

AI in Healthcare

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Abstract - Artificial intelligence (AI) is a technology that helps to make tasks easier for humans, especially in healthcare. This transformation is driven by the increasing availability of healthcare data and the rapid advancements in analytical techniques. In this article, we aim to provide an overview of the current status of AI applications in healthcare and explore its potential future uses, considering it as one of the most revolutionary technologies of the 21st century. Healthcare is identified as an early candidate for a significant transformation through AI technologies, and our goal is to contribute to the discussion on how AI can enhance decision-making capabilities in this sector. Our aim will assess whether the current structures are adequately equipped to handle the challenges posed by AI in healthcare. Artificial intelligence, machine learning, and deep learning have the potential to greatly assist in proactive patient care, mitigate future health risks, and streamline healthcare workflows. The future of healthcare, driven by AI, holds promise for more efficient and effective healthcare delivery.

Keywords: Artificial intelligence, Machine learning, Clinical decision support, Healthcare.

1. Introduction

Artificial intelligence (AI) technology is quite distinct from traditional healthcare methods because it can gather information, process it, and provide clear results to users. AI achieves this through machine learning algorithms. In healthcare, AI is used to tackle complex problems by analyzing intricate medical data. It enables computer algorithms to make conclusions without direct human input, recognizing patterns and creating logical pathways. However, to minimize errors, AI outputs need to be repeatedly tested.

Unlike humans, AI algorithms are quite literal; they can't adapt or understand context beyond what's explicitly provided. Understanding the future of healthcare requires a good grasp of AI's role. Although AI research began in 1956, it had a limited impact on medical practice for many years. However, the recent hype surrounding machine learning is becoming a reality.

AI is particularly well-suited for healthcare delivery, and its use in clinical settings has grown exponentially. Modern medicine faces the challenge of managing vast amounts of structured and unstructured data to treat and manage diseases. AI systems, with their data-mining and pattern-recognition abilities, come to the rescue. Medical AI is helpful for the prediction, diagnosis, and treatment of diseases. It uses symbolic models of diseases and analyzes their connections with patient signs and symptoms. Diagnostic AI applications collect and synthesize clinical data, compare it with predefined disease categories, and aid in diagnosis and treatment. Furthermore, AI is involved in developing treatment protocols, drug research, and patient monitoring.

2. Technologies of Artificial Intelligence

Many technologies are directly concerned with healthcare, each supporting particular mechanisms and tasks. A few important AI technologies in healthcare are detailed as follows:

1) Machine learning

Machine learning is a specific area within the broader field of artificial intelligence (AI). It relies on algorithm models to implement AI concepts. What sets machine learning apart is its ability to adapt and improve over time when exposed to new data. It's as if the machines are actually learning as they process information. Neural Networks and Deep Learning One of the biggest prevailing types of AI is machine learning which is a statistical method. For the healthcare industry, machine learning plays an important role because it can help us to make sense of the large amount of healthcare data that is generated every day within electronic health records. The use of machine learning in healthcare is automating medical billing, clinical decision support, and the development of clinical practice guidelines within health systems. Machine learning algorithms can help us to find patterns and insights in medical data that would be impossible to find manually. The neural network is an intricate technology that became feasible after the 1960s. It is used to find out whether a patient will develop a specific disease. It works similarly to a neuron's function in processing signals but it is not as functional when compared to the brain's functions. Deep learning is progressively utilized for speech

recognition and fundamentally is a type of natural language processing (NLP).

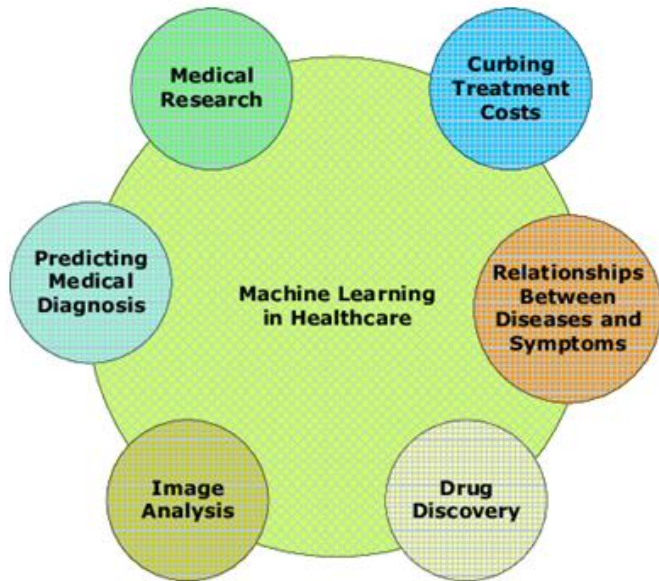


Figure 1: Application of Machine Learning

2) Natural Language Processing (NLP)

In the medical dataset, data is categorized as structured and unstructured. NLP techniques are used to extract insights from unstructured clinical text, such as doctor’s notes and patient records. This helps in identifying patterns, trends, and important information within textual data. NLP is utilized for converting data into a usable and analyzable form. Doctors can use speech-to-text conversion tools with built-in NLP capabilities to transcribe their notes and enter them into the corresponding patents in Electronic Health Record (EHR) fields and also medical staff can use the NLP tools to extract relevant data from EHRs.

3) Artificial neural networks

Artificial neural networks (ANNs) are a fundamental component of AI and machine learning in healthcare. Artificial neural networks are data processing models inspired by the structure and functioning of the human brain, consisting of interconnected nodes (neurons) that process and transmit data and make predictions or decisions based on that learning. The main objectives of artificial neural networks are to reflect the activities of human brain nerve cells utilizing neural networks of algorithms and maintaining information. In healthcare, artificial neural networks are used for a wide range of applications, leveraging their ability to learn.

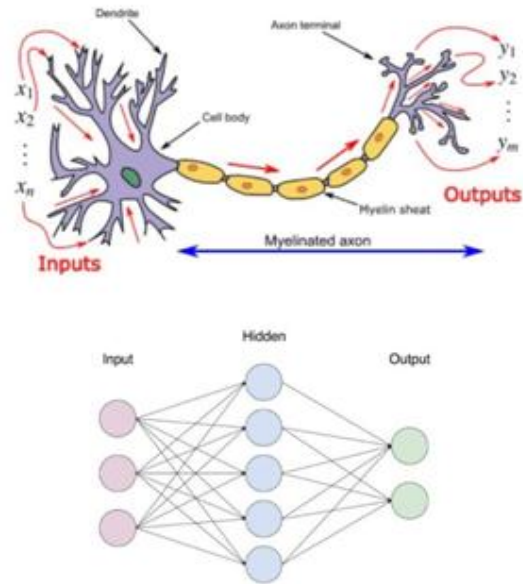


Figure 2: Process of Artificial neural networks

4) Robotic Process Automation

Robotic Process Automation (RPA) is a technology that uses software robots to automate repetitive, rule-based tasks in various industries, including healthcare. While RPA is not a form of artificial intelligence, it is often used with AI to improve process efficiency and accuracy. Robotic Process Automation helps many areas in healthcare, including appointment scheduling, billing, and claims processing, reducing operational costs and human errors. Robotic surgery, also known as robot- assisted surgery, revolutionizes the field of medicine by empowering surgeons to perform various types of surgical procedures with unmatched precision and flexibility. Some benefits of RAS are increased accessibility and better decision-making, less tissue damage, and faster recovery.

During the recent COVID-19 crisis, healthcare facilities harnessed the potential of robots in the operating room and clinical settings to address pressing challenges. Robots were employed to reduce the risk of pathogen exposure and provide vital support to healthcare workers, thereby helping to ensure the safety of both patients and medical professionals.



Figure 3: Robotic surgery

3. Advantages of AI in Healthcare

Ability to analyze data and improve diagnosis:

AI technology is great at quickly and accurately viewing medical records and data. It's faster and more precise than humans, helping doctors make quicker and better diagnoses, which means patients get better care.

Better patient care:

When AI is used well in healthcare, it makes patient care better. It makes medical research faster, helps doctors make better decisions, and reduces mistakes in treatment plans.

Reduced cost of care:

AI can help save money in healthcare. It can do tasks like paperwork faster and with fewer mistakes than people. This saves money and helps us use resources better.

Quick and Accurate data:

In medicine, it's important to have information that is both quick and right. AI gives real-time data that helps doctors make decisions faster and can prevent problems from getting worse.

Reduced staffs stress:

Jobs in healthcare can be very stressful, and there aren't always enough people to do the work. AI can help by doing some tasks, making it easier on the staff, and making sure that patients get good care even when things are busy.

Support with administrative tasks:

AI can do things like keeping records, analyzing scans, and entering data. This means doctors and nurses have more time to take care of patients and do other important parts of their jobs.

4. Future Scope

The future scope of AI in healthcare research is highly hopeful. Future studies can explore the integration of AI into remote patient monitoring, enhancing healthcare accessibility and reducing geographical barriers. Additionally, there is potential to develop AI algorithms for predicting disease outbreaks and optimizing resource allocation during health crises. As AI continues to evolve, research can focus on creating user-friendly AI interfaces for healthcare professionals and patients, facilitating seamless adoption. The future of AI in healthcare research is assured to revolutionize healthcare delivery, diagnostics, and patient outcomes.

5. Conclusion

Artificial intelligence technology is rapidly advancing and holds tremendous potential to improve various aspects of healthcare, ultimately leading to better and quicker patient outcomes. Healthcare organizations must be agile in adapting to these evolving technologies, changing regulations, and the expectations of consumers. Artificial intelligence, along with machine learning and deep learning, plays a vital role in enabling proactive patient care, reducing future health risks, and streamlining healthcare processes. It has proven particularly valuable in robot-assisted surgeries and early disease diagnosis, such as detecting cancer in its initial stages. Another advantage of AI is its capacity to handle data storage, apply advanced data analysis, and perform complex tasks at high speeds and low costs. AI is also employed in roles like virtual nursing assistants, clinical judgment or diagnosis support, image analysis, as well as managing workflows and administrative tasks.

REFERENCES

- [1] S Gaikwad, K Hingol, S Kapadi, S Renuke and M Gaonkar, "Smart Assistant for Doctors", Journal of Computational and Theoretical Nanoscience, vol. 15, no. 11-12, pp. 3324-3327.
- [2] A Martín-Campillo, C. Martínez-García, J. Cucurull, R. Martí, S. Robles and J. Borrell, "Mobile Agents in Healthcare a Distributed Intelligence Approach", Computational Intelligence in Healthcare 4. Studies in Computational Intelligence, vol. 309, 2010.
- [3] Arnold, M. H. (2021). Teasing out artificial intelligence in medicine: An ethical critique of artificial intelligence and machine learning in medicine. Journal of Bioethical Inquiry, 18(1), 121-139. <https://doi.org/10.1007/s11673-020-10080-1>.
- [4] Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. Future Healthcare Journal, 6(2), 94-98. <https://doi.org/10.7861/futurehosp.6-2-94>
- [5] Guan. (2019). Artificial intelligence in healthcare and medicine: Promises, ethical challenges, and governance. Chinese Medical Sciences Journal, 0(0), 99. <https://doi.org/10.24920/003611>
- [6] Khanna, D. (2020). Use of artificial intelligence in healthcare and medicine. <https://doi.org/10.31221/osf.io/eshm9>
- [7] Kiener, M. (2020). Artificial intelligence in medicine and the disclosure of risks. AI & Kaur, et al Page 12 SOCIETY, 36(3), 705-713. <https://doi.org/10.1007/s00146-020-01085-w>
- [8] N.M.J. Augusstine and S.R.N. Samy, "Smart Healthcare Monitoring System using Support Vector

- Machine", Australian Journal of Science and Technology, vol. 2, no. 3, pp. 1-8, 2018.
- [9] Price, W. N., & Cohen, I. G. (2019). Privacy in the age of medical big data. *Nature Medicine*, 25(1), 37-43. <https://doi.org/10.1038/s41591-018-0272-7>.
- [10] Reddy, S., Fox, J., & Purohit, M. P. (2018). Artificial intelligence-enabled healthcare delivery. *Journal of the Royal Society of Medicine*, 112(1), 22-28. <https://doi.org/10.1177/0141076818815510>.
- [11] Artificial intelligence in healthcare: past, present and future <https://svn.bmj.com/content/2/4/230>
- [12] Artificial intelligence in healthcare https://en.wikipedia.org/wiki/Artificial_intelligence_in_healthcare
- [13] Role of artificial intelligence in healthcare in the future <http://rx4group.com/what-role-is-artificial-intelligence-likely-to-play-in-healthcare-in-the-future/>
- [14] Use of Artificial intelligence in healthcare delivery, Sandeep Reddy, page 8/19.
- [15] Artificial intelligence in healthcare, eHealth initiatives, November 2018, 2 of 7.

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