



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 3, March 2025

Artificial Intelligence - Revolutionary Impact on Health Care Sector

Dr.B.Gayathri

Assistant Professor, Department of Business Administration, Sri Vasavi College (Self Finance Wing), Erode, Tamil Nadu, India

ABSTRACT: Artificial intelligence (AI) is becoming a major force for change in healthcare systems around the world as a result of issues like rising prices, restricted access, and the increasing need for individualized care. This research attempts to critically evaluate AI's integration in several healthcare domains and is driven by the pressing need to utilize AI's potential to reduce these difficulties. Through wearable driven by AI, we examine how AI enhances clinical decision-making, streamlines hospital operations and management, improves medical picture processing, and transforms patient care and monitoring. We examine how AI has changed particular healthcare domains through a number of case studies, and we talk about the issues that still need to be resolved. This paper provides a critical evaluation of AI's transformation potential, giving academics a better grasp of AI's present and Future Impact In Healthcare. In order to manage the challenges of using AI, it promotes an interdisciplinary conversation among researchers, doctors, and engineers. This helps to build AI-driven solutions that put a patient-centered approach, equity, and ethical standards first.

KEYWORDS: Artificial Intelligence in Health Care; Comparison Report; Challenges in health care.

I. INTRODUCTION

Artificial intelligence (AI) has revolutionized several sectors, particularly in the healthcare sector [1]. The use of AI in clinics and hospitals represents a revolution in healthcare management and delivery. This study seeks to explore the complex role of AI in healthcare, examining its influence on clinical decision-making, hospital operations, medical diagnostics, patient care, and the ethical dilemmas it introduces. The idea of artificial intelligence in healthcare dates to the early days of computer science when researchers first envisioned robots capable of emulating human intelligence [2]. However, it wasn't until machine learning methods advanced [3], computer power and data became more available that AI applications in healthcare truly took off.

y [4]. This progression has been marked by key milestones, from the development of early expert systems [5] to the emergence of advanced neural networks that now surpass human experts in certain tasks [6]. AI is now being used in healthcare in a variety of ways [7]. In clinical contexts, it aids in illness diagnosis, patient outcome prediction, and treatment plan modification [8]. AI improves scheduling and patient flow, speeds up administrative tasks, and increases operational effectiveness in hospital management [9].



Fig: 1 Applications of AI Source from internet

In the realm of medical diagnostics, AI increases the speed and accuracy of image processing in radiology and pathology [10]. AI also plays a vital role in patient care through telemedicine, virtual assistance, and remote monitoring, drastically altering the way that patients and doctors communicate [11].

AI algorithms can be primarily categorized into three main types: machine learning, deep learning, and natural language processing; each has special advantages and uses.

1. Machine learning (ML): ML algorithms learn from data to provide predictions or judgments rather than being specifically designed for the purpose [18]. In the healthcare sector, supervised learning algorithms have played a major role in developing predictive models for patient outcomes based on previous data [19]. On the other hand, unsupervised learning can be useful in discovering new disease categories by recognizing patterns or clusters in data [20]. Reinforcement learning, in which algorithms learn to make decisions via trial and error, may help optimize personalized therapy [21].

2. Deep learning (DL): A subset of machine learning (ML), DL uses multi-layered neural networks to evaluate complicated data structures, thus the term "deep." Because of its remarkable effectiveness in processing imaging data, Convolutional Neural Networks (CNNs) are extremely helpful for identifying diseases from medical imagery like MRIs or X-rays [22].

Residual Networks (ResNet), Inception, Visual Geometry Group (VGG), and Graph Convolutional Networks (GCNs) are advanced designs in Convolutional Neural Networks (CNNs), each offering distinct advantages and applications in image analysis, classification, and graph data processing [23]. Recurrent Neural Networks (RNNs), known for their ability to process sequential data, are commonly used to analyze time-series data, such as physiological signals collected during patient monitoring, to predict health outcomes or deterioration over time [24]. For example, Long Short-Term Memory (LSTM) networks, a sophisticated variant of RNNs, have been extensively applied in detecting sleep apnea using polysomnography data [25].

In addition, Transformer models, such as Generative Pre-trained Transformers (GPT) and Bidirectional Encoder Representations from Transformers (BERT), have revolutionized the analysis of natural language in clinical notes. These models allow for more precise extraction of patient data and insights, improving diagnostic and prognostic capabilities. Furthermore, Generative Adversarial Networks (GANs) and conditional diffusion models are now being used to generate synthetic medical images for training purposes, addressing privacy concerns. Meanwhile, Graph Neural Networks (GNNs) are opening up new possibilities for modeling complex biological and health-related networks, from understanding disease pathways to predicting protein interactions.

3. Natural Language Processing (NLP): NLP techniques empower computers to comprehend and interpret human language. In healthcare, NLP is used to extract valuable insights from unstructured data sources, such as academic papers or clinical notes, assisting in prognosis prediction and diagnostic processes [25]. One notable NLP model is GatorTron, which demonstrates the potential of these techniques in the medical field. [26]. This extensive NLP model was created especially for the healthcare sector and is based on Transformer. The Transformer architecture, which is renowned for its ability to manage sequence-to-sequence operations and handle large datasets, is used to read and analyze electronic health information.

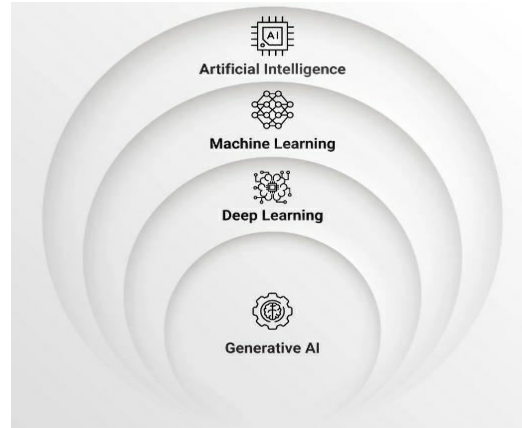


Fig: 2 AL, ML, DL And NLP from Internet

2. CASE STUDIES

These sections will offer in-depth analyses of certain case studies and the function of AI in customizing medical care.

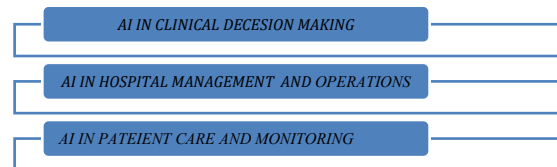


Fig: 3 AI in health sector

2.1 AI IN CLINICAL DECISION MAKING

AI Algorithms for Diagnosis and Prognosis:

AI algorithms are providing new insights into healthcare and are increasingly playing a significant role in the diagnosis and prognosis of diseases. Large volumes of medical data are analyzed by these algorithms to find trends and connections that would be missed by human examination. By examining ECG patterns and other vital signs, artificial intelligence (AI) models are used in cardiology to forecast heart attacks and strokes [13].

AI in Detecting Diseases

Cancer detection: Early cancer detection is one of the most innovative uses of artificial intelligence. One noteworthy example is the application of deep learning algorithms to the processing of mammograms in order to diagnose breast cancer. According to research, artificial intelligence (AI) can frequently detect patterns in mammograms that are suggestive of malignant growths more accurately than conventional techniques. Google Health developed an AI model, according to a noteworthy study that was published in the journal Nature [26]. AI algorithms, for example, may sort through genetic data, radiographic pictures, and patient histories in oncology to find cancer early [12].

Diabetes management: One major area of healthcare development is the application of AI to the management and detection of diabetes, especially through machine learning algorithms. Numerous researches have shown that these algorithms are capable of analyzing patient data to forecast the development, course, and consequences of diabetes. In one study, eight diabetes complications—metabolic syndrome, dyslipidemia, neuropathy, nephropathy, diabetic foot, hypertension, obesity, and retinopathy—were predicted and categorized using a number of supervised classification algorithms [26].

Heart disease prediction: An important development in cardiovascular healthcare is the use of AI to predict heart disease. This application seeks to assess the degree of cardiac disease, which is essential for efficient management and treatment, in addition to predicting its development.

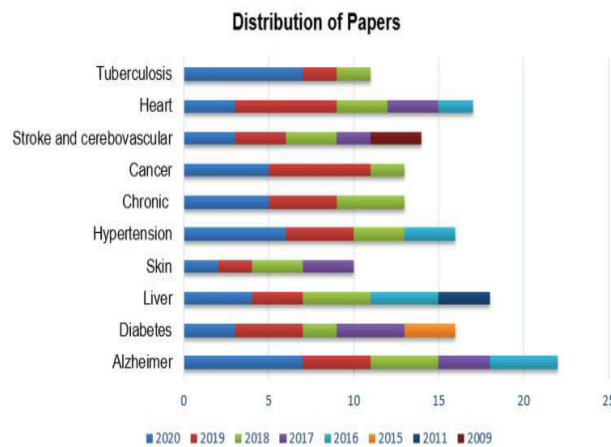
AI in mental health: AI is utilized to customize treatment strategies in the field of mental health. Artificial intelligence (AI) systems can assist in detecting the onset of mental health difficulties and recommend solutions that are specific to each person's circumstances by tracking patterns in speech, behavior, and social media activity. In mental health, where treatment effectiveness can differ greatly from person to person, this individualized approach is essential.

AI in Diagnostics and Imaging in Medicine: One revolutionary advancement in healthcare is the incorporation of AI into medical imaging and diagnostics. This section looks at how AI is changing pathology and radiology by introducing previously unheard-of levels of efficiency and precision. We will examine the growing importance of AI in improving diagnostic procedures and go over particular instances of AI systems in imaging technologies like CT and MRI scans.

AI in ultrasound: AI is having a big impact on a lot of different ultrasound applications. For instance, AI systems are utilized in cardiac imaging to evaluate cardiovascular function by analyzing pictures from electrocardiography scans [27]. They are able to measure metrics such the ejection fraction, which shows h

AI in X-ray analysis: AI is transforming X-ray analysis in a number of medical specialties. By improving image analysis for tumor detection, increasing accuracy in identifying benign and malignant lesions, and decreasing false positives and negatives, artificial intelligence (AI) is revolutionizing breast cancer screening in mammography, for example. This streamlines the diagnostic process for prompt and efficient treatment.

The following chart will display the results of a list of research papers published, categorized by the disease.



II. THE ROLE OF AI IN PATIENT CARE AND MONITORING

The development of personalized medicine, a paradigm that customizes medical care to each patient's unique features, has been accelerated by the use of AI in healthcare. This subsection examines how AI plays a key role in advancing this individualized approach and providing before unreachable new insights into patient care:

Customizing therapies based on genetic profiles:

The study of genomics is one of the most important uses of AI in personalized medicine. Large gnomc databases can be analyzed by AI algorithms to find mutations and variants that may affect how a person reacts to particular treatments.

Predictive analytics in drug development: AI is also essential to drug development, especially when it comes to forecasting the reactions of various individuals to a medication. Artificial intelligence (AI) algorithms can forecast how well medications will work for different demographic groups by examining past data from clinical trials and patient records. When creating clinical studies and creating medications that work better for particular patient groups, this predictive ability is crucial. AI has advanced remarkably in medication development in recent years.

Tailoring treatment regimens: AI systems are skilled at combining and evaluating a wide range of health data, including test findings, clinical records, lifestyle data, and environmental influences. Healthcare professionals can develop more thorough and individualized treatment regimens thanks to this capability. For example, AI may evaluate information from blood sugar measurements, nutrition logs, and wearable technology to suggest tailored lifestyle and pharmaceutical changes for improved management of chronic conditions like diabetes.

India's AI India's healthcare industry is rapidly changing due to artificial intelligence (AI), which is providing answers to persistent problems including accessibility, cost, and care quality. Recent studies and papers shed light on the state of affairs, anticipated growth, and ongoing difficulties in incorporating AI into Indian healthcare.

Market Expansion and ForecastIn India, the market for AI healthcare is growing quickly. The market is expected to increase at a compound annual growth rate (CAGR) of about 40.50% between 2024 and 2032, from its estimated valuation of USD 0.83 billion in 2023 to USD 17.75 billion by 2032. Market research on ZION Increased healthcare spending, advances in technology, and a growing need for effective healthcare solutions are the main drivers of this expansion.

For instance, during the COVID-19 pandemic, AI tools like Qure.ai's chest X-ray solution were employed to identify patients' risk levels, facilitating timely interventions.

Globe

The market for AI in healthcare is growing significantly on a global scale. The market was estimated to be worth USD 19.27 billion in 2023 and is expected to increase at a compound annual growth rate (CAGR) of 38.5% from 2024 to 2030, reaching USD 187.7 billion. Research Grand View

The growing need for improved patient outcomes, accuracy, and efficiency in the healthcare industry is what is driving this expansion.

The comparison chart provides a comprehensive overview of how AI is being utilized in the healthcare sector in India and globally, highlighting key applications, market growth, challenges, public perception, and recent advancements.

Features	India	Other Countries
Key Applications	Disease diagnosis, basic screenings, administrative assistance	Advanced diagnostics, personalized medicine, surgical support
Market Growth	USD 0.83 billion in 2023, projected to reach USD 17.75 billion by 2032	USD 19.27 billion in 2023, projected to reach USD 187.7 billion by 2030
Growth Rate (CAGR)	40.50% (2024-2032)	38.5% (2024-2030)
Challenges	Data privacy, shortage of skilled tech professionals	Data security, regulatory challenges, integration with existing systems
Public Perception	Generally positive, but concerns over	83% of physicians are

	privacy and accuracy remain	cautious about AI's role in patient care decisions
Recent Developments	Initiatives by startups like Qure.ai, investments in emerging startups	High-level applications in surgical reports, drug discovery, and personalized healthcare

The following figure shows the economic growth of AI in 2023

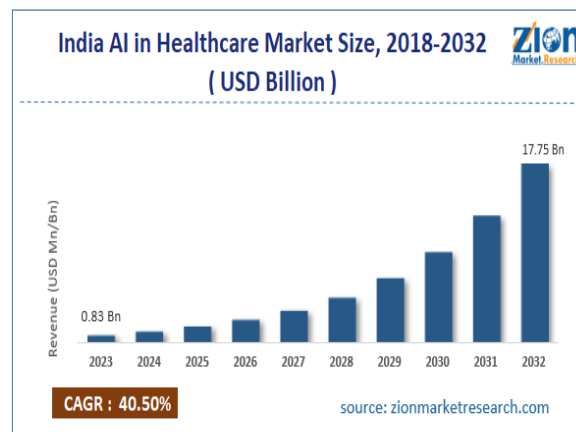


Fig: 4 expected market growth

III. AI IN MANAGEMENT

The study shows that healthcare professionals spend over 35% of their time entering patient information into electronic health records. To address issues like maintaining the confidentiality of patient records from various departments, a hospital administration system was developed. By allowing institutions to handle all of the documentation in one location, it lessens the workload for staff members who organize and review patient records. It can assist in doing a variety of tasks, including:

- Maintain patient data records.
- Maintaining a log of insurance data.
- Remember the contact information.
- Keep the appointment schedule up to date.
- Monitoring the payment of bills
- Pharmaceutical Management
- Financial Management

IV. CHALLENGES IN AI

Implementing AI in public health has tremendous potential but also faces several challenges:

4.1. Security and Privacy of Data Sensitive Information: Sensitive personal information is frequently present in public health data. It is essential to guarantee data privacy and adherence to laws (such as GDPR and HIPAA).

• Security of the internet Risks: Patient confidentiality is at danger due to AI systems' susceptibility to data breaches and cyber-attacks.

4.2. Availability and Quality of Data • Inaccurate or Incomplete Data: The accuracy of AI models may be impacted by biased, inconsistent, or incomplete public health data. • Data Integration Challenges: Incompatible formats and standards can make it challenging to integrate data from many sources, such as labs, hospitals, and public health organizations.

4.3. Moral Issues • Bias and Fairness: Prejudices from past data may be inherited by AI algorithms, producing unfair or discriminatory results. • Transparency and Accountability: Because AI models are "black boxes," it can be challenging to comprehend how decisions are made, which raises questions about accountability.

4.4. Resource and Infrastructure Limitations • Expensive: A substantial financial commitment is needed to develop and sustain AI systems. • Lack of Infrastructure: The application of AI is hampered in low-resource environments by a lack of sophisticated computer infrastructure.

4.5. Workplace Difficulties • Skill Gap: There is a dearth of qualified experts in both public health and artificial intelligence. • Using new technologies because they are unfamiliar or untrustworthy.

4.6. Legal and Regulatory Obstacles • Lack of Standardization: Inconsistencies arise because there are no common

4.7. Ethical Use and Public Trust

• Public Perception: Adoption of AI may be hampered by public skepticism and anxiety over data exploitation.
• Ethical AI Use: It can be difficult to guarantee that AI is applied ethically, particularly in delicate fields like illness surveillance and prediction

4.8. Scalability and Implementation

• Pilot to Scale: Many artificial intelligence solutions are still in the pilot stage and have trouble expanding to larger populations.
• Integration with Current Systems: It can be difficult and time-consuming to integrate AI tools with current public health systems.

4.9. The capacity for interpretation and action

• Complex Outputs: AI models frequently generate intricate results that call for professional interpretation.
• Actionable Insights: It can be difficult to convert AI forecasts into practical public health measures.

4.10. Cross-disciplinary Collaboration • Communication Gap: Data scientists, medical professionals, and legislators must work together effectively; however, this is frequently the case.

V. CONCLUSIONS

An extensive analysis of the important role AI is playing in transforming healthcare has been presented in this study. AI has demonstrated its revolutionary effects in a number of fields, such as clinical decision-making, hospital operations, medical imaging, diagnostics, and patient care via wearable technology and virtual assistants. AI has the potential to transform the healthcare industry by providing improved diagnosis accuracy, enabling customized therapies, and maximizing operational efficiency. AI provide such great improvements, but there are certain obstacles in them if we want to overcome those obstacles, it costs us a lot of money at the same time, only by spending a lot of money can identify the accuracy of diseases in it.

REFERENCES

1. Rajpurkar, P.; Chen, E.; Banerjee, O.; Topol, E.J. AI in health and medicine. *Nat. Med.* **2022**, *28*, 31–38.
2. Ghafur S, van Dael J, Leis M, Darzi A, Sheikh A. Public perceptions on data sharing: key insights from the UK and the USA. *Lancet Digit Health.* 2020;2(9):e444-e446.

3. Esteva, A.; Kuprel, B.; Novoa, R.A.; Ko, J.; Swetter, S.M.; Blau, H.M.; Thrun, S. Dermatologist-level classification of skin cancer with deep neural networks. *Nature* 2017, 542, 115–118.
4. Rajkomar, A.; Dean, J.; Kohane, I. Machine learning in medicine. *N. Engl. J. Med.* 2019, 380, 1347–1358.
5. Topol, E.J. High-performance medicine: the convergence of human and artificial intelligence. *Nat. Med.* 2019, 25, 44–56.
6. Yala, A.; Bauer, A.; Narayan, S.; Lehman, C.D.; Barzilay, R. A deep learning model to triage screening mammograms: A retrospective study. *Lancet Digit. Health* 2019, 1, e22–e29.
7. Liu, Y.; Chen, P.H.C.; Wang, L.; et al. Artificial intelligence in health care: Anticipating challenges to ethics, privacy, and equity. *JAMA* 2020, 323, 1673–1674.
8. Beam, A.L.; Kohane, I.S. Big data and machine learning in health care. *JAMA* 2018, 319, 1317–1318.
9. Sharma, A.; Dey, N.; Ashour, A.S. Computational intelligence in healthcare: insights from the Indian healthcare system. *Springer* 2020, 3, 102–110.
10. Dilsizian, S.E.; Siegel, E.L. Artificial intelligence in medicine and cardiac imaging: From promises to practice. *JACC Cardiovasc. Imaging* 2019, 12, 255–271.
11. Yu, K.H.; Beam, A.L.; Kohane, I.S. Artificial intelligence in healthcare. *Nat. Biomed. Eng.* 2018, 2, 719–731.
12. Esteva, A.; Chou, K.; Yeung, S.; et al. Deep learning-enabled medical computer vision. *IEEE Trans. Med. Imaging* 2020, 39, 1178–1189.
13. Choi, E.; Schuetz, A.; Stewart, W.F.; Sun, J. Using recurrent neural networks for early detection of heart failure onset. *J. Am. Med. Inf. Assoc.* 2017, 24, 561–566.
14. Miotto, R.; Wang, F.; Wang, S.; et al. Deep learning for healthcare: Review, opportunities, and challenges. *Brief. Bioinform.* 2018, 19, 1236–1246.
15. Naylor, C.D.; Shaw, J.; Watts, A.; et al. Predicting health outcomes using machine learning: A review of the current state of the art. *Lancet Digit. Health* 2021, 3, e354–e365.
16. Raghu, A.; Steinhubl, S.; Chandra, S.; et al. Predicting heart disease risk with artificial intelligence: State of the art. *J. Am. Coll. Cardiol.* 2020, 75, 923–930.
17. Kermany, D.S.; Goldbaum, M.; Cai, W.; et al. Identifying medical diagnoses and treatable diseases by image-based deep learning. *Cell* 2018, 172, 1122–1131.
18. Yang, Q.; Yu, H.; Xu, Y.; et al. Artificial intelligence for healthcare applications: Medical data analysis. *Comput. Biol. Med.* 2020, 122, 103801.
19. Agarwal, R.; Duh, M.S.; Fleisher, L.A. Artificial intelligence and its application in surgical decision-making. *JAMA Surg.* 2020, 155, 319–320.
20. Zhang, Y.; Zhang, Y.; Deng, C.; et al. AI in diagnostic radiology: Opportunities and challenges. *J. Med. Syst.* 2020, 44, 24.
21. Rajpurkar, P.; Irvin, J.; Zhu, K.; et al. Deep learning for chest radiograph diagnosis: A retrospective comparison of the CheXNet algorithm to practicing radiologists. *PLOS Med.* 2018, 15, e1002686.
22. Litjens, G.; Kooi, T.; Bejnordi, B.E.; et al. A survey on deep learning in medical image analysis. *Med. Image Anal.* 2017, 42, 60–88.
23. Shen, D.; Wu, G.; Suk, H.I. Deep learning in medical image analysis. *Annu. Rev. Biomed. Eng.* 2017, 19, 221–248.
24. Le, N.Q.K.; Nguyen, M.N.; Moustafa, N.; et al. A novel deep learning-based method for detecting lung cancer in medical images. *IEEE Access* 2020, 8, 35856–35867.
25. Alom, M.Z.; Taha, T.M.; Yakopcic, C.; et al. 3D deep learning models in medical image analysis. *Comput. Biol. Med.* 2018, 100, 124–134.
26. Razzak, M.I.; Imran, M.; Xu, M. Big data analytics for preventive medicine. *Comput. Biol. Med.* 2018, 100, 124–135.
27. Zhu, W.; Zhang, X.; Zhang, X.; et al. Application of deep learning for predicting hospital readmission and other health outcomes. *IEEE Access* 2020, 8, 21452–21461.
28. He, K.; Zhang, X.; Ren, S.; Sun, J. Deep residual learning for image recognition. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)* 2016, 770–778.
29. Rajpurkar, P.; Chen, E.; Banerjee, O.; et al. AI for radiology in healthcare: A critical review. *IEEE Trans. Med. Imaging* 2021, 40, 1736–1748.
30. Esteva, A.; Robicquet, A.; Ramsundar, B.; et al. A guide to deep learning in healthcare. *Nat. Med.* 2019, 25, 24–29.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details