CHAPTER-19

USES OF AI SYSTEMS IN HEALTHCARE INDUSTRY

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Chapter ID: NSP/ICAAR-2023/A-19

ABSTRACT

Artificial Intelligence (AI) is increasingly being used in healthcare industry to improve patient outcomes, reduce costs, and streamline processes. AI-powered applications can analyze large amounts of data to help with clinical decision-making, improve diagnosis, and personalize treatments. Some of the key applications of AI in healthcare industry include image analysis, natural language processing, predictive analytics, etc. AI has the potential to revolutionize healthcare industry in many ways, including improving patient outcomes, reducing costs, and increasing access to care. However, there are also challenges to overcome, such as data privacy and security, regulatory issues, and ethical concerns. It will be important for healthcare organizations to work with AI developers and other stakeholders to ensure that AI is used ethically and responsibly in healthcare industry. Artificial Intelligence (AI) is transforming the healthcare industry by enabling faster and more accurate diagnosis, improving patient outcomes, and increasing operational efficiency. AI-powered robotic assistants are also being used in healthcare industry to perform routine tasks such as taking vitals and collecting samples, freeing up healthcare professionals to focus on more complex tasks.

Keywords: *Clinical decision-making, image analysis, natural language processing, robotic assistants.*

INTRODUCTION

AI in layman's language refers to the use of computer algorithms and machine learning techniques to enable machines to perform tasks that typically require human intelligence, such as recognizing patterns, making predictions, and decision making. In the context of healthcare, AI can help improve patient care, diagnosis, and treatment outcomes by analyzing vast amounts of medical data and providing insights to healthcare professionals. Examples of AI applications in healthcare include predictive models for diseases, personalized treatment plans, medical imaging analysis, and drug discovery and development. Overall, AI in layman's terms refers to the use of technology to mimic human intelligence and improve the efficiency and effectiveness of various processes. AI-powered virtual assistants are also being used to enhance patient engagement, provide medical advice, and automate administrative tasks. Moreover, AI is playing a crucial role in drug discovery and development by enabling the identification of potential drug targets, predicting drug efficacy and toxicity, and optimizing clinical trial designs. These advancements have the potential to revolutionize the healthcare industry by making healthcare more efficient, cost-effective, and accessible to all.

Doctors don't have to learn by heart almost as much more data as they did 50 years before. Digital technology has liberated medical doctors, nurses and researchers to focus further mental energy

on higher-level cognitive tasks and patient concern. AI is ready to obtain this to the next stage. "Thinking" time was spent getting into a position to think, to build a decision, to study something. Much more time went into discovering or acquiring information than into digesting it. More than a few hours of calculating were required to obtain the data into comparable form. When they were in comparable form, it took only an only some seconds to decide. From chronic diseases, like cancer, to radiology, AI is being leveraged to deploy efficient and precise inventions that will help take care of patients suffering from these diseases and hopefully find a cure for them. AI provides several advantages over traditional methods of analytics and making clinical decisions. AI algorithms make the systems more precise as they get the opportunity to understand training data, which furthers helps humans get unprecedented insights into treatment variability, care processes, diagnostics, and patient results.

EvolutionofAI in Healthcare

The phrase "artificial intelligence" was first coined in a Dartmouth College conference proposal in 1955. But the AI applications did not enter the healthcare field until the early 1970s when research produced MYCIN, an AI program that helped identify blood infections treatments. The proliferation of AI research continued, and in 1979 the American Association for Artificial Intelligence was formed (currently the Association for the Advancement of Artificial Intelligence, AAAI).

Throughout the 1980s and 1990s, the design of new AI systems helped achieve medical advancements such as:

- Producing faster data collection and processing
- Assisting in more precise surgical procedures
- More comprehensive implementation of electronic health records

Artificial Intelligence (AI) is prevalent in business and is now applied in healthcare. The rise of healthcare data implies the increasing use of Artificial Intelligence (AI). The key areas where Artificial Intelligence is being applied are early disease diagnosis, drug design process, drug trials, diabetic retinopathy, cancer treatments, cardiovascular disease, and eye care.

Artificial Intelligence (AI) holds great promise for improving the delivery of healthcare and medicine worldwide, but only if ethics and human rights are put at the heart of its design, deployment, and use, according to new WHO guidance published today. The report, Ethics and governance of artificial intelligence for health, is the result of 2 years of consultations held by a panel of international experts appointed by WHO.

"Like all new technology, artificial intelligence holds enormous potential for improving the health of millions of people around the world, but like all technology it can also be misused and cause harm," said DrTedrosAdhanomGhebreyesus, WHO Director-General. "This important new report provides a valuable guide for countries on how to maximize the benefits of AI, while minimizing its risks and avoiding its pitfalls."

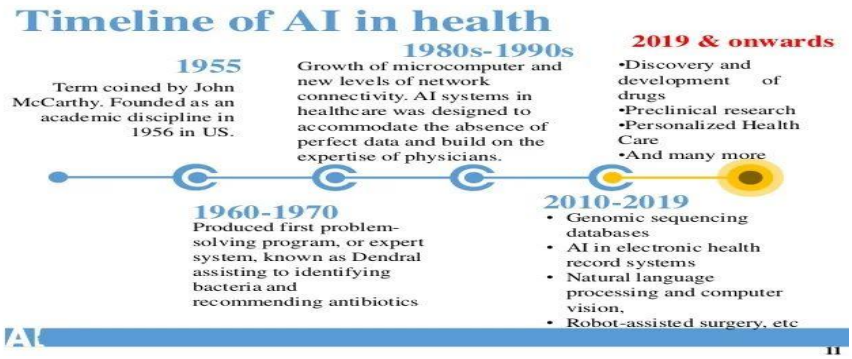

FIG.1: AI in healthcare till now

PRESENT SCENARIO

In 2021, the AI in healthcare market was worth over 11 billion U.S. dollars worldwide, with a forecast for the market to reach around 188 billion U.S. dollars by 2030. Furthermore, as of 2021, around a fifth of healthcare organizations worldwide were in early-stage initiatives of using artificial intelligence in their organizations. While a further quarter of hospitals and health systems reported to be in the pilot stage of rolling out artificial intelligence and machine learning technologies. The most common types of AI software in use in healthcare worldwide in 2021 was healthcare data integration and natural language processing.

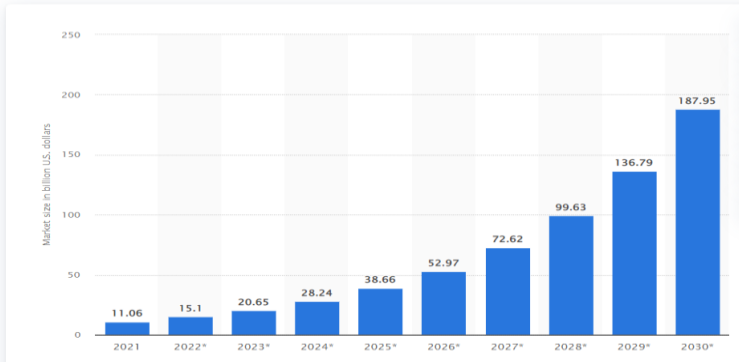

FIG.2: Graphical representation of growth of AI in medical

Applications of Artificial Intelligence in Health Care

1. **Managing Medical Records and Data**

Managing data and records in healthcare is critical for providing quality patient care, ensuring compliance with regulatory requirements, and making informed decisions about patient treatment and outcomes**.**

- **Data Analysis:** AI algorithms can analyze vast amounts of healthcare data to identify patterns and insights that would be difficult for humans to detect. This can help healthcare providers make more informed decisions about patient care and treatment.
- **Predictive Analytics:** AI can help predict patient outcomes and identify patients who are at high risk of developing certain conditions. This can help healthcare providers proactively manage patient care and reduce the likelihood of adverse events.

- **Natural Language Processing (NLP):** NLP can be used to extract meaningful information from unstructured data sources such as physician notes, medical literature, and social media. This can help healthcare providers identify trends and insights that may not be apparent from structured data sources.
- **Patient Monitoring:** AI can be used to monitor patient vital signs and detect changes that may indicate a need for medical intervention. This can help healthcare providers respond quickly to changes in patient health and improve patient outcomes.
- **Medical Imaging:** AI can analyze medical images such as X-rays, CT scans, and MRIs to help healthcare providers detect abnormalities and diagnose conditions. This can help improve the accuracy and speed of diagnosis, leading to better patient outcomes.

2. Treatment Design

Artificial Intelligence (AI) has the potential to transform healthcare treatment design by providing personalized and precise treatment plans to patients. Here are some ways AI can be used in treatment design:

- **Clinical Decision Support:** AI-powered decision support systems can provide healthcare providers with real-time recommendations for treatment options based on patient data and medical history. This can help healthcare providers make more informed decisions and improve patient outcomes.
- **Drug Discovery:** AI can help identify new drugs and treatments by analyzing large amounts of data and identifying potential drug candidates. This can accelerate the drug discovery process and lead to the development of new treatments for previously untreatable conditions.

  Overall, AI has the potential to transform healthcare treatment design by providing more personalized and precise treatments to patients, improving outcomes, and reducing costs. However, it is important to ensure that these AI-powered systems are developed and implemented in an ethical and responsible manner to protect patient privacy and safety.

3. Surgery

AI does not eliminate surgical issues, but it can potentially reduce them while enhancing outcomes for patients and surgeons alike. This is illustrated in the following examples

A startup called Theator recently raised $39.5 million in a series a funding round. The company has an AI video solution built to help surgeons see what went wrong and right during procedures. They can then study the footage to make improvements for the future.

Artificial intelligence applications in healthcare include surgical robots that are increasingly common in operating rooms.Robotic assisted surgery is a type of minimally invasive surgery that uses robotic systems to assist surgeons in performing surgical procedures with precision and control. The surgeon uses a console to control the robotic arms, which have instruments attached to them that can perform a variety of surgical tasks.

Some examples of surgical procedures that can be performed using robotic assisted surgery include prostate surgery, gynecologic surgery, and cardiac surgery. While robotic assisted surgery has many benefits, it is important to note that it is not suitable for all surgical procedures and may not always be the best option for every patient. These uses of AI won't replace humans' surgical expertise. Though, they can work as surgeons' partners, improving the likelihood of procedures succeeding.

4. AI in "Nutrition" is enhancing the journey to a healthy and fit lifestyle

Currently, an extensive number of nutrition-related apps are available in stores, with different functions and accuracies. With the integration of AI, nutrition apps can become a very good example of AI use cases in the healthcare sector, which can give customized recommendations and suggestions

based on a person's preferences and habits. VITL, a start-up based in London, is applying AI to diagnose patients' nutritional needs and deficiencies. Along with the diagnosis, it further provides users with a bespoke nutrition plan and daily vitamin pack. To map out the logic and thought process of human nutrition experts, the start-up uses an AI engine called LANA (Live and Adaptive Nutritional Advisor) which employs a broad range of lifestyle and diet data points.

LIMITATIONS OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

While artificial intelligence (AI) has the potential to revolutionize healthcare, there are also limitations to its use. Here are some limitations of AI in healthcare:

- **Lack of data quality:** AI relies on high-quality data to make accurate predictions and recommendations. However, healthcare data can be incomplete, inconsistent, or biased, which can limit the effectiveness of AI.
- **Lack of expertise:** Developing and implementing AI systems in healthcare requires a high level of expertise in both AI and healthcare. There is a shortage of experts with these skills, which can limit the development and adoption of AI in healthcare.
- **Cost:** Implementing AI in healthcare can be expensive, requiring significant investment in hardware, software, and expertise. This can limit access to AI-powered healthcare for patients who cannot afford it.
- **Human factor:** AI in healthcare is designed to augment and support healthcare professionals, not replace them. However, there is a concern that AI may replace certain tasks, such as diagnosis, leading to the displacement of healthcare professionals.

Future Aspect of AI in Healthcare

The future of AI in healthcare is exciting and holds great promise for improving patient outcomes and the overall healthcare system.

Healthcare expenses could potentially fall due to previous and more accurate diagnoses. AI also causes risks for the medical profession and patients. Until the data warehouse gets big enough and extremely well qualified, doctors will have to persist to use their training and experience to guarantee that artificial intelligence is yielding the proper diagnoses and course of medical treatment.

The future of AI in healthcare holds great promise for improving patient outcomes and the overall efficiency of the healthcare system. However, it is important to ensure that these AI-powered systems are developed and implemented in an ethical and responsible manner to protect patient privacy and safety.

As AI technologies expand, they will change the way doctors look at their patients, broaden the possibilities to predict and treat diseases, save healthcare expenses and progress medical care in regions where access to healthcare is limited. Finally, picturing a future of medicine based on data and analytics gives explanation for hope but needs constant research to understand its full potential.

CONCLUSION

Artificial Intelligence is a growing computer science domain which has applications in various fields as well as in medicinal services framework. AI can be used for a variety of applications in healthcare, including personalized medicine, disease detection, medical imaging, drug discovery, and administrative tasks. As AI continues to develop and be integrated into healthcare, it is important to prioritize ethical and responsible development and implementation. This includes ensuring patient privacy and safety, addressing biases in AI algorithms, and prioritizing patient-centered care. There are

some proven evidence that medical AI can play an important role in helping the doctors and patients to deliver healthcare much more professionally in the 21st century. Artificial Intelligence can be used as a supporting friend to the overburdened healthcare sector. The primary aim of AI is to analyze relationships between treatment techniques and patient outcomes.AI is changing every nook and corner of healthcare. It has its all challenges because health is unique domain where no compromise can be made.

REFERENCES

1. *TH,(2022)https://www.thehindu.com/brandhub/integrating-ai-into-healthcare-a-trilliopportunity-for-india/article66060253.ece*
2. *Region And Segment Forecasts,(2022 – 2030),Grand View Research. "GVR Report cover Artificial Intelligence In Healthcare Market Size, Share, And Trends Analysis Report By Component (Software Solutions, Hardware, Services), By Application (Virtual Assistants, Connected Machines) https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-healthcare-marke*
3. *Davenport,T. (2019) The potential for artificial intelligence in healthcarehttps://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/*
4. *Stewart,C. (2023) http://www.statista.com/*
5. *FIG.1: Source- www.slideshare.net*
6. *FIG.2: Source-http://www.statista.com/*