



Artificial Intelligence (AI) in Healthcare

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ABSTRACT

Artificial intelligence (AI) is the systems or machines that mimic intelligence to perform tasks and can iteratively improve themselves based on the information they collect. AI is being effectively utilized in a multitude of setting such as hospitals, and clinical laboratories as well as in research approaches. The basic or salient feature of AI in the medical field is treatment management as well as its diagnosis. AI systems in health care are succeeding because of the advanced algorithms for learning numerous characteristics from a huge amount of health care data that helps in problem-solving is achieved at a rate and amount futile for humans. The algorithms can be furnished with auto-learning to improve performance and accuracy. AI systems are utilized to facilitate physicians with advanced medical knowledge about journals, clinical papers to brief patient care and medical textbooks. AI can offer fewer diagnostic as well as therapeutic errors. For the learning process, it can make use of medical data, particularly from the patient population. There are different types of AI which can be used in the healthcare field like biomarkers, natural language processing, rule-based expert system, and physical robotics. AI is used in treatment design, disease progression, diagnosis aid, and health monitoring

Keywords: Healthcare Diagnostics, Clinical Decision Support Systems (CDSS), Machine Learning (ML) in Medicine, Natural Language Processing (NLP), Healthcare Cost Reduction, Data Privacy in Healthcare AI, Personalized Medicine, Predictive Analytics in Healthcare, Remote Patient Monitoring, Robotic Surgery

1. Introduction

Artificial intelligence (AI) and the associated technologies are progressively being used in various fields and disciplines and are now imitated in the healthcare sector. AI is being effectively utilized in a multitude of settings such as hospitals, and clinical laboratories as well as in research approaches. Along with enhanced use in engines, machines etc., AI is utilized in electronic health records (EHR) and also in the development of disciplines included in life sciences as well as neurosciences. The basic or salient feature of AI in the medical field is in the diagnosis and treatment of diseases. In general, AI is referred to as the "field of science" as well as engineering and deals with the computational understanding of intelligence or intelligent behavior with the formation of artefacts that impart such behaviors. Furthermore, AI can be defined as the machine's proficiency to emulate intelligent human behavior employing especially assigned computer software to perform projects compelling human brain intelligence in less time and less cost. As the central motive of AI is to contribute systems that can think and act like the human brain, thus the systems are titled intelligent agents. The formal definition of AI can be expressed as a field of science concerned with the computational understanding of what is commonly called intelligent behavior and with the creation of intelligent agents that exhibits such behaviors. This can be interpreted as a machine with human-like proficiency extending via computers in the execution of assignments done by humans.

AI theory can be creditably inferred through the intelligent agent concept. Thence, it assimilates the essential qualities needed to qualify for the Turing test given by the British mathematician Alan Turing, one of the benefactors of modern computer science as well as AI. Turing test analyzes computers as it possesses the ability of computers to perform like a human in tasks. The skills required in an intelligent agent are perception, practical reasoning and competence in accomplishing assigned tasks. "As AI is an interdisciplinary concept embracing fundamentals and equipment of diversified areas like computation, mathematics, logic, and biology, it is used to deal with issues of understanding imitating intelligence and performing cognitive tasks with minimum human arbitrations". AI systems in health care are successful because of the advanced algorithms for learning numerous characteristics from a huge amount of health care data that helps in problem-solving and achieved at a rate and amount futile for humans. The algorithms can be furnished with - auto- learning to improve performance and accuracy. AI systems are utilized to support physicians with advanced medical knowledge about journals, and clinical papers to inform patient care and medical textbooks in general. AI can offer fewer diagnostic as well as therapeutic errors. For the learning process, it can make use of medical data, particularly from patient populations.. The intelligent agents utilized for AI systems comprise a computational core with tangible actuators and sensors tilted as Robots, one with only a computational environment called infobot, if advising program combined with human experts then termed a decision support system. There are various applications of AI in medicine such as estimating disease liabilities, assessing treatment potency, handling treatment complexity, facilitating patient care, clinical investigation and drug advancement diagnosing illness and directing researchers in developing expensive clinical trials companion

2. Literature Review

Increased Demand for AI: We discovered that AI has incredible potential to decrease healthcare expenses, offer proactive healthcare services, alleviate healthcare workers' workloads, and deliver quicker and more accurate diagnoses. The increasing healthcare costs create a demand for AI services.

Advantages of AI: The article explores the moral implications of AI in the healthcare sector, addressing concerns regarding consent, responsibility, and openness. Makes sure that its applications are used in a proper manner and the process for decision making is clear.

Generative AI models are in place in clinical decision support systems (CDSS), and they support healthcare professionals in their decision-making processes, by increasing their diagnostic accuracy. Generative AI models are being integrated into clinical decision support systems (CDSS) to help healthcare professionals to take informed decisions diagnostics [Abbasi, N., Nizamullah, F. N. U., Zeb, S., & Fardous, M. D. (2024)].

Rising Healthcare Costs: Cost is rising because of factors such as aging populations, high rates of chronic disease, and advancements in technology. The financial pressure highlights the importance of finding affordable ways to handle and lower costs.

Insufficient Healthcare Workers: The increasing need for healthcare services is not in line with the number of healthcare professionals available. The divide is worsened by elements like exhaustion, the advancing age of medical staff, and inadequate preparation of incoming professionals. Cutting-edge technologies such as AI help bridge this divide by enhancing human abilities and enhancing effectiveness.

AI's role and abilities involve employing advanced algorithms to examine extensive healthcare data, extracting valuable insights that can guide clinical decisions and enhance patient outcomes. And can constantly acquire new knowledge and improve through feedback, resulting in increased precision and efficiency as it evolves. AI offers doctors current medical information from diverse sources like journals, textbooks, and clinical databases, leading to precise and knowledgeable patient care [Bresnick, J. (2018)].

The assimilation of artificial intelligence within Ayurveda presents significant potential for improving the field by blending traditional wisdom with modern technological advancements. This strategy may enhance the personalization, effectiveness, and accessibility of Ayurvedic therapies, all while honoring the fundamental principles of this time-honored practice. The machine learning approach is used to identify the *Prakriti* of the person [Jamdaade, K.M., Patil,

H.Y. (2023)]. The preventive and personalized treatment could be possible with the help of *Prakriti* identification [Sharma R, Prajapati PK (2020)].

3. Design

The adoption and implementation of Artificial Intelligence (AI) in healthcare present a diverse and evolving landscape across the globe, reflecting varying levels of technological advancement, regulatory environments, and healthcare needs [Bozkurt and R. C. Sharma (2023)]. In developed countries, AI integration into healthcare systems is often characterized by advanced technological infrastructure and substantial investments in research and development. For instance, in the United States, AI is extensively utilized in diagnostic imaging, personalized medicine, and predictive analytics [Chen, X. (2024)]. While designing this paper some problems were faced such as despite progress in AI technologies in healthcare, there is a lack of proof of its actual impact on enhancing diagnostic accuracy, customizing treatments, and improving patient results. Furthermore, obstacles like privacy of data, biased algorithms, and moral issues hinder the effective execution of these technologies.

This research aims to:

Evaluate AI's impact on healthcare practices and address the critical barriers to optimize its integration and effectiveness. Assess how well AI technologies work in diagnostic imaging and make predictions in healthcare environments.

Identifying challenges and limitations in artificial intelligence's role in healthcare and providing suggestions to overcome them.

4. Discussion

Information has been collected for the research paper with help of methods such as:

Data Collection Methods: Surveys, interviews, and analysis of healthcare records. Instruments will include structured questionnaires and semi-structured interview guides. Data collected through interviews with healthcare professionals and analysis of institutional records. And used tools such as: connectedpaper.com, scispace.com, chatpdf.com to find relevant literature and identify gaps in the field.

Data Analysis: Statistical analysis for quantitative data and the combination of these methods will provide a complete understanding of AI's impact in healthcare.

Qualitative Analysis: Collect and analyze data from healthcare institutions using AI technologies. Some scientific methods can also be used to assess the effectiveness and performance of AI systems.

For better understanding a survey containing structured questionnaire was prepared using google forms to gather opinion/responses regarding Artificial Intelligence (AI) in healthcare sector and was circulated to professionals in the healthcare field as well as to general public.

The questions were designed in such a way that they point out some key areas such as:

- Knowledge about usage of AI tools in the Healthcare sector.
- Effectiveness of AI in improving diagnostic accuracy.
- Primary concerns regarding use of AI in Healthcare.
- In what areas of the Healthcare sector will AI benefit the most?
- Will AI take over the healthcare sector in the upcoming 5-10 years?
- Which techniques would you believe in, traditional or modern AI tools?

5. Results

Following are some diagrams of pie charts & bar graph that helps to understand and analyze the survey:

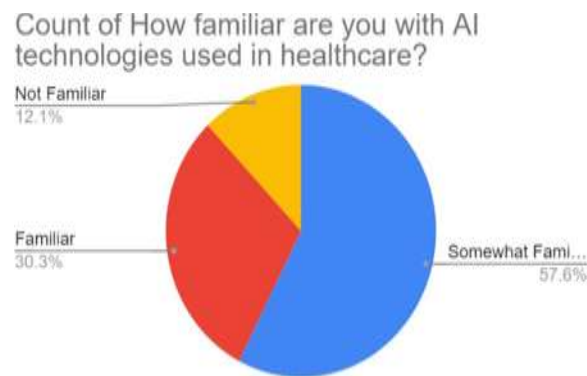


Figure 1: % of familiarity with AI technologies used in healthcare.

The analysis of the question - How familiar are you with AI technologies used in healthcare? is shown in Fig. 1. Blue indicates that the people have answered - Somewhat Familiar (57.6%).

Red indicates that the people have answered - Familiar (30.3%). Yellow indicates that the people have answered - Not Familiar (12.1%).

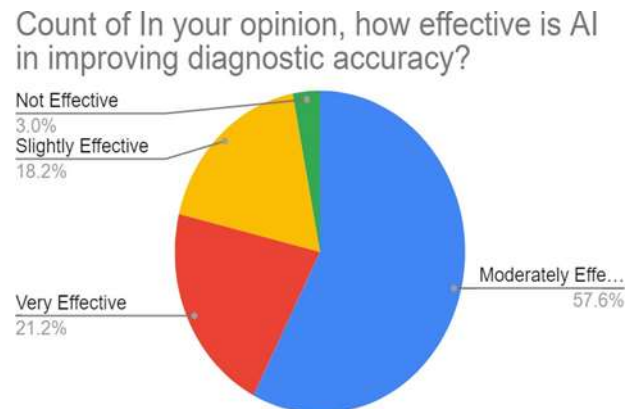


Figure 2: % of opinion for effectiveness of AI in improving diagnostic accuracy.

The analysis of the question - How effective is AI in improving diagnostic accuracy? is shown in Fig. 2. Blue indicates that the people have answered - Moderately effective (57.6%).

Red indicates that the people have answered - Very effective (21.2%). Yellow indicates that the people have answered - Slightly Effective (18.2%). Green indicates that the people have answered - Not Effective (3.0%).

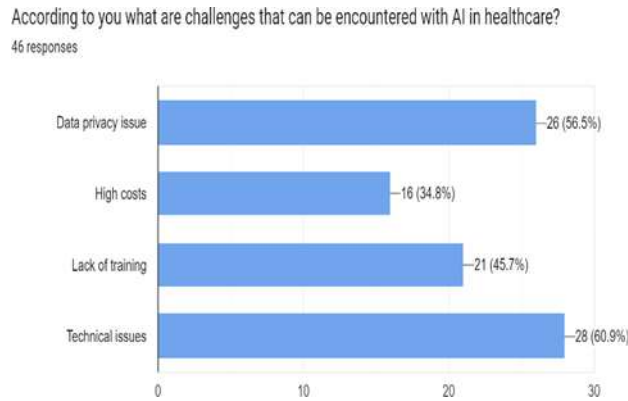


Figure 3: Challenges encountered with AI in healthcare

The analysis of the question - What is/are the challenge/s we can encounter with AI in healthcare? is depicted in Fig. 3. For Technical Issues maximum people have voted (60.9%).

For Data Privacy some people have voted (56.5%). For Lack of training some people have voted (45.7%). For High costs least people have voted (34.8%).

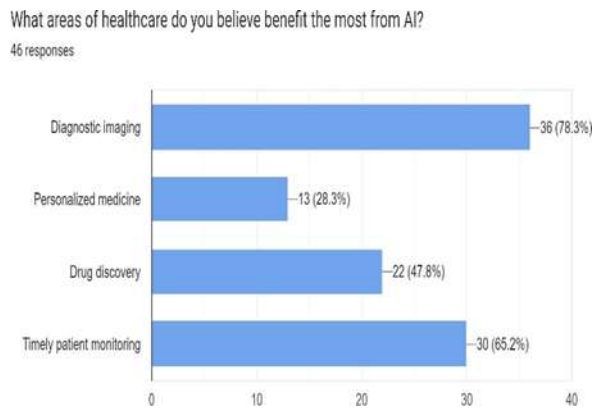


Figure 4: Areas where AI will benefit the most in healthcare

The analysis of the question - What area/s do you believe will benefit the most from AI? is depicted in Fig. 4. For Diagnostic Imaging maximum people have voted (78.3%).

For Timely patient monitoring some people have voted (65.2%). For Drug Discovery some people have voted (47.8%).

For Personalized medicine least people have voted (28.3%).

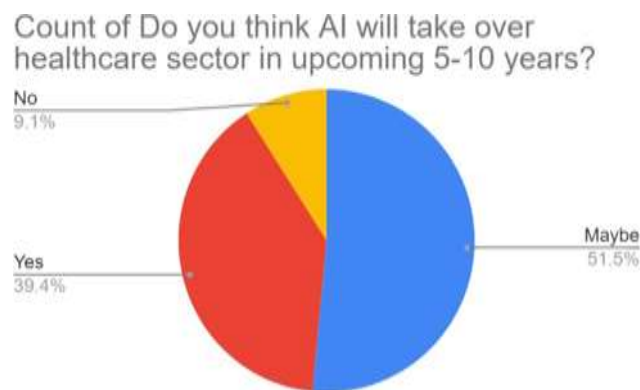


Figure 5: % of opinion of AI taking over the healthcare sector in upcoming 5-10 years.

The analysis of the question - Do you think AI will take over the healthcare sector in the upcoming 5 -10 years? is shown in Fig. 5. Blue indicates that the people have answered - Maybe (51.5%).

Red indicates that the people have answered - Yes (39.4%). Yellow indicates that the people have answered - No (9.1%).

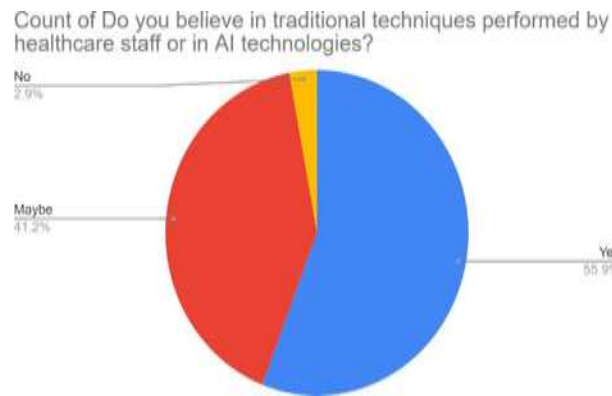


Figure 6: % of opinion of believe in traditional techniques or AI technologies.

The analysis of the question - Do you believe in traditional techniques performed by healthcare staff or in AI technologies is shown in Fig. 6. Blue indicates that the people have answered - Yes (55.9%).

Red indicates that the people have answered - Maybe (41.2%). Yellow indicates that the people have answered - No (2.9%).

6. Conclusion

Effectively merging AI into healthcare systems has the potential for significant benefits, but it is essential to first tackle and resolve the various obstacles associated with its incorporation.

Future studies should focus on the following topics:

Implementing thorough measures to protect data privacy: Ensuring patient confidentiality alongside utilizing AI technologies efficiently. Dealing with Algorithmic Bias: Ensuring transparency and diverse training data for AI systems to avoid perpetuating health inequalities. Creating ethical standards and regulations to oversee the use of AI in healthcare, ensuring compliance with moral guidelines.

Despite notable advancements, the utilization of AI in healthcare is still in its evolving phase. Ongoing research consistently enhances the technology, leading to significant breakthroughs in various industries in the future [Saxena, A. K., Ness, S., & Khinvasara, T. (2024)]. The integration of AI tools into healthcare holds immense potential for enhancing patient outcomes, streamlining processes, and driving cost efficiencies [Olawade, D. B., David-Olawade,

A. C., Wada, O. Z., Asaolu, A. J., Adereni, T., & Ling, J. (2024)]. AI facilitates remote patient monitoring, allowing healthcare workers to track patients' vital signs and health metrics in real-time. This not only enhances patient safety but also reduces hospital readmissions and healthcare costs [Rana, M. S., & Shuford, J. (2024)].

The increasing scope of AI in healthcare is highly positive as it helps the healthcare process in numerous ways, be it decision making, administrative tasks, record maintenance or robotic surgery. Due to its high efficiency and excellent rate of error reduction, it has proved to be a reliable tool for the process. One of the fields of healthcare which benefitted greatly from this is the disease diagnostics [Kalra, N., Verma, P., & Verma, S. (2024)].

From above it is clear that AI will play a pivotal role in shaping the future of healthcare. By addressing the challenges and adhering to the recommendations outlined, stakeholders can ensure that AI technologies are implemented responsibly and effectively, leading to improved healthcare outcomes, greater efficiency in healthcare delivery, and a more equitable healthcare system for all [Udegbe, F. C., Ebulue, O. R., Ebulue, C. C., & Ekesiobi, C. S. (2024)]. The journey towards AI-enabled healthcare is complex and ongoing. The ultimate goal is to harness AI's transformative power to benefit patient care while safeguarding patient rights and promoting equitable healthcare practices [Williamson, S. M., & Prybutok, V. (2024)].

Artificial Intelligence has a sanguine effect on healthcare because it has the capability to accommodate and analyze gigantic data that produce more precise results. With the use of AI technology, doctors will have to rethink the manner in which they treat their patients. Robotics used in AI play a vital role in the automatic processes in medical science. These robots are used in performing surgeries, and monitoring patients. Using AI in healthcare would reduce cost and it would be convenient to extend medical care to remote areas where health support is limited.

Acknowledgements

Appendix A. Survey: A detailed list of questions for healthcare professionals regarding AI usage in their sector. **Appendix B. Interviews:** Prepared questions and watched qualitative interviews of professionals in this field.

Appendix C. Google forms: Google forms circulation to the people and professionals who are around us to know their opinion on usage and applications of Artificial Intelligence in the healthcare field.

References

- Haenlein, M.; Kaplan, A (2019). A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence.
- Bekbolatova, M., Mayer, J., Ong, C. W., & Toma, M. (2024, January). Transformative potential of AI in Healthcare: definitions, applications, and navigating the ethical Landscape and Public perspectives. In Healthcare.
- Jiang et al. (2017). Jiang, Fei, Yong Jiang, Hui Zhi, Yi Dong, Hao Li, Sufeng Ma, Yilong Wang, Qiang Dong, Haipeng Shen, and Yongjun Wang. 2017. Artificial Intelligence in Healthcare: Past, Present and Future.
- Väänänen et al. (2021). Väänänen, Antti, Keijo Haataja, Katri Vehviläinen-Julkunen, and Pekka Toivanen. 2021. AI in Healthcare: A Narrative Review.
- Abbasi, N., Nizamullah, F. N. U., Zeb, S., & Fardous, M. D. (2024). Generative AI in healthcare: Revolutionizing Disease Diagnosis, expanding treatment options, and enhancing patient care. *Journal of Knowledge Learning and Science Technology* ISSN: 2959-6386 (online).
- Bresnick, J. (2018). AI and the Future of Healthcare Administration. *Health IT Analytics*.
- Jamdaade, K.M., Patil, H.Y. (2023). Prakriti Nishchitikan of Human Body Using Supervised Machine Learning Approach. In: Sharma, N., Goje, A., Chakrabarti, A., Bruckstein, A.M. (eds) *Data Management, Analytics and Innovation*.
- Sharma R, Prajapati PK (2020). Predictive, preventive and personalized medicine: leads from ayurvedic concept of Prakriti (human constitution).
- Bozkurt and R. C. Sharma (2023). "Challenging the status quo and exploring the new boundaries in the age of algorithms: Reimagining the role of generative AI in distance education and online learning," *Asian Journal of Distance Education*.
- Chen, X. (2024). AI in Healthcare: Revolutionizing Diagnosis and Treatment through Machine Learning. *MZ Journal of Artificial Intelligence*, 1(2).
- Saxena, A. K., Ness, S., & Khinvasara, T. (2024). The Influence of AI: The Revolutionary Effects of Artificial Intelligence in Healthcare Sector. *Journal of Engineering Research and Reports*.
- Olawade, D. B., David-Olawade, A. C., Wada, O. Z., Asaolu, A. J., Adereni, T., & Ling, J. (2024). Artificial intelligence in healthcare delivery: Prospects and pitfalls. *Journal of Medicine, Surgery, and Public Health*.
- Rana, M. S., & Shuford, J. (2024). AI in Healthcare: Transforming Patient Care through Predictive Analytics and Decision Support Systems. *Journal of Artificial Intelligence General Science (JAIGS)* ISSN: 3006-4023, 1(1).
- Kalra, N., Verma, P., & Verma, S. (2024). Advancements in AI based healthcare techniques with focus on diagnostic techniques. *Computers in Biology and Medicine*.
- Udegbe, F. C., Ebulue, O. R., Ebulue, C. C., & Ekesiobi, C. S. (2024). The role of artificial intelligence in healthcare: A systematic review of applications and challenges. *International Medical Science Research Journal*, 4(4).
- Williamson, S. M., & Prybutok, V. (2024). Balancing privacy and progress: a review of privacy challenges, systemic oversight, and patient perceptions in AI-driven healthcare.
- Alsheibani, S., Cheung, Y., & Messom, C. (2018). Artificial intelligence adoption: AI readiness at firm-level. In M. Tanabu, & D. Senoo (Eds.), *Proceedings of PACIS2018: Pacific Asia Conference in Information Systems (PACIS) [37]* Association for Information Systems.