

From Language Models to Life - Savers: The Evolution of GPT and Applications in Healthcare and Beyond

Kranthi Godavarthi

Data Architect and Technology Leader in Data Engineering, Business Intelligence and Data Science

Abstract: *The application of Artificial Intelligence (AI) is reshaping the healthcare landscape, addressing critical challenges to achieve the "quadruple aim" of healthcare: improving patient outcomes, enhancing care quality, reducing costs, and supporting clinician satisfaction. Increasing demands due to aging populations, rising chronic disease rates, and escalating healthcare expenses present significant hurdles for healthcare providers and regulators globally. AI technologies, particularly machine learning (ML), provide innovative solutions across healthcare operations, from diagnostics and personalized treatment to operational efficiencies and patient management. By leveraging AI's capacity to analyse vast datasets, healthcare systems can enhance disease prediction, support preventive care, and improve chronic disease management. For instance, deep learning applications in medical imaging now rival or surpass traditional diagnostics in early detection, such as identifying tumours in mammography.*

Keywords: Artificial Intelligence, Healthcare, Machine Learning, Patient Outcomes, Medical Imaging, Electronic Health Record (EHR), Data, Personalize Medical Treatments, Patterns, Recommendations, Cost.

1. Introduction

Healthcare systems worldwide experience various challenges in realizing the 'quadruple aim' for healthcare. Aging populations, increasing costs of healthcare globally, and the rising burden of chronic diseases are making it difficult for regulators, governments, and health providers change healthcare delivery models (Bajwa et al., 2021). In addition, the COVID - 19 pandemic significantly affected the quality of healthcare. The pandemic highlighted the shortages in the healthcare workforce and the imbalance in access to healthcare. That said, adopting technology in the healthcare has the opportunity to fix many of the challenges experienced in healthcare.

What is Artificial Intelligence

Artificial intelligence refers to the process of making intelligent machines using rules that machines emulate human cognitive tasks. Bajwa et al., (2021) points out that AI is a powerful branch of computer science that can change the practice of medicine and methods of healthcare delivery. AI systems can anticipate problems or handle issues as they arise. As a result, healthcare systems can be intelligent, and intentional and operate in an adaptive manner (Bajaj et al., 2021). The greatest power of AI is its ability to identify patterns from massive datasets. For instance, systems of AI can transform an entire patient medical record into a single number that it is easy to interpret.

How AI is used in Healthcare

AI is being used in healthcare through machine learning applications. With the help of machine learning, health experts can create new medical procedures, control large sizes of patient data sets, and enhance the treatment of chronic illnesses (Mack - BC, 2022). Big data collected from Electronic Health Record (EHR) systems have been critical in healthcare applications. The impact of EHR is a significant boost in quality of healthcare, and increased access to health records for research functions (Habehh and Gohel, 2021).

Prediction has played a big advantage in the healthcare treatment approaches. For this reason, scientists have developed intelligent models to help in disease diagnosis and prediction of clinical illnesses. A study conducted by Liu, Zhang, and Razavian resulted in the creation of a deep learning algorithm that predicts the start of diseases such as kidney failure, stroke, and heart failure (Habehh and Gohel, 2021). The developed algorithm utilized the structured and unstructured data from EHR in diagnosis. This represented the versatility of machine learning algorithms in the healthcare applications.

Similarly, ML offers room for research and clinical trials. According to Davenport and Kalakota (2019), adopting ML predictive approaches allows scientists to choose clinical trial participants. As such, this allows data to be accessed with ease and in real - time. Machine Learning has also transformed the field of medical imaging. Today, electronically recorded medical imaging data is available in large size. Further, several algorithms can be used to identify and discover abnormalities in the dataset. ML algorithms can be used to analyze imaging data just like advanced radiologists can. Habehh and Gohel (2021) point out that deep - learning algorithms have been used to identify tumors based on Mammograms during the early periods. The use of deep learning approaches allows for ease detection of tumors in the early stages. According to Habehh and Gohel (2021), deep learning algorithms has been said to do better than radiologists by an AUC score of 11.5%. To illustrate the value of adopting artificial intelligence in health care service, Massachusetts Institute of Technology Hacking Medicine Brazil conducted an urgent care service for health care professional at a hospital. In this research, the digital solution automated 92% of medical care registrations. This increased the time for health screening by around 16% during implementation, and in the first 3 months after completion. In addition, the waiting time for medical care after automation with AI solution reduced by approximately 12 minutes (Bin et al., 2022). According to Jannik (2024), accuracy is

Volume 13 Issue 11, November 2024

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

www.ijsr.net

important in healthcare, as such, AI provides a 96% accuracy rate and a 98% precision rate.

The role AI plays in healthcare goes past using data to influence healthcare research and diagnostics. It is also transforming how healthcare providers make clinical decisions. Given AI computers can “learn” from endless data sets and uncover patterns in data, it is now being used to change many areas of clinical care (Mack - BC, 2022). AI and machine learning technology are helping providers personalize medical treatments and care. In the hospitals, AI is being used to predict the period a patient should stay in hospital. As a result, this improves the decision making, care planning, and patient management. Furthermore, it reduces the costs that healthcare facilities spend on patients (Mack - BC, 2022). Mack - BC (2022) points out that IBM’s Watson is being used by researchers to highlight effective treatment options. IBM Watson for Genomics is being used to detect specific treatments for over 1, 000 patients.

In the healthcare sector, AI has become a disruptive force that is important to both treating and preventing chronic illnesses. AI has ushered a new era of data - driven, and customized healthcare. This has enormous potential to enhance patient results, and encourage preventive measures. According to the GlobalData Healthcare (2023), huge gains have been realized in the management of chronic diseases with the use of AI. For example, a virtual programme provided by Welldoc to patients with type 2 diabetes displayed impressive results. Approximately 77% of individuals recorded a 4.8% drop in their baseline body weight at the endpoint (GlobalData Healthcare, 2023). According to GlobalData Healthcare (2023), systolic blood pressure improvements were statistically significant. This highlighted the importance of AI - driven therapies. According to Arefin (2024), an enhanced level of alertness is important during the course of chronic illnesses. This cannot be realized through irregular visits to the doctor. Diseases can go untreated because of the temporal gap between the identification of worsening conditions and the subsequent scheduled appointments (Arefin, 2024). Inadequate disease prevention can be realized through infrequent check - ins. Chronic conditions need constant monitoring and intervention. That said, continuous adoption of AI - driven solutions helps individuals with chronic diseases to navigate the many facets of their comorbidities.

Impact of AI in health care insurance providers

AI is transforming the insurance healthcare sector by allowing insurance providers to enhance operations, and customer experience, and reduce risk. AI - driven chatbots can deal with customer queries, while ML algorithms can scan large healthcare data to predict potential claims (Davenport and Kalakota, 2019). Insurance AI applications are being developed rapidly, especially when it comes to managing health insurance. AI is being used by health insurance providers to automate repetitive tasks like claims, fraud detection, and customer service. AI chatbots allow insurance providers to attain quick and efficient responses to their inquiries. Moreover, insurance providers are leveraging AI to provide predictive analytics. According to Mello and Rose (2024), predictive analytics is the use of big data and statistical algorithms to detect the chances of future results. Insurance companies can leverage predictive analytics to

determine customers who are likely to make a claim. This provides room for insurance organizations to take preventative measures such as offering policy discounts (Mello and Rose, 2024). AI can also benefit healthcare insurance providers through the identification of fraud. In summary, AI can use machine learning to allow complex, timely, and dynamic data analysis of health insurers and electronic health records to generate deep insights into the medical costs, and claims.

How AI can benefit future Innovations in healthcare

Innovations in healthcare has been rapidly evolving because of the advancement of AI. Healthcare has become more open, accessible, and equitable across the planet. With the continuous development of AI, it is expected to result in massive innovation of healthcare products. AI technologies are currently transforming operations in hospitals and diagnosis of diseases (Gupta, 2024). Furthermore, these tools are bound to advance standardization sustainably. For instance, cutting down on physician analysis of imaging and its results can help reduce the general costs of therapeutics. According to Gupta (2024), Teamwork combined with the power of AI data analysis will enhance the industry of personalized medicine. Without AI and knowledge of previous history, chronic pain conditions can be very time - consuming. However, the creation of new AI tools has the likely chance to analyze patient histories more efficiently and help doctors determine the best care strategies as well as reveal hidden data movements that were not readily available.

Soon, AI tools will replace how teams work in healthcare systems. As such, AI will allow interdisciplinary care with different professionals. This could be achieved by using AI tools in workforce planning, and operational management. In medicine, this might be a game - changer in treatment planning because it could lead to better patient results when different opinions are taken into account. Lastly, Gupta (2024) highlights that AI will revolutionize the communication industry. According to Gupta (2024), poor communication in health, and the need for patient - centered care is a new trend in healthcare. For this reason, medical communication between doctors and patients can be enhanced with the use of AI tools such as email or text communication. This may provide efficiency and reduce time on these tasks.

2. Conclusion

In conclusion, machine learning (ML) represents one of the most transformative areas within artificial intelligence, driving significant advancements across diverse industries, particularly in healthcare, which is increasingly embracing AI to meet evolving needs. By leveraging ML, healthcare organizations can unlock insights from vast volumes of unstructured data—insights that were previously hidden or impossible to derive—empowering clinicians to make well - informed, timely decisions that respond directly to individual patient conditions and needs. This capability enhances precision in diagnostics, optimizes treatment planning, and supports personalized care, ultimately leading to improved patient outcomes.

Furthermore, the integration of AI and ML in healthcare is not only transforming how care is delivered but also how healthcare systems operate. These technologies facilitate operational efficiencies, reduce administrative burdens, and allow healthcare providers to allocate resources more effectively, enhancing patient care while reducing costs. With ongoing advancements, AI and ML have the potential to revolutionize areas such as predictive healthcare, where early intervention can prevent or mitigate the progression of chronic diseases, and mobile health technologies, which enable more accessible and portable patient monitoring outside traditional care settings.

Altogether, the developments in AI and ML mark a pivotal shift in healthcare toward a future that is more personalized, predictive, preventive, and patient - centered. The continued adoption of these technologies promises to bring about a more responsive and equitable healthcare system, fostering a new era of data - driven, accessible care that improves quality of life while upholding the core values of medical practice.

References

- [1] Arefin, S. (2024). Chronic Disease Management through an AI - Powered Application. *Journal of Service Science and Management*, 17 (4), 305 - 320.
- [2] Bajwa, J., Munir, U., Nori, A., & Williams, B. (2021). Artificial intelligence in healthcare: transforming the practice of medicine. *Future healthcare journal*, 8 (2), e188 - e194.
- [3] Bin, K. J., Melo, A. A. R., da Rocha, J. G. M. F., de Almeida, R. P., Cobello Junior, V., Maia, F. L., . . . & Ono, S. K. (2022). The impact of artificial intelligence on waiting time for medical care in an urgent care service for COVID - 19: single - center prospective study. *JMIR Formative Research*, 6 (2), e29012.
- [4] Jayanna Hallur, "The Future of SRE: Trends, Tools, and Techniques for the Next Decade", *International Journal of Science and Research (IJSR)*, Volume 13 Issue 9, September 2024, pp.1688 - 1698, <https://www.ijsr.net/getabstract.php?paperid=SR24927125336>
- [5] Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future healthcare journal*, 6 (2), 94 - 98.
- [6] GlobalData Healthcare. (2023, December 14). *Harnessing AI's potential to treat and prevent chronic health conditions*. Medical Device Network. <https://www.medicaldevice-network.com/analyst-comment/harnessing-ai-potential-to-treat-and-prevent-chronic-health-conditions/>
- [7] Gupta, A. (2024, August 12). *Council post: Five ways AI is advancing the future of health*. Forbes. <https://www.forbes.com/councils/forbesbusinesscouncil/2023/11/01/five-ways-ai-is-advancing-the-future-of-health/>
- [8] Habebh, H., & Gohel, S. (2021). Machine learning in healthcare. *Current genomics*, 22 (4), 291.
- [9] Jannik. (2024, August 6). *Global AI in healthcare statistics: Market to reach \$45.2B*. WiFiTalents. <https://wifitalents.com/statistic/ai-in-healthcare/>
- [10] Mack - BC, J. (2022, July 25). *How artificial intelligence is impacting the health care Field*. University of San Diego Online Degrees. <https://onlinedegrees.sandiego.edu/ai-healthcare/>
- [11] Mello, M. M., & Rose, S. (2024, March). Denial—Artificial Intelligence Tools and Health Insurance Coverage Decisions. In *JAMA Health Forum* (Vol.5, No.3, pp. e240622 - e240622). American Medical Association.
- [12] Jayanna Hallur, "Social Determinants of Health: Importance, Benefits to Communities, and Best Practices for Data Collection and Utilization", *International Journal of Science and Research (IJSR)*, Volume 13 Issue 10, October 2024, pp.846 - 852, <https://www.ijsr.net/getabstract.php?paperid=SR241009065652>