily functions, such as the heart rate, blood glucose level, blood pressure, sleeping patterns, and brain activity. It also makes use of operations and systems that are more complicated, such as GPRS, technologies that are based on 3rd and 4th generation smart phones, GPS, and technology that is Bluetooth-based.

The application of artificial intelligence is part of early detection and diagnosis. It is put to use in a number of different ways to increase the precision, reliability, and speed with which illness, such as cancer, may be detected. For example, Google's DeepMind Health Technology makes use of AI to model the human brain by combining machine learning with an algorithm based on neuroscience. This allows the company to give diagnostic and decision-making help to healthcare practitioners. AI in medicine has the potential to improve its performance via the use of 'auto-learning' in applications that take place in the real world. Examples of applications that make use of Physical AIM include medical imaging, machine learning, deep learning, natural language processing, and medical robotics, to mention just a few of them.

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## **OBJECTIVE**

1. To The Study of AI-enabled health solutions have been demonstrated in the study to be valuable and promising.
2. To The Study of Artificial intelligence [AI] is a term used to describe a branch of science that aims to give computers the ability to perform functions.

## **MEDICAL IMAGING**

AIM is well-known for its image processing and interpretation operations, including radiological image analysis, skin lesion photography, and retinal photography. These activities are performed by imaging utilizing digital technology. In recent years, there has been a dramatic increase in the number of papers that use computer vision algorithms to assess static medical photographs. These articles now number in the thousands rather than the hundreds. Radiology, pathology, ophthalmology, and dermatology are some of the fields that have received a lot of attention recently. This is because diagnostic tasks in these specialties often include the detection of visual patterns, and there is also a growing availability of pictures that are highly structured.

In recent years, artificial intelligence has been incorporated in a variety of medical imaging-related domains of practice, including medical image denoising, dose reduction, auto-segmentation, case triage, and picture restoration. illustrates the variety of AI applications that may be used in medical imaging. An example of this method may be seen in the research conducted by Wolterink et al., in which artificial intelligence was used to predict routine-dose computed tomography (CT) pictures from low-dose CT images. Despite the fact that Wang et al. suggested an AI-based technique for calculating high-quality full-dose positron emission tomography from low-dose photos, the method has not yet been implemented. It is possible that the use of AI techniques to lower radiation exposure while maintaining the quality of medical imaging will result in a lower overall radiation exposure. However, there are drawbacks that must be taken into consideration, such as visual distortion. Images obtained from medical procedures such as x-ray, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound tests are among the most fascinating types of data because they include a great deal of clinical and scientific information.

To mimic human cognition in the analysis, presentation, and comprehension of complex medical and health care data, or to exceed human capabilities by providing new ways to diagnose, treat, or prevent disease, artificial intelligence in healthcare is an umbrella term that describes the use of machine-learning algorithms and software, also known as artificial intelligence (AI). To be more specific, artificial intelligence (AI) refers to the capacity of computer algorithms to draw approximations of conclusions based purely on the facts that they are given.

The analysis of correlations between clinical data and patient outcomes is the major goal of AI applications that are used in the health care industry. Diagnostics, the creation of treatment protocols, the discovery of new drugs, the development of customized medicine, as well as patient monitoring and care, are all areas of practice that make use of AI systems. The capacity of AI technology to collect data that is greater in scale and more varied in nature, to analyze that data, and to generate an output that is clearly defined for the end-user is what sets it apart from conventional healthcare technologies.

AI does this via the use of algorithms for machine learning and deep learning. It is especially interesting to consider the possibility that AI may assist with the triage and interpretation of conventional radiographs (X-ray photographs), given that radiographs are the imaging test that is performed the most often in the majority of radiology departments. These procedures are able to identify recurring patterns in behavior and generate their own reasoning. For machine learning models to be able to provide relevant insights and predictions, they need to undergo prolonged training utilizing vast volumes of data.

AI algorithms behave differently from humans in two ways:

- Because algorithms are quite literal; once a goal has been established, the algorithm can only learn from the data that is inputted into it, and it can only comprehend what it has been programmed to accomplish.
- Intelligence and other deep learning algorithms are black boxes; these algorithms may make very accurate predictions, but they give very little to no explanation of the rationale behind their judgments, other than the data and the kind of algorithm that was utilized.

Use of artificial intelligence in medical care In addition to radiology, other medical specialties that make extensive use of photos, such as anatomy, dermatology, cardiology, gastroenterology, and ophthalmology, have also begun to use medical image processing in large numbers. Detailed medical image analyzers make use of computed tomography, magnetic resonance imaging, ultrasound, pathology images, fundus images, and endoscopic data [54] in order to diagnose or categorize the severity of the illness. The utilization of large amounts of data to monitor diseases and manage hospitals guarantees that the end product will be of high quality. By employing a number of different machine learning libraries (MLlib), Spark is able to extract valuable insights and information from vast volumes of medical data that have been given by a wide range of sources. The development of intelligent healthcare apps that can make accurate diagnosis and treatment choices for patients will be made possible by the use of recent developments in the field of machine learning (ML). The patient's medical history is compiled using big data analysis methods.

## CONCLUSION:

The preceding essay demonstrated that artificial intelligence is the most beneficial in the field of healthcare since it enhances the efficiency with which patients are cared for. It goes above and beyond to take care of its consumers and is always working to improve the quality of the services it offers. It helps lessen the amount of effort and time that the doctors have to put in. The death toll is another statistic that may be lowered with the aid of AI. It has been observed that there has been a rise in the number of newly discovered illnesses; hence, it may be useful to reduce the likelihood of newly discovered diseases and may assist doctors in considering how to reduce the transmission of diseases. AI tools have the potential to be of great assistance in enhancing both the practices already used in healthcare and the challenges that medical professionals and nurses confront when caring for patients. AI is able to assist in the production of technical reports in hospitals since hospitals have enormous amounts of data gathered in the papers. It is able to make use of computers to execute complicated data in a shorter amount of time and at a lower cost. Additionally, it is useful in robotic services and medical care.

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