ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

A systematic review of recent advancements and Applications of Artificial Intelligence in Health Care.

Shetty Balija Deepthi **Shashikiran** **Sharvari Rao**

Dr. Aslam B Nandyal

[1,2,3,4]**Alva's Institute of Engineering and Technology**

deepthishettybalijadeepthi@gmail.com 4al21cs136@gmail.com sharvariraocks619@gmail.com aslam@aiet.org.in

ABSTRACT: Using AI technology to raise the standard and efficacy of healthcare services is the aim of the rapidly expanding artificial intelligence domain (AI) in healthcare. AI, which makes use of machine learning algorithms and sophisticated data analytics, may assist with several areas of healthcare, including diagnosis, treatment planning, and patient monitoring.Human-machine intelligence (AI) systems analyze vast amounts of medical data to identify patterns, predict outcomes, and aid in decision-making. This might improve accuracy, reduce mistakes, and enhance The manner in which medical care is provided. However, problems with data privacy, algorithm bias, and ethical issues must be resolved to guarantee the moral and appropriate application of AI in healthcare. Exciting AI advancements have the potential to drastically change the healthcare industry.

Key Words: Diagnostic imaging, Drug discovery and development, Remote patient observation, Natural language processing in EHR's, Surgery and robotics, Predictive analytics and personalized medicine**.**

I. **INTRODUCTION:** Human-machine intelligence (AI) and healthcare have experienced a remarkable rise in recent years, completely changing the field of medicine Regarding diagnosis, treatment, and scientific methods. Enhancing performance, accuracy, and individualized treatment plans are all potential benefits of integrating AI technologies into healthcare systems. This systematic review attemptsto thoroughly investigate and analyze the most recent advancements in AI applied to healthcare and challenges faced.Throughout history, the healthcare sector has generated vast amounts of information from
clinical imaging, medicinal trials, and affected person statistics. Researchers and practitioners haveadvanced progressive solutions to increase diagnostic accuracy, optimize remedy plans, and streamline procedures by utilizing AI's skills in fact machine learning, pattern recognition, and analysis. Reviewing a wide range of AI applications in healthcare, including natural language processing, robotics,diagnostic imaging ,predictive analytics etc,this paper methodically classifies and evaluates them.As we explore go deeper into the subject of Human-machine intelligence (AI), it becomes necessary to critically evaluate the advantages, disadvantages. Healthcare professionals, legislators, and researchers are a some of the stakeholders who must comprehend the implications of artificial intelligence (AI) in order to appropriately navigate the rapidly changing landscape and ensure that AI adoption is compliant with legal requirements and patient-centric ideals.This review compiles the most recent research to provide a thorough analysis of the state-of-the-art AI initiatives in healthcare.The goalof this comprehensive review isto offer details regarding identifying knowledge gaps, and adding to the ongoing discussion about the revolutionary role of AI in altering healthcare shipping and outcomes[22].

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

II. **Surgery and Robotics**: The groundbreaking combination of surgery and robots has revolutionized traditional surgical procedures in the medical sector. The historically developing area of surgery has experienced a significant transformation with the introduction of robots.

Robotic surgery is used in many different domains, such as orthopaedics, cardiothoracic surgery, urology, general surgery, and gynaecology. Numerous benefits of robotic surgery include enhanced visualization, reduced invasiveness, reduced blood loss, and accelerated recuperation times. However, there are several difficulties that must be carefully considered, such as as the high cost of robotic systems, the learning curve for surgeons, the absence of haptic input, and the implications for society and ethics. Looking ahead, developments in artificial intelligence, telesurgery, robotic component miniaturisation, and augmented reality integration are all part of the future trajectoryof surgery and robotics. Informed consent via open communication, patient access and equity, and regulatory monitoring to guarantee safety and effectiveness are all stressed by ethical considerations. Empirical examples show the real-world successes and advancements made in the field, such as the successful robotic heart surgery done at the Cleveland Clinic. When everything is considering, using robots in surgery represents a paradigm change with significant potential toenhance patient outcomes. That being said, future developments and moral dilemmas will determine how this innovative collaboration develops[8]-[9]-[10]-[19].

III. **Predictive analytics and personalized medicine:** By fusing individualized care with data-driven insights, personalized medicine and predictive analytics are two cutting-edge concepts in the healthcare sector that are revolutionizing patient care.

By using data to predict future health outcomes, predictive analytics helps healthcare practitioners proactively address possible problems. Predictive analytics finds patterns, trends, as well as risk elements linked to diseases by examining large datasets and using machine learning techniques. Clinicians can anticipate the development of an illness, avoid complications, and allocate resources as efficiently as possible with this proactive approach. Analytics that predict, can be used, for example, to identify patients who are more likely to develop a particular ailment, opening the door to early intervention and individualised preventive care. Precision medicine, another name for personalised medicine, is a patient-centered approach that customises medical care to each patient's unique needs. Beyond heredity, this personalisation takes into account lifestyle, surroundings, and patient preferences. Thanks to developments in genomics and molecular profiling, medical practitioners may now better comprehend each patient's own biological composition, which enables the development of tailored treatments. Clinicians can find specific indicators and recommend medications that have the lowest chance of side effects by analysing the genetic code of a patient. The shift away from the one-size-fits-all approach towards precision medicine offers more customised and efficient healthcare solutions.

The amalgamation of personalised medicine with predictive analytics has significant potential to revolutionise the provision of healthcare services. By identifying possible health concerns and directing individualised actions, predictive analytics improves patient outcomes. Personalised medicine,yet, ensures that these interventions are customised to the unique qualities of every patient, increasing The efficiency of treatment. A more proactive, patient-centered, and effective healthcare system is made possible by the integration of these strategies. Treatments are not only timely and targeted, but they also stop theprogression of diseases and enhance overall health outcomes. As technology and understanding of biological systems continue to progress, the synergy between predictive analytics and personalized medicine is poised to play an essential part in the future of healthcare[16]-[17]-[18].

IV: Remote patient monitoring: Remote patient monitoring (RPM) is a cutting-edge method of providing healthcare that uses technology to keep an eye on patients outside of traditional hospital settings. Using digital platforms, wearable sensors, and linked gadgets, this method collects andtransmits patient data to healthcare providers in real- time. Vital health metrics are tracked and transmitted using a range of gadgets, such as wearable sensors, smart devices, and home monitoring equipment, in the context of remote patient monitoring. These devices can track your heart rate, blood pressure, andglucose levels, and vital signs, among other things. The collected data is thensecurely transmitted to physicians, allowing for continuous patient health status monitoring.

There are several advantages connected to the implementation of remote patient monitoring. First of all, it makes it possible for medical professionals to monitor patients with long-term illnesses carefully in their daily lives, which helps with early problem detection and lessens the frequency of hospital stays. On the other hand, because they can control their diseases from the comfort of their homes, patientsenjoy more convenience and a higher quality of life. When patients take a more active role in their own care, RPM may also improve patient engagement. For Remote patient surveillance is used

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

in the management of chronic illnesses such as diabetes, hypertension, and heart failure, is especially helpful. Medical professionals can minimize problems and reduce the overall burden on the healthcare system by keeping a close eye on vital signs and relevant health indicators and acting quickly to intervene when abnormalities arise. The COVID-19 outbreak has increased the use of remote patient monitoring since it may deliver care while decreasing in-person interaction.

Telehealth services have become essential components of modern healthcare delivery because of their integration with remote patient monitoring. Future advancements in synthetic intelligence and machinery learning, for example, should further enhance remote patient monitoring and enable more accurate predictive analytics and personalised treatments.

To sum up, remote patient observation offers a proactive and patient-centric approach, which is a revolutionary change in the manner in which medical care is provided. The potential for remote patient monitoring to improve patient outcomes, lower healthcare costs, and create a more efficient and sustainable healthcare system by utilising technology to gather and analyse real-time health data[3]-[4]-[20].

v. **Diagnostic imaging:** Diagnostic imaging is essentialto contemporary medicine because it gives medical professionals non-invasive means of seeing and assessing the insides of patients' bodies. This broad discipline includes an assortment of imaging techniques, each of which provides a distinct perspective on a different facet of anatomy and pathophysiology. Ionising radiation is used in X-rays, a basic imagingtechnique, to produce finely detailed images of bones and some soft tissues. X-ray imaging is frequently used to test for diseases like pneumonia, diagnose joint problems, and find fractures. CT scans provide cross-sectional images ofthe body byusing X-rays taken from various angles. This modality offers more clarity and detail, making it effective for diagnosing diseases in the musculoskeletal system, brain, chest, and belly[3].

CT is particularly useful for detecting abnormalities, wounds, and tumors in many organs. MRI uses powerful magnets and radio waves to produce incredibly detailed images of soft tissues, organs, and the central nervous system. Visualizing the brain, spinal cord, joints, and organs such as the heart isvery beneficial. MRI is a highly versatile diagnostic tool that offers superior contrast resolution without the need of ionizing radiation. High-frequency sound waves are used in ultrasound imaging to produce real- time images of interior structures. It is frequently used in obstetrics toassess organs such as the liver, kidneys,and cardiovascular system additionally to tracking fetal development. By giving useful information, techniques such as PET (positron emission tomography) and single-photon emission computed tomography (SPECT) help in the diagnosis and follow-up of conditions like cancer, heart problems, and neurological illnesses. A particular kind of X-ray called a mammogram is used to visualize the breast.

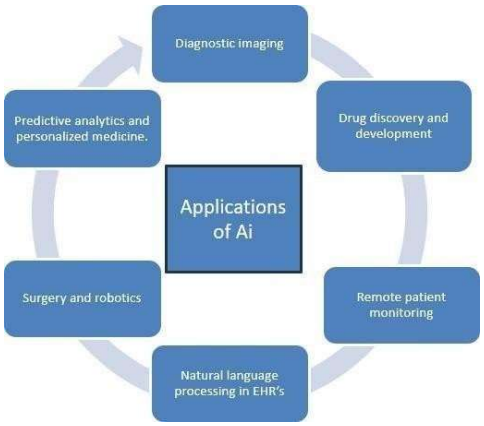
It's an essential tool for the early detection of abnormalities and the timely intervention that improves results in the screening and diagnosis ofbreast cancer. In interventional radiology, imaging methods are combined with minimally invasive treatments.

Using real-time imaging guidance, radiologists can conduct treatments such as angioplasty, embolization, and biopsies that would otherwise need traditional surgery. Diagnostic imaging has revolutionized the healthcare sector by enabling medical personnel to observe, recognize, and monitor a variety of medical conditions. The continued advancement of imaging technology leads to improved results for patients and aids in selecting the most appropriate course of treatment by enabling earlier and more accurate patient identification.Which imaging technique is best suited depends on the clinical circumstances, highlighting the significance of a multidisciplinary approach in the field of diagnostic imaging[21].

vi. **Natural language processing in EHR's:** Technological developments are driving a major revolution in the dynamic and complex world of healthcare. Processing of natural language (NLP) is one of the ground-breaking technologies that is revolutionising the way healthcare practitioners use and Engage in communication with Electronic Health Records (EHRs). This in-depth article explores the history, uses, advantages, difficulties, and potential future developments of this revolutionary partnership as it dives into the complex interaction between NLP and EHRs.The introduction of electronic data processing to manage patient data in the early 1960s marked the beginning of the journey towards digital healthcare

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

records. But the idea of EHRs didn't take off until the latter half of the 20th century. Initially, the maingoal of the primitive EHRs was to digitise simple patient data. Technology breakthroughs, government regulations, and the growing demand for all-encompassing patient care have propelled the development of EHRs into complex systems that do more than just store data over time. The Role of Natural Language Interpretation in Healthcare is the interaction between the language of humans and computers is the focus of the artificial intelligence subfield of natural language processing, or NLP. NLP serves as a link in the healthcare industry between structured, usable data and unstructured clinical narratives. Its use in electronic health records (EHRs) solves the problems caused by the volume of textual data in these records. Radiology reports, discharge summaries, and physician notes are merely a few examples of the unstructured data it is located in EHRs. To ensure that translate these tales into a structured framework for analysis, NLP is essential in helping to interpret and extract pertinent information from them.The semantic meaning of words, sentences, and context in clinical narratives is understood by NLP algorithms. This skill enables a deeper comprehension of the data, facilitating more precise extraction and interpretation. Using processing of natural language (NLP) to automatically gather relevant data from unstructured narratives improves the completeness and quality of healthcare documentation. This guarantees a more accurate and thorough portrayal of the patient's medical history while also lessening the workload for medical personnel.NLP has the capacity for automate billing and coding procedures. NLP algorithms can automatically assign the right medical codes based on clinical note analysis, which streamlines administrative operations and reduces errors in the reimbursement process. Through the analysis of massive amounts of textual data, NLP aids in the development of sophisticated CDSS. Based on the patient's history and present clinical state, these systems offer tailored treatment recommendations, highlight potential hazards, and give pertinent information to medical experts. Insights from EHRs can be extracted more broadly with the help of NLP, which helps with population health management. Healthcare organisations can improve public health through the execution of targeted interventions and preventive measures according to the determination of similarities, risk factors, and trends within patient populations. Efficiency is greatly increased by the data automation extraction and structuring procedures with NLP. A simplified process results from healthcarepersonnel spending more time on patient care rather than entering data by hand. Efficiency is greatly increased by the automation of data extraction and structuring procedures with NLP. A simplified process results from healthcare personnel spending more time on patient care rather than entering data by hand. The creation of individualised treatment programmes is aided by NLP's capacity to extract pertinent patient data[5]-[6]-[7].



VII .Challenges :

A. Data Security and Privacy:

The primary concern with in the context of artificial intelligence (AI), data security and privacy in healthcare is the sensitivity of healthcare data. This necessitates taking deliberate steps to preserve and respect affected person privacy as a moraland legal necessity. This intricate project employs a variety of tactics, such as the use of strong encryption protocols to safeguard sensitive data, close observance ofinformation access controls to limit and control the dissemination of statistics, and a vigilant commitment to guaranteeing adherence to stringent records protectionlaws, like the European Union's General Data Protection Regulation (GDPR) and the Portability and Accountability of Health Insurance Act (HIPAA)[19]-[12]-[13]-[14].

B. Data Quality and Standardization:

Data quality and Standardization represent a critical problem in the complicated landscape around the application of artificial intelligence (AI) in healthcare.This issue results from inconsistent or poor-quality data, which puts AI models' gold standard performance at risk due to capacity issues. Taking a complex approach to this project means investing strategically in comprehensive information cleansing and preprocessing techniques, proactively implementing strong facts exceptional assurance measures, and standardizing records codecs and terminologies to ensure uniformity and compatibility. These elements come together to create a comprehensive strategy that seeks to lower the risks associated with shaky fact assets, guarantee a foundation of integrity and consistency within the complex world of of AI-enabled healthcare technology, and improve the accuracy and reliability of input data all of which are necessary for the efficient operation of AI models, decision-making, and overall outcomes for affected parties.

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

C. Interoperability:

The complex field of healthcare presents challenges for interoperability since disparate healthcare systems employ disparate formats and standards, making smooth data interchange challenging. To ensure that overcome this obstacle, interoperability standards like Fast Healthcare Interoperability Resources (FHIR) must be actively promoted, standardized data exchange protocols must be created and implemented, and healthcare IT providers must collaborate to form a cohesive approach that addresses interoperability issues, promotes cohesive data sharing, and creates a unified framework that enhances the efficency and productivity of healthcare systems. In the end, this results in better patient care, more efficient workflows, and the achievement of interoperable technology' full potential to advance healthcare service delivery.

D. Combination with Existing Workflows

The problem of incorporating artificial intelligence (AI) into current workflows in the rapidly evolving field of healthcare innovation centers on the integration's ability to cause disruption. To address this difficulty, methods for overcoming resistance to change, the necessity of staff training to adjust to the latest technologies, and the possibility of delays in established processes must be identified and navigated. Proper planning, stakeholder engagement, and the active participation of healthcare staff are crucial for ensuring a smooth and successful adoption of artificial intelligence (AI) features into established workflows, which will ultimately promote efficiency,raise the standard of care for patients, and realize the transformative potential of AI in expanding healthcare delivery[12]-[13]-[14]-[15].

E. Ethical Concerns and Bias:

Managing the complicated terrain of artificial intelligence (AI) use in healthcare involves ethical problems and bias since models produced with AI have the potential to perpetuate biases embedded in training data, leading to unfair outcomes. An all-encompassing strategy is required to deal with this issue. This entails recognizing the inherent difficulties in upholding moral principles, avoiding bias, and guaranteeing fairness in AI algorithms;advocating for systematic dataset curationto lessen prejudice; and formulating comprehensive ethical standards to guide the advancement and use of AI technologies[12]-[14]-[15].

F. Cost and Resource Constraints:

The implementation and maintenance of artificial intelligence (AI) applications in the healthcare industry provide a challenge due to cost and limited resources. These stem from the significant financial commitments necessary for implementation of technology, construction of infrastructure, and training of staff. This problem is especially acute for smaller healthcare organizations, which could have fewer resources both financially and technically. To ensure that reduce this difficulty, resources must be strategically allocated, affordable artificial intelligence solutions must be investigated, and assistance from governmental and business alliances must be sought.To ensure that promote innovation, guarantee that the advantages of artificial intelligence in healthcare are widely accessible, and improve patient outcomes in a range of healthcare applications It is essential that financial and resource limitations be overcome[19]-[12]-[13]-[14].

CONCLUSION: This systematic review provides an extensive overview of recent advancements in AI in the healthcare industry, emphasizing the transformative power and promise of these technologies. Artificial intelligence (AI) has the potential to completely transform healthcare practices because of its many applications, which include customized treatment plans, remote patient monitoring, drug discovery, and accurate diagnosis.

In the healthcare industry, artificial intelligence (AI) improves clinical decision-making and streamlines operational processes, resulting in increased productivity and simpler patient access.

It is critical to address the challenges related to data privacy, ethical issues, Combination with Existing Workflows and Cost and Resource Constraints in addition to the many benefits and opportunities that artificial intelligence brings. Maintaining justice, respecting ethical standards, and protecting patient privacy must all be carefully balanced in the proper application of AI technologies. Maintaining confidence among patients, healthcare providers, and other stakeholders requires ongoing efforts to resolve these issues.

Future applications of AI in healthcare seem to have a bright and exciting future.The future course of artificial intelligence applications will be greatly influenced by ongoing research and development as well as cooperation between the healthcare sector, government agencies, and IT companies. Future developments could lead to better explainability, interoperability, and expanded applications in fields like clinical trials and telehealth. These developments may result in a time when AI will be seamlessly integrated with healthcare procedures to improve patient outcomes and completely transform the medical field.

This systematic analysis essentially highlights the need fora comprehensive approach to address the associated challenges and fully realize the benefits of artificial intelligence in healthcare. It is crucial that we respect the principles of transparency, accountability, and ethical considerations as we travel this new path in order to guarantee the proper and long-lasting integration of AI technology in the rapidly evolving healthcare industry.

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 10, Issue 5, May 2024

References:

1. [Artificial intelligence **in** diagnosticimaging**: impact on the radiography profession**] https://www.birpublications.org/doi/full/10.1259/bjr.20190840

2. [Artificial intelligence **in** diagnosticimaging**: status quo, challenges, and future opportunities**] https://journals.lww.com/thoracicimaging/abstract/2020/05001/artificial_intelligence_in_diagnostic_imaging_.3.aspx

3. [Remote patient monitoring **using** artificialintelligence**: Current state, applications, and challenges**] https://wires.onlinelibrary.wiley.com/doi/full/10.1002/widm.1485

4. [Remote patient monitoring**: a systematicreview**] https://www.liebertpub.com/doi/abs/10.1089/tmj.2019.0066

5. [Artificial intelligence **approachesusing** natural language processing **to advance** EHR**-basedclinical research**] https://www.sciencedirect.com/science/article/pii/S0091674919326041

6. [**Application of** natural language processing **in** healthcare] https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119818717.ch21

7. [**Using clinical** natural language processing **for** health **outco mes research: overview and actionable suggestions for futureadvances**] https://www.sciencedirect.com/science/article/pii/S1532046418302016

8. **Introduction to** AI**-driven** surgical robots https://f.oaes.cc/xmlpdf/cccaccf3-537d-41e9-911f-c56837269138/5701.pdf

9. [Artificial intelligence **andthe future of** surgicalrobotics] https://journals.lww.com/annalsofsurgery/Fullt e xt/2019/08000/Artificial_Intelligence_and_the_Future_of_Surgical.7.as

10. [**What is** artificialintelligence surgery] https://f.oaes.cc/xmlpdf/12698bfb-9a4f-4399-9885-6955f9c3d8de/3890.pdf

11. [Opportunities and challenges of artificialintelligence in healthcare] https://www.e3s-conferences.org/articles/e3sconf/pdf/2019/36/e3sconf_spbwosce2019_02028.pdf

12. [AI ApplicationsinHealthcare a Comprehensive ReviewofAdvancements and Challenges] https://www.ijsdcs.com/index.php/IJMESD/article/view/400

13. [AI in health: state of the art, challenges, and futuredirections] https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-1677908

14. HealthcareServices: A Predictive Analytic Perspective] https://www.igi-global.com/chapter/ai- driven-prognosis-and- diagnosis-for- personalized-healthcare-services/251143

15. [Predictive Analysis in Health Care System UsingAI] **https://www.researchgate.n et/profile/Archana-Hombalimath/publication/3 55780402_Analytics_and_Big_Data_in_the_Health_ Domain/links/61947e27d7d1af224bfaea4b/Analytics- and-Big-Data-in-the- Health-Domain.pdf#page=125**

16. [Artificial intelligence **with** robotics **in healthcare:a narrative review of its viability in India**] https://www.cureus.com/articles/116306-artificial- intelligence-with-robotics-in-healthcare-a- narrative-review-of-its-viability-in-india.pdf\

17. . [Remote patient monitoring**: a comprehensive study**] https://link.springer.com/article/10.1007/s1265 2-017-0598-x

18. [Diagnostic image **quality assessment and classification in medical** imaging**: Opportunitiesand challenges**]

19. [Artificial intelligence (AI) **in** healthcare **and research**] **https://healthcare.report/Resources/Whitepapers/31b40935-fca9-4018-b44b- 1c08034d11c4_Artificial- Intelligence-AI-in- healthcare-and- research.pdf**