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Artificial Intelligence in Healthcare: Current Applications and Future Scope - A Comprehensive Review for Medicare

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ABSTRACT: The applications and advantages of artificial intelligence (AI) in healthcare are the main topic of this article, which also emphasizes how AI can enhance clinical practice, translational research, and biomedical research. Explainability, industrial applications, and finding vulnerabilities are the three categories into which AI research is separated, with a focus on industrial applications. By efficiently handling vast amounts of data, artificial intelligence (AI) provides substantial benefits in the healthcare industry through wearables, virtual nursing, digital consultations, disease detection, and patient care. Notwithstanding its advantages, AI has drawbacks, including lack of standardized medical data, irrelevant performance metrics, and methodological flaws. The COVID-19 epidemic made it clear that India needs a strong AI-powered healthcare system, with a focus on moving from paper-based to electronic records. AI minimizes redundant diagnoses, improves imaging, medical histories, clinical decision-making, and aids preventative health initiatives. The paper offers suggestions for creating AI methods that work to raise the standard, safety, and affordability of healthcare.

KEYWORDS: Artificial Intelligence, Healthcare Sector, Biomedical Research, Translational Research, Disease Diagnosis, Information Processing, Role, Impact, Mobile Agent, Multi-agent System, Machine Learning, Network Technology.

I. INTRODUCTION

The term artificial intelligence (AI) describes how machines may mimic human intelligence, including learning and problem-solving. AI was initially applied in healthcare in the early 1950s to support diagnosis through computer-aided testing. AI research and use in healthcare has surged due to recent improvements in computing power and data availability. Clinical decision-making, illness diagnosis, treatment planning, and patient care management are now all done with AI. Large medical datasets are processed and analyzed in order to find trends and offer fresh perspectives. By evaluating enormous volumes of data, AI technologies assist clinicians in making decisions, identifying illnesses, and increasing the precision of diagnoses. The goal of AI in healthcare is to increase its preventive, predictive, personalized, and collaborative aspects. It aids in infection prevention, illness risk detection, and health problem management. While AI and biotechnology produce large amounts of data to improve patient outcomes, digital health innovations have given patients and practitioners access to cutting-edge technologies. By incorporating clinical experience into AI research, models are made relevant and intelligible to healthcare practitioners, ensuring transparency, accountability, and ethical AI deployment.

II. LITRATURE SURVEY

With revolutionary advancements that improve patient care, medical diagnosis, and treatment, artificial intelligence (AI) has played a major role in the healthcare industry. Researchers and medical professionals understand that AI-driven solutions are becoming more and more important for handling enormous volumes of medical data since they enable accurate patient data retrieval and clinical insights that might enhance the provision of medical treatment. A variety of AI frameworks let practitioners provide precise, evidence-based diagnoses and treatment regimens by accessing clinical data from publications, medical textbooks, and standardized medical protocols.

AI has a significant impact on healthcare in areas like error reduction, diagnostic support, and risk prediction. By producing outcomes that are nearly exact, artificial intelligence (AI) can eliminate symptomatic and pharmacological errors that are frequently unavoidable in human medical care. AI devices, for instance, are able to evaluate large patient populations in order to provide predictive analytics and health risk alarms. Automated data processing for Electronic Medical Records (EMR), handicap assessment, and imaging for early disease identification in specialties including cardiology, neurology, and cancer are some of the main uses of AI.

AI-enabled technologies, such as the "ambient intelligent system" RUDO, have demonstrated significant potential in real-world applications for helping people with disabilities, especially those who are blind or visually impaired. By giving them tools for independence and improving their quality of life, RUDO helps blind people navigate their homes ([10]). Using AI-based recommendations, a "smart assistant," another AI application, provides pregnant women with nutritional and medication advice, thereby improving maternal health.

III. APPLICATIONS OF AI IN HEALTHCARE

By enhancing data management, treatment planning, online consultations, virtual nursing, and pharmaceutical administration, artificial intelligence (AI) is revolutionizing the healthcare industry. AI makes it easier to gather, monitor, and arrange medical records, guaranteeing quicker and more dependable access to crucial patient data. Virtual nurses, like Molly, the AI nurse from Sense.ly, keep an eye on patients' health and offer care, especially for long-term diseases. Through applications like AiCure, which employs AI and cameras to confirm appropriate drug adherence, AI also enhances medication management. All things considered, AI improves healthcare accessibility, accuracy, and efficiency, which leads to improved patient care and results. AI is used in treatment design to generate individualized treatment plans based on medical knowledge and medical records, which results in more accurate and efficient care. AI-powered applications such as Babylon eliminate the need for in-person visits by providing online medical consultations and appointment scheduling based on user-provided medical records.

Application Area	Description	Example
Data management	AI enhances the organization, monitoring, and management of patient records, ensuring accessibility and reliability.	Electronic Health Records
Virtual nursing	AI-powered virtual nurses can monitor patient health, provide assistance, and help manage chronic conditions.	Sense.ly's Molly
Digital consultations	Allows remote consultations and scheduling based on patient-provided information.	Babylon Health
Diseases detection	AI tools analyze medical imaging and patient data to identify diseases more accurately and efficiently.	Imaging algorithms for cancer
Personalized treatment	AI develops customized treatment plans by analyzing medical history and patient records.	IBM Watson Health
Medication management	AI systems ensure correct medication adherence and dosage management.	AiCure

Table.1 Application areas where AI is used

IV. BLOCK DIAGRAM RESEARCH IN MEDICARE

Medicare is using AI in novel ways to improve clinical, translational, and scientific research in a number of areas. AI uses complex machine learning algorithms to evaluate large biological data sets, including proteomic and genomic data, in the field of biomedical research. This is a major step toward personalized medicine by allowing researchers to identify the molecular causes of diseases and create individualized treatments for each patient. AI uses predictive modeling in translational research to find people who are more likely to develop a particular disease. Early intervention and the development of individualized treatment plans are made easier by this proactive approach, which may enhance results and lower medical expenses.

Additionally, AI uses natural language processing (NLP) in clinical research to carefully examine clinical data, including electronic health records (EHRs). AI improves clinical judgment and decision-making by identifying patterns in this data, which results in more precise diagnoses and efficient therapies. Figure 1 illustrates these various uses of AI in Medicare, showing how the incorporation of AI into healthcare is spurring innovation and enhancing patient care in a number of ways.

Clinical and community health scenarios are changing as a result of AI's capabilities, which include its broad approaches, varied patterns, and underlying assumptions. Numerous medical applications that have shown notable outcomes throughout time are indicative of this shift. Medicare studies that look into the use of AI in healthcare are carried out according to a number of criteria. These criteria aid in classifying and comprehending the various effects of AI. Application Area (e.g., medical applications, clinical health, community health), Data Type (e.g., biological data, clinical data, electronic health records), Patient Population (e.g., particular age groups, demographics, health conditions), Translation Period (e.g., short-term, long-term, continuous studies), and Study Design (e.g., observational, experimental, longitudinal studies) are some of the components that are depicted in Figure 2. Each of these components is essential to Medicare's application and research of AI, guaranteeing a thorough strategy for enhancing healthcare results via cutting-edge technology.

BLOCK DIAGRAMS:

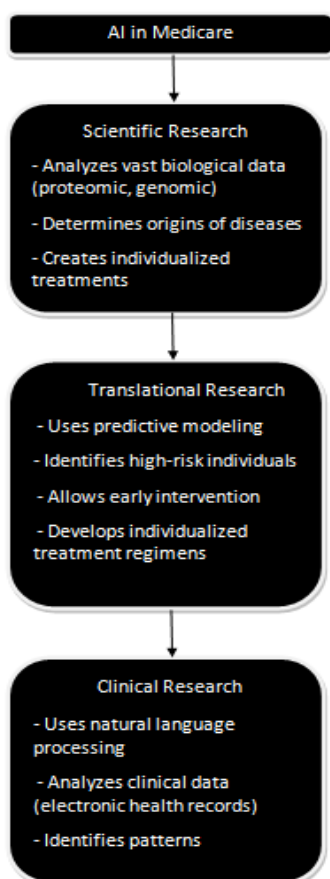


Fig.1 AI medicare in different areas

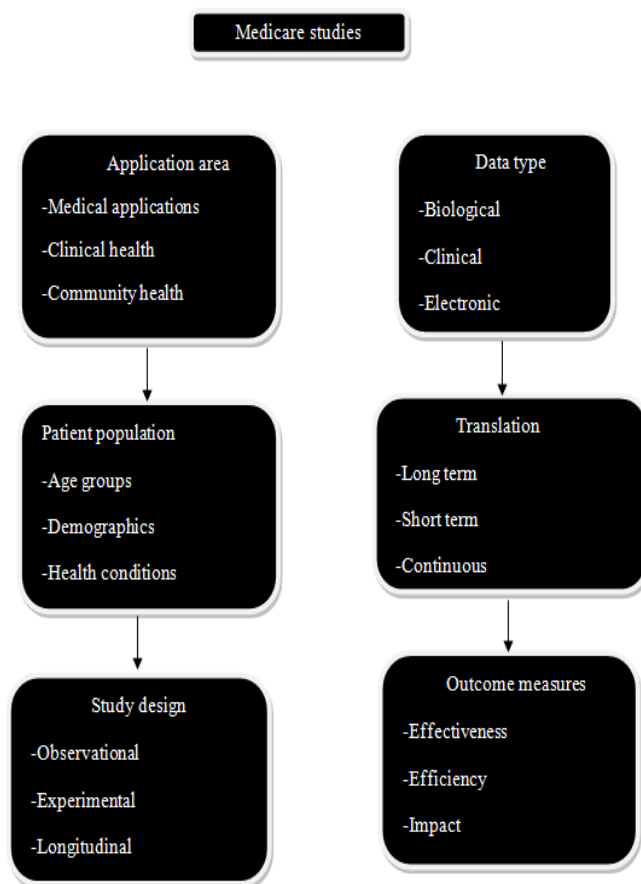


Fig.2 Different elements of medicare studies

V. AI ROLE IN HEALTHCARE SECTOR

By improving diagnosis, treatment, and operational efficiency, artificial intelligence (AI) is transforming the healthcare industry. By detecting questionable regions in mammograms, AI can lessen the necessity for biopsies and assist general practitioners by cutting down on the number of specialist appointments. The efficacy and user readiness of new healthcare technology determine their success. By gathering and evaluating data, lowering the need for human involvement, and improving patient safety, sensor-based robotics enhance hospital operations.

Although there are obstacles in integrating AI into clinical procedures and electronic health record (EHR) systems, some EHR providers are implementing AI analytics. AI's promise in early virus detection was proved during the COVID-19 pandemic. Data security and compatibility are guaranteed by standardizing AI protocols. By creating more datasets, wearable technology and AI can enhance detections and forecasts.

By helping the elderly and doing nursing duties, robotics in healthcare lowers the need for human labor while demonstrating the possibility of highly developed, human-like robots.

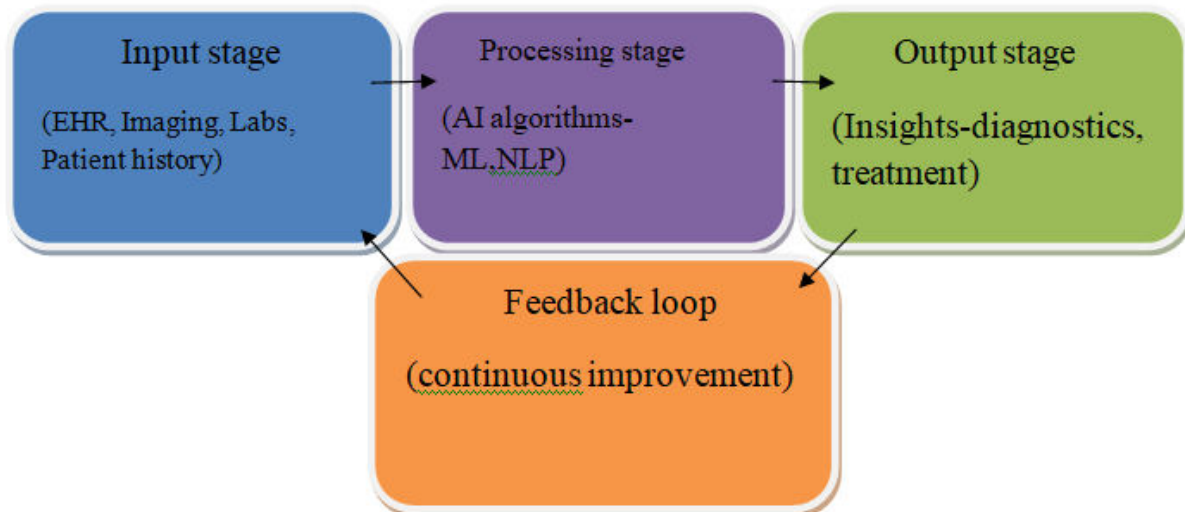


Fig.3 AI role architecture

VI. RESEARCH METHODOLOGY

AI is transforming healthcare by enhancing patient care, clinical research, and diagnostics. In order to provide accurate insights and lower errors in pharmacological and symptomatic therapies, it mines enormous databases using complex algorithms. AI frameworks help doctors provide proper patient care by providing useful clinical data from several sources. By evaluating crucial data from huge patient populations, AI aids in the prediction of health hazards. Clinical data from diagnostic imaging, lab tests, medical records, and demographics are processed by it. AI research is improving EMR techniques, imaging, and disability evaluations, as well as cardiovascular, neurological, and cancer problems. AI-powered wheelchairs and robotic aids are examples of technologies that help persons with disabilities become more independent. In the Medicare sector, AI helps with data management and medication development. AI's many uses are exemplified by devices such as the RUDO system for the blind and intelligent aides for pregnant women. Digital innovations enhance maternal care, while AI-powered exoskeletons assist people with disabilities in walking. AI's contributions to healthcare include drug research, diagnosis, and the provision of vital patient data. Explainable AI (XAI), human-computer interface (HCI), and artificial intelligence (AI) must all be integrated for a responsive healthcare system, particularly in times of crisis like the COVID-19 pandemic.

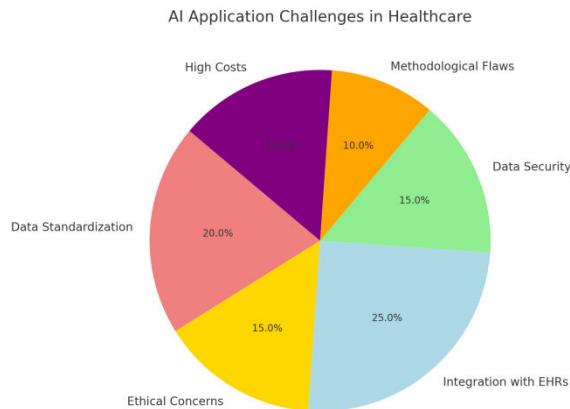


Fig.4 Representation using Pie Chart

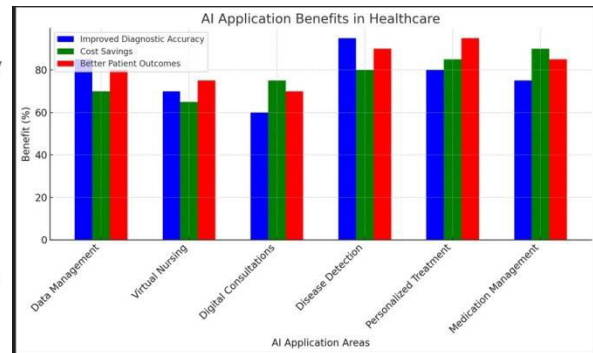


Fig.5 Representation using Bar Graph

VII.CONCLUSION

India's healthcare system has serious problems with equity, affordability, accessibility, and quality. Investing in cutting-edge technologies like machine learning, big data, the internet of things, and artificial intelligence (AI) is essential to addressing issues. By improving disease detection, treatment, and data management, artificial intelligence (AI) in particular has the potential to completely transform healthcare. AI was useful in disease research, patient monitoring, and supplying vital medical information during the COVID-19 epidemic. High prices and accessibility are still obstacles, though. The revolutionary effects of AI in healthcare, encompassing clinical practice, translational research, and biomedical research, are highlighted in this paper. AI's significance is highlighted by its capacity to handle enormous datasets, evaluate medical data, and assist in decision-making. The continued advancement of AI holds promise for resolving present issues and improving healthcare systems' overall efficacy.

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