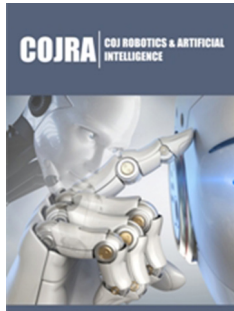


Transforming Perspective in Healthcare with Artificial Intelligence and Robotics

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Abstract

Artificial Intelligence (AI) has the potential to completely change health care. AI is becoming more sophisticated at doing what humans do, but more efficiently, faster, and for less money. AI is made powerful by combining AI algorithms with machine learning and deep learning algorithms, as well as high-speed processors. In healthcare, both AI and robotics have immense potential. AI and robotics are becoming a component of our healthcare ecosystem, just as they are in our daily lives. The phrases “artificial intelligence” and “robotics” are often misunderstood. Artificial intelligence and robotics, on the other hand, are not the same thing. AI and robotics are two distinct domains of science and engineering that can be merged to create an artificially intelligent robot, with AI serving as the brain and robotics serving as the body. Robotics is a branch of engineering and technology concerned with the design and operation of robots. Robots are machines that have been programmed to complete a task on their own. Sensors on robots allow them to communicate with external reality.

They have the flexibility to shift and are designed to complete a certain mission. In robotics and AI combination, AI is the robot’s brain, and robotics is the robot’s body. This means that by combining artificial intelligence and robotics, robots can think, act, and solve issues in the same way as humans do. In the healthcare industry, artificial intelligence and robotics are now commonplace. They are involved in a variety of aspects of the healthcare industry. AI and robotics can assist speed up medicine roll-out dates and improve hospital operations in a variety of ways, from patient care to drug production and clinical research. AI and robotics are revolutionizing the healthcare industry in various ways. The purpose of this study is to discuss how AI and robotics can work together to see the change in healthcare. It also looks into the effects of AI in the field of health care, such as virtual medical assistants, automated image diagnostics, personal health companions, cancer, cardiology, radiology, and AI-powered chatbots. Different perspectives are highlighted and discussed here to solve the real problems and to serve society.

Keywords: Healthcare; Robotics; Artificial Intelligence; Diagnosis; Training

Introduction

The new era for healthcare

Big data and Machine learning have an impact on nearly every facet of modern society, including amusement, economics, and medicine. Netflix understands what movies and shows people want to watch, amazon understands when or where they want to shop, and Apparently know which disorders and scenarios users are searching for. In the evolution of new technologies, Artificial Intelligence (AI) is a prominent research area [1]. Artificial Intelligence (AI) is undeniably becoming more prevalent in health and medicine. It’s thanks to advances in learning algorithms, which are becoming more precise and accurate by the day. Second, as processing power and numerous processor technologies have improved, AI has grown considerably more powerful. Finally, having access to a big amount of data combined with limitless cloud storage is a significant feature that supports in the development of various AI systems. This information is used to increase the learning algorithms’ accuracy. The algorithms work in conjunction with the training data to provide novel screening and therapeutic insights. As a result, it improves the results of patients [2]. AI will improve patient

outcomes by 30% to 40% while cutting treatment costs by 50%, according to Frost and Sullivan [3]. According to estimates, the AI health care market is expected to grow by 40% by 2021, reaching \$6.6 billion [4].

Over the last decade, there has been a surge in research on the ethics of robots, particularly as it relates to healthcare. Robots have the potential to support and aid humans in a range of situations, including homes [5,6], businesses [7,8] schools [9], and more, thanks to recent advances in artificial intelligence and machine learning (AI). In 1985, a robotic arm connected up with a Computerized Tomography (CT) scanner was utilized for a CT-guided brain tumor biopsy [10], which was the first reported usage of a robot-assisted surgical procedure. Since then, technology has advanced at a breakneck pace, enhancing robot capabilities. Nonsurgical robots are utilized to assist healthcare staff such as nurses, caretakers, and therapists, according to this study research. Robots have been classified into five categories in this paper: hospital, Training, research, End of Life care, Treatment, making decisions, diagnosis, and early detection [11]. The most recent work, both for commercially accessible and research robots is presented and analyzed for each category of the robot. The objective of this section is to highlight the efficacy of currently existing healthcare robots, explore the obstacles they confront and speculate on the future of robotics technologies in healthcare [12].

The article [13] opens by stating a piece of really useful information: it is anticipated that with the assistance of digitalization, medical knowledge would quadruple every 73 days. It also emphasizes how a human's ability to absorb new information may be limited, and that the only option would be to rely on digital technology. The process of tailored digital diagnosis of a patient is expected to become much more efficient with the implementation of real analysis, molecular information from next-generation sequencing, data gathered from various apps, and digital trials. AI is currently being used extensively in the healthcare industry to reduce the likelihood of incorrect lab test findings, cut medical transcribing costs, and enhance physician efficiency. The use of robotic procedures results in a faster stay in the hospital, less blood loss, and more accurate prediction of patient fatality rates [14]. Artificial Intelligence's [15,16] acceptance in the healthcare sector has been so beneficial that it has produced a subtle conflict regarding it surpassing human abilities to treat without the help of technology. AI has proven to be far more efficient than we had anticipated, thanks to self-correcting and self-developing algorithms that can hold data for vast groups of people with few errors [17,18]. When it comes to drug development, applying Machine Learning algorithms is predicted to reduce the time it takes to find a specific medicine. It'd also be less expensive and more secure. AI has also aided in the advancement of therapy approaches. AI has proven to be far more efficient than human analysis in evaluating and accurately diagnosing symptoms of medical imaging such as X-rays, CT scans, MRIs, and ultrasounds [19]. The management of data is a major concern with AI. To tackle this problem, several computer techniques including cloud computing are utilized to make the data

transparent. As stated in the article, medical costs will decrease significantly in the coming years as a result of improved diagnosis [20,21].

For decades, Artificial Intelligence has played an important role in our daily lives [22]. We employ AI algorithms to increase the efficiency of our work in nearly every aspect of our lives. Many articles and research studies have demonstrated how Artificial Intelligence has supported human judgment in clinical judgments and improved treatment efficiency. Artificial Intelligence has eased medical procedures by doing complex tasks in a fraction of the time and at a fraction of the expense. The massive data analyzing tools have aided medical professionals in dealing with patients efficiently by allowing them to make the best possible decisions while saving time and money. Analyzing procedures like as X-ray images, CT scans, and MRI scans may be completed in half the time and with higher efficiency with both the help of robots. Clinical trials often take ten years to identify a new medicine. Drugs that are far cheaper and safer than those discovered manually can now be discovered in days with the help of AI [23].

Gadgets for healthcare management are currently popular. They aid in the monitoring of common health indices such as diabetes, heart rate, and blood oxygen. Healthcare bots also are available through apps for limited health help [24,25]. Even though AI robots are anticipated to accomplish duties without errors in theory, there have been significant drawbacks when compared to a person with a degree in medicine. However, no negative of AI systems can outweigh these benefits [26,27]:

A. It's almost unthinkable to expect medical experts to always be up to date on the latest scientific developments without any technological assistance. The implementation of machine learning into the healthcare sector would aid doctors and nurses in the treatment plan that has been drawn up.

B. The treatment performed will be painless and relatively inexpensive.

C. Given the ongoing updating and revision of algorithms created by professionals, the chances of therapy going wrong and being lethal are quite slim.

D. In the unavailability of physicians, chatbots play a significant role in primary care. Chatbots have proven to be effective in telemedicine, patient engagement, and mental health difficulties, despite the fact that they cannot totally replace a human with a medical degree.

E. When it comes to insurance claims and financial concerns, AI technology can be used to replace humans in medical departments. Multiple databases can be cross-checked using specially created software and double-check them. These also can be programmed to compute payments with no need for human intervention.

F. AI can treat patients significantly more accurately and consistently than a human doctor if it is outfitted with an effective algorithm and working technique.

G. With the constant environmental degradation in mind, AI technology can be utilized to predict potential health problems.

H. Patients can receive round-the-clock medical care both before and after surgery. They won't even have to schedule or book appointments manually. It will be a part of the system designed, from diet charts to drug reminders.

I. The discovery and development of critical data in clinical data will assist medical care specialists in making appropriate clinical decisions and improving patient satisfaction in a variety of patients.

J. Because of AI's ability to gather and process massive amounts of data, as well as its growing use by clinics, research centers, medication companies, and other medical care institutions, the socio-economic condition of the healthcare industry is expected to improve dramatically.

K. Here all the benefits of AI and Robotics are discussed in the article further goes into detail about areas where the collaboration of AI with Robotics will take it to a higher level.

Collaboration of AI with Robotics

Keeping well

One of AI's most important positive advantages is that it can help people stay healthy so they don't need to see a doctor as frequently, if at all. Consumers of health apps are already benefiting from the use of AI and the Internet of Medical Things (IoMT). Individuals are urged to develop healthier habits by employing technology tools and apps that help them maintain a healthy lifestyle on a proactive basis. It allows customers to take charge of their own health and well-being. Additionally, AI helps healthcare providers better understand the day-to-day trends and needs of the people they serve for, enabling them to provide more analysis, direction, and assistance to help people remain healthy.

Early detection

AI is already used to more precisely detect diseases, including cancer, in their early stages. As per the American Cancer Society, a significant number of mammograms provide false results, resulting in one in every two healthy women being treated for cancer. Mammograms may now be examined and interpreted 30 times faster and with 99 percent accuracy thanks to artificial intelligence, reducing the need for unnecessary biopsies. Consumer wearables and other diagnostic implants are being used in conjunction with AI to identify and detect possible life episodes in patients with early-stage heart disease, allowing physicians and other caregivers to better monitor and detect possible life occurrences at an earlier, more highly treatable stage.

Decision making

By connecting vast health data with appropriate and timely judgments, predictive analytics can aid clinical decision-making and actions, as well as priorities administrative processes, to improve treatment. QFD is a strong decision making and prioritization tool

that has been used extensively in varied fields. The use of QFD in the form of software tool to prioritize customer and technical requirements have been demonstrated by [28,29,30]. The use of Data Mining along with QFD can also prove effective in forecasting the dynamic requirements which may lead to improved decision making. [31,32] have illustrated use of Data Mining techniques of forecasting. This concept can prove to be promising technique to aid clinical decision-making and actions. The use of pattern recognition to identify patients at risk of getting a disorder – or seeing one worsen – as a result of behavioral, environmental, genomic, or other factors is another area where AI is beginning to take root in healthcare.

Diagnosis

IBM's Watson for Health allows healthcare organizations to employ cognitive technology to unlock large amounts of health data and make more precise diagnoses. Watson can review and store significantly more medical data than any human, including every medical publication, symptom, and case study of therapy and reaction from around the world. DeepMind Health, a division of Google, is collaborating with clinicians, academics, and patients to solve real-world healthcare issues. The technique combines machine learning and systems neuroscience to create neural networks that imitate the human brain and incorporate sophisticated general-purpose learning algorithms.

Treatment

AI can help clinicians take a more comprehensive approach to disease management, better coordinate care plans, and help patients better manage and comply with their long-term treatment programs, in addition to scanning health records to help providers identify chronically ill individuals who may be at risk of an adverse episode. For more than 30 years, robots have been employed in medicine. They range in complexity from small laboratory robots to very complicated surgical robots that may assist a human surgeon or do surgeries on their own. They're utilized in hospitals and labs for repetitive work, rehabilitation, physical therapy, and support for those with long-term problems, in addition to surgery.

End of care

People are growing older than earlier centuries, and as we face death, we are dying in a new and lengthier way, from diseases like dementia, heart failure, and osteoporosis. It's also a time when loneliness is a common occurrence. Robots have the potential to transform end-of-life care by allowing patients to stay independent for extended periods of time, decreasing the need for hospitalisation and care facilities. AI, paired with developments in humanoid design, is allowing robots to go even further; allowing them to hold 'conversations' and other social interactions with people in order to keep ageing minds sharp.

Research

The distance between the research facility and the sufferer is considerable and costly. A medicine takes an average of 12 years to get from the research lab to the patient, according to the

California Biomedical Research Association. Only five out of every 5,000 medications that start in preclinical testing make it to human testing, and only one of those five gets authorized for human use.

Furthermore, a new drug costs an average of \$359 million to develop from the laboratory to that same patients (Figure 1).

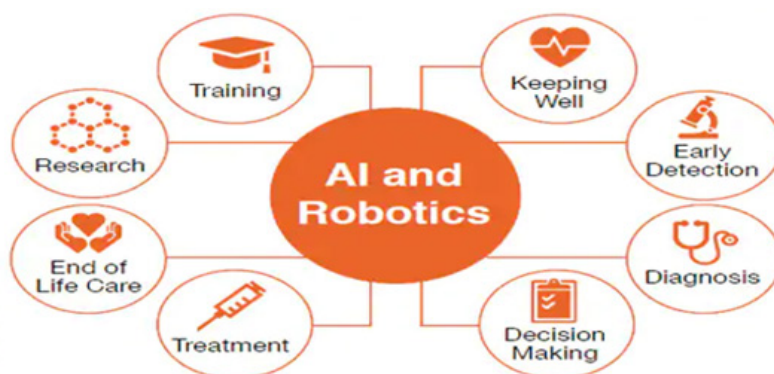


Figure 1: Different change of Perspectives using AI and Robotics.

Training

AI allows those training to go through realistic scenarios in a way that basic computer-driven algorithms cannot. Because an AI computer can quickly draw from a huge database of scenarios, a trainee's response to questions, judgments, or suggestions might question in areas that a person cannot. In addition, the training software can adjust to the trainee's previous responses, enabling the difficulties to be changed on a regular basis to meet their learning needs. These eight examples are discussed here to show how the perspective in healthcare is transforming day by day with the use of AI and Robotics.

Conclusion

Artificial intelligence adoption in the realm of healthcare will be transformative, especially in a densely populated developing country like India. With the use of technology, the most difficult matter of providing basic minimal health care to each and every citizen may now be readily answered. It is critical to assure reliable performance and customizability, as well as foresee the social impact, in order to ensure seamless integration of robots in healthcare settings. We've selected eight examples to show how this transformation is now taking place. When all hospitals and medical facilities incorporate this technology into their daily operations, it will benefit both patients and doctors. Medical services would then be available to practically everyone and would be significantly less expensive. AI could revolutionize not only treatment, but the entire diagnostic, treatment, and follow-up process. The full implementation of Ai with robotics will be a protracted process with a number of downsides. Customizable robots will be required to do a wide range of activities in novel environments and while collaborating with a diverse range of people, including those who are uncomfortable with their presence. We still don't know how patients will react to a therapy technique that involves essentially no human involvement.

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