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The Role of Artificial Intelligence in Revolutionizing Healthcare: A Comprehensive Review

Kajal Gohane[1], Roshini S[2], Komal Pode[3]

[1,3]M. Sc., Microbiology, Student at ClinoSol Research, Hyderabad, Telangana, India
[2]Bachelor of Physiotherapy (BPT), Student at ClinoSol Research, Hyderabad, Telangana, India

ABSTRACT

A breakthrough era that holds enormous promise for increasing patient care, lowering healthcare costs, and improving overall healthcare outcomes has arrived with the integration of Artificial Intelligence (AI) in healthcare. This in-depth analysis examines the several ways in which AI is transforming healthcare, including diagnosis, treatment, drug research, patient management, and administrative procedures. To lay a strong foundation for understanding AI, machine learning, and deep learning applications in healthcare, the examination begins with clarifying their core principles. It explores how AI might be used to analyze large-scale, intricate medical datasets including electronic health records (EHRs), medical imaging, and genomes, enabling the early detection of disease, precise diagnosis, and tailored therapy recommendations. Additionally, AI-driven technologies like natural language processing (NLP) have demonstrated considerable potential in extracting important insights from unstructured clinical notes and research literature, supporting clinical decision support and medical research. AI-powered robotics and automation have also begun to play crucial roles in rehabilitation and minimally invasive surgery, lowering the invasiveness of operations and speeding up patient recovery. The review emphasizes the efforts that are still being made to create AI-driven drug discovery systems that hasten the identification of new treatments and enhance the layouts of clinical trials. By examining trends and patterns in healthcare data, it also examines AI's function in predictive analytics, predicting disease outbreaks, and enhancing population health management. Furthermore, in the context of optimizing healthcare operations and lowering administrative duties, the contribution of AI to administrative tasks such as medical billing, fraud detection, and resource allocation is considered. The review emphasizes the significance of privacy, transparency, and responsible AI deployment while highlighting the ethical and regulatory concerns involved with AI in healthcare. In order to fully realize the potential of AI, it also analyzes potential adoption barriers and the necessity of interdisciplinary cooperation between healthcare experts, data scientists, and legislators. In conclusion, this in-depth analysis offers a complete overview of how AI is altering healthcare and provides insights into its present successes and potential in the future. This effort intends to spur innovation, educate stakeholders, and open the door for a more effective, patient-centered, and accessible healthcare ecosystem by shedding light on the revolutionary effects of AI on healthcare.

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KEYWORDS: *Artificial intelligence, Healthcare, Physical Robots, Medical Diagnosis, Machine Learning, Healthcare Analytics, Electronic Health Record, Patient Care, Clinical Decision Support, Disease Detection, Telemedicine, Electronic Health Records (EHR), Medical Imaging, Drug Discovery, Personalized Medicine, Healthcare Efficiency, Healthcare Transformation, AI Applications, Healthcare Innovation*

INTRODUCTION

The term Artificial Intelligence (AI) describes the methods by which a system can mimic human intellectual processes, such as logic, judgment, extrapolation, or learning from past mistakes, to achieve goals without being explicitly programmed to take certain actions. The healthcare industry has been changing recently as a result of technological improvements. Artificial Intelligence (AI) is one of the most significant forces driving this evolution. The use of AI in modern healthcare systems has quickly advanced from the realm of science fiction. The field of medicine is changing as a result of its capacity to analyse massive volumes of data, make intricate judgments, and aid medical personnel in diagnosis and treatment. Healthcare systems around the world, which struggle, have embraced AI.

Health data are also highly expensive to gather, for example in longitudinal research and clinical trials, therefore they usually require rigorous security once they are gathered. Additionally, the failure of present systems to gather pertinent social and environmental information excludes a crucial group of factors from data streams for individual health, hindering even the most basic computational procedures.

History of AI in medical field

The use of artificially intelligent systems for patient diagnostics has come a long way. For instance, Esteva et al. and Hekler et al. developed classification models using clinical imaging data in the field of visually oriented specialties, such as dermatology, to help doctors diagnose skin cancer, skin lesions, and psoriasis.

In particular, Esteva et al. trained a deep convolutional neural network (DCNN) model using 129,450 images to classify images into one of two categories as either keratinocyte carcinoma or seborrheic keratosis; and malignant melanoma or benign nevus. This problem is known as a binary classification problem in machine learning.

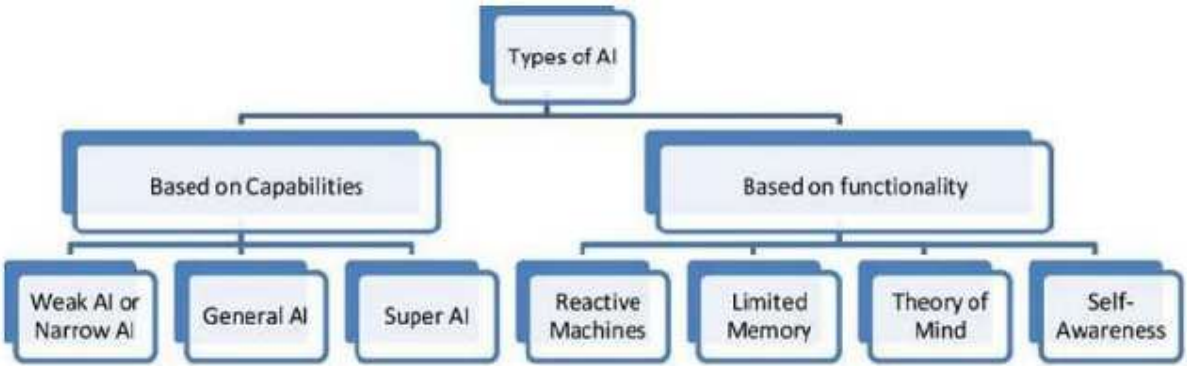
There have been significant advancements in the use of AI systems for medication discovery and offering individualized therapy alternatives.

What Is Al?

Al systems are technological systems that have the ability to process information in a way that approaches intelligent behavior, according to UNESCO. The ability to employ computer programs to carry out activities or reason in a variety of healthcare settings, including diagnosis and treatment, is a condensed definition of artificial intelligence (Al) for healthcare. This intelligence resembles the intelligence that we identify with human intelligence. Al in healthcare also refers to the application of machine-learning algorithms or software to analyze and present complex medical and healthcare data in a manner that mimics human cognition. Data and security, analytics and insights, and shared expertise are the three essential tenets for the successful application of AI in the healthcare industry.

➢ Types of Al

The main categories of Al are based on the capabilities and functions of Al.



Types of AI in relevance to healthcare

Machine learning

One of the most prevalent types of AI is machine learning, which analyzes massive amounts of data to find patterns and make predictions without explicit programming. Deep learning neural networks, a well-established technique in healthcare research and utilized for categorization applications, are the most challenging type of machine learning. The biological activity, absorption, distribution, metabolism, and excretion (ADME) features and physicochemical parameters of pharmacological compounds have been evaluated using machine learning-based algorithms. To give prognosis prediction and the best treatment plan, machine learning algorithms are utilized with massive datasets such genetic information, demographic data, or electronic health records. By using indirect and complicated methods, machine learning (ML) is particularly beneficial for discovering subtle trends in huge datasets that may be missed by humans performing manual studies.

Natural language processing

The area of artificial intelligence known as "natural language processing" (NLP) interprets human language. Several voice recognition programs are included. The two fundamental NLP techniques are statistical NLP and semantic NLP. It is frequently used for tasks like information extraction, turning unstructured data into structured data, and classifying data and documents. Instead of needing to enter certain text sequences or make choices from menus so that a machine can recognize the data, NLP enables physicians to write more organically. The EMR has been subjected to extensive database analysis in order to find adverse events and postoperative problems from medical records.

Rule expert systems

The most basic type of artificial intelligence is a rule-based expert system, which acquires knowledge from human experts and knowledge engineers to create a set of rules for a specific set of input data. Smaller problems should be the focus of these systems because larger ones have more complicated rules that may clash with one another and make solutions more challenging. It gives the programmer the ability to approach problem-solving tasks more naturally, flexibly, and at greater levels of abstraction. In the last fifteen years, basic approaches in this rapidly developing field have been developed and applied to a number of difficult issues of high complexity with notable success by AI researchers.

Physical Robots

Physical robots carry out predetermined tasks when bringing supplies to hospitals, such as lifting, moving, welding, or assembling goods. Artificial intelligence (AI) can be used to diagnose many diseases utilizing robots. These robots are also utilized for diagnosis operations, which is a huge benefit for medical staff because it stops the spread of dangerous radiation. Physical robots have been used in the healthcare industry to increase cost-effectiveness of services like telemedicine, ambient-assisted living, intelligent health management, psychotherapy, and companionship, as well as to expand the digitization of health care work processes. Many hospitals are using robots to help them carry out operations or treatments that call for accuracy, control, and flexibility.

Robotic process automation (RPA)

A technical foundation called robotic process automation aims to eliminate boring and repetitive chores from people's daily workloads. It is software that mimics a virtual workforce of human workers and completes repetitive activities, lessening the workload of humans in the process. RPA primarily uses servers with computer applications, not actual robots. When such routine tasks are programmed, RPA technology has a strong tendency to increase the profits and efficiency of commercial operations. RPA has the advantage of making sure that its applications and tools have good visual designs that can provide patients with improved user experiences. RPA aims to establish a precise framework that anyone with a fundamental understanding of technologies can apply.

Computer vision (CV):

Significant technological advancements have enabled machines to recognize objects and scenes at the same level as humans, and this is known as computer vision. The development of contemporary CV has coincided with the production of significant amounts of digital data in a variety of scientific disciplines. The development of certain traits and abilities is one of the significant applications of AI and computer vision in surgical technology. When diagnosing various illnesses, CV makes use of complex algorithms. It also allows surgeons observe patients' interior organs during surgeries and aids in the early detection of diseases like cancer.

How to Build Effective and trusted AI-Augmented Healthcare Systems?

The usage and implementation of AI in clinical practice remains limited after more than a decade of intense concentration, with many AI products for healthcare still in the design and development stage. While there are various approaches to developing AI systems for the healthcare industry, far too frequently, attempts are made to fit square pegs into round holes, i.e., identify healthcare issues and apply AI solutions without giving the local context (such as clinical workflows, user needs, trust, safety, and ethical implications) the attention it deserves.

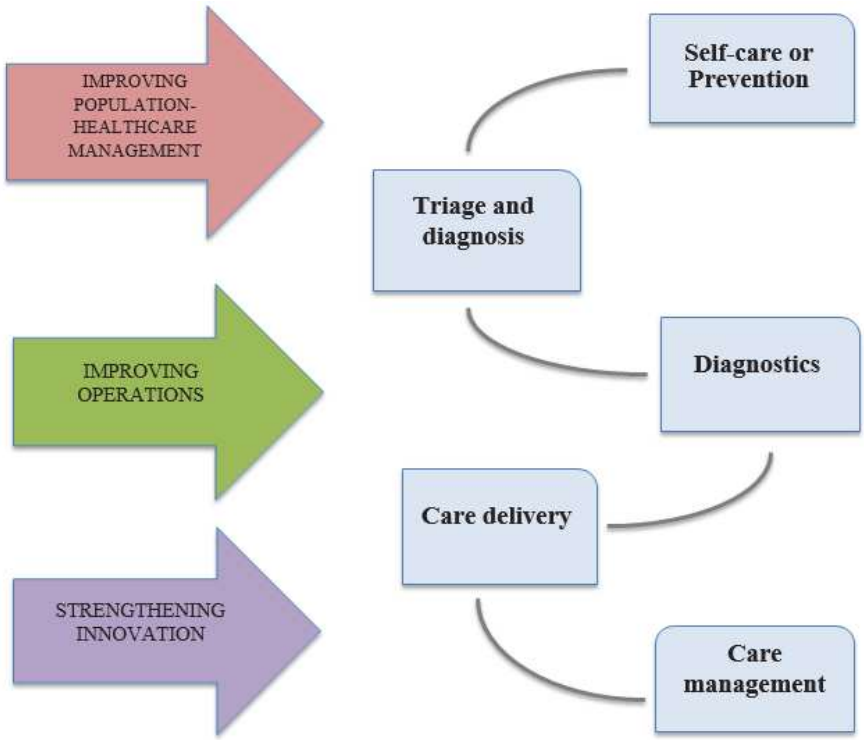
We believe that rather than replacing human intelligence, AI amplifies and augments it. In order to improve efficiency and efficacy, it is crucial when developing AI systems for the healthcare industry to concentrate on rather than replace the critical components of human-human interaction in medicine. Additionally, advancements in AI in healthcare will result from a thorough grasp of the complexity of patient journeys and care pathways from a human-centered perspective.

Artificial Intelligence and Healthcare in India

In India, AI development is still in its early stages. Although there isn't a single regulatory organization in India that is primarily concerned with AI, some steps have been launched. The absence of suitable infrastructure in India is one of the main obstacles to implementing AI in healthcare. Since most cloud computing infrastructure is found on servers outside

of India, many Indian start-ups have relocated there. Additionally, the fact that many pieces of medical equipment used in healthcare for diagnostic or therapeutic purposes are imported from other nations raises the issue of software compatibility.

There are many obstacles in the way of India adopting AI-driven healthcare. However, the Government of India has undertaken a number of initiatives relating to the establishment of AI, including the creation of the Artificial Intelligence Task Force, the National Strategy for Artificial Intelligence (AIFORALL) developed by the NITI Aayog, and the establishment of four Committees for AI within the Ministry of Electronics and Information Technology. AI has aided in the screening of COVID-19 cases, coronavirus containment, contact tracing, enforcement of quarantine/social seclusion, tracking of suspects, treatment and remote monitoring of COVID-19 patients, as well as the creation of vaccines and medications.



IMPACT OF AI IN HEALTHCARE

Current use and future use cases of AI in healthcare

By democratizing and standardizing a future of linked and AI-augmented care, precision diagnostics, precision treatments, and, ultimately, precision medicine, AI can help healthcare systems accomplish its "quadruple aim." Research on the use of AI in healthcare is advancing quickly, and examples of potential applications are being shown in both the physical and mental health care fields. These applications include drug discovery, virtual clinical consultations, disease diagnosis and prognosis, medication management, and health monitoring.

Enhancing Diagnostics

Effective medical therapy is built on a foundation of accurate and prompt diagnosis. Due to the complexity of symptoms and the vast amount of medical information, healthcare providers frequently struggle to appropriately identify illnesses. By analyzing medical data such as patient histories, test findings, imaging scans, and even genetic information to help diagnose diseases, AI is changing diagnosis. Machine learning algorithms are trained to spot patterns and anomalies that human doctors would overlook, increasing diagnostic precision and lowering the likelihood of misdiagnosis.

Predictive Analytics

Another ground-breaking aspect of AI's use in healthcare is its capacity to forecast trends and outcomes in the health sector. AI algorithms can analyze patient data to locate people who are at high risk of contracting particular diseases like diabetes or heart disease and notify medical professionals. This makes individualized preventive interventions and preemptive intervention possible, which can greatly enhance patient outcomes. Furthermore, AI-driven predictive models can foresee epidemics and disease outbreaks, helping public health authorities allocate resources efficiently.

Personalized Treatment Plans

Personalized medicine, in which therapies are tailored to specific individuals based on their genetic make-

up, medical history, and lifestyle, is becoming more and more prevalent in healthcare. By evaluating genetic data and spotting potential drug combinations, AI plays a crucial part in this transformation, enabling clinicians to prescribe the most effective drugs with the fewest side effects. Adapting to changes in a patient's health and guaranteeing optimal care throughout the treatment process, AI-driven treatment recommendations are likewise dynamic.

Drug Discovery and Development

New medication development and discovery are notoriously time- and money-consuming processes. By searching through enormous databases of molecular data to find possible medication candidates, AI is hastening this process. The selection of substances for additional testing can be streamlined by using machine learning algorithms, which can forecast how various compounds will interact with the human body. This not only quickens the process of developing new drugs but also lowers the possibility of expensive clinical trial failures.

Surgical Precision and Assistance

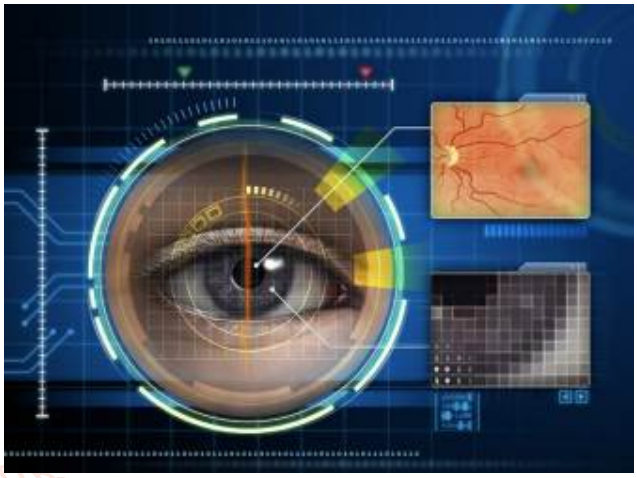
AI is progressing significantly in operating rooms as well. AI-powered robotic surgical devices enable surgeons to carry out treatments with unparalleled precision, minimizing invasiveness and speeding up patient recovery. AI can provide crucial information during operations by superimposing augmented reality visuals on the surgeons' field of vision. This degree of direction improves surgical results and helps make operations safer and more efficient.

Health Monitoring and Remote Care

The way patients are monitored and cared for is changing as a result of sensors and wearable technology powered by AI. These gadgets can gather information on exercise levels, vital signs, and other health parameters continuously. This data is analyzed by AI algorithms to find patterns that deviate from typical behavior, enabling quick action in case of medical problems. Furthermore, without the need for regular in-person visits, remote patient monitoring enables healthcare professionals to monitor patients' progress and modify treatment programs.

Diabetic retinopathy screening

Individuals should be screened for diabetic retinopathy and treated as soon as it is discovered in order to reduce unnecessary, diabetes-related vision loss worldwide. However, due to the high prevalence of diabetes patients and the shortage of personnel in the field of eye care globally, screening is expensive. In the USA, Singapore, Thailand, and India, investigations on automated AI algorithms for diabetic retinopathy have shown reliable diagnostic performance and cost effectiveness. Additionally, the Centers for Medicare & Medicaid Services accepted Medicare coverage for the use of the IDx-DR AI algorithm, which was approved by the Food and Drug Administration and achieved 87% sensitivity and 90% specificity for detecting more-than-mild diabetic retinopathy.



Improving the precision and reducing waiting timing for radiotherapy planning

Helping clinicians with planning and image preparation chores for radiation cancer treatment is a significant application of AI. The task of segmenting the images is now time-consuming and difficult, requiring an oncologist to manually draw contours around the regions of interest using specialized software. The waiting periods before beginning potentially life-saving radiotherapy treatments can be significantly shortened thanks to the AI-based Inner Eye open-source solution for head and neck, as well as prostate cancer.

Precision Therapeutics

We must greatly enhance our understanding of disease if we are to advance toward precise therapies. A variety of multimodal datasets are being gathered by researchers around the world who are investigating the cellular and molecular causes of disease and hoping to develop digital and biological indicators for diagnosis, severity, and progression. Drug discovery and immunomics/synthetic biology are two crucial potential uses of AI.

Immunomics and synthetic biology

In the future, by using AI tools on multimodal datasets, we may be able to better understand the cellular basis of disease, the clustering of diseases, and the patient populations to develop preventive strategies that are more specifically tailored to the patient population. One such strategy would be to use immunomics to diagnose and predict care and treatment options. This will be a game-changer for many healthcare standards, with a particular influence in the areas of cancer, neurological disorders, and

uncommon diseases, personalizing the experience of care for each patient.

Dermatological classification of skin cancer

AI programs can operate at levels consistent with their training data. The training set, which is based on dermatological characterisation, is consistent with the subpar findings for the broad screening tests. It would be very interesting to learn whether the algorithm would perform noticeably better using a training set based on a more precise means of discrimination, such as biopsies. Both the algorithm and the dermatologists achieved significantly better results on the more specific classification challenge, which raises the possibility that many more difficult-to-classify photos may have been excluded during the clinical choices that initially led to the selection of these cases for biopsies. Although the authors caution that additional work is necessary for it to provide benefit in a broad sense, this is an overall extremely promising outcome.

Coronary artery disease

Numerous patients with chest discomfort go through invasive testing just to receive a negative result. There is a tremendous incentive to develop alternative strategies because of the detrimental effects on patient experience, accessibility to expensive diagnostic facilities, and cost. Invasive coronary angiography, in which a cardiac catheter is placed to give a contrast dye to the arteries supplying the heart, can be used to directly quantify stenosis after X-ray imaging. The invasive fluid flow reserve (FFR) technique, which is based on inserting a pressure sensor through a cardiac catheter, allows for the direct assessment of blood flow. It continues to be a work in progress as more work is being done on it.

Personal Networked Devices and Apps

Personal EKG

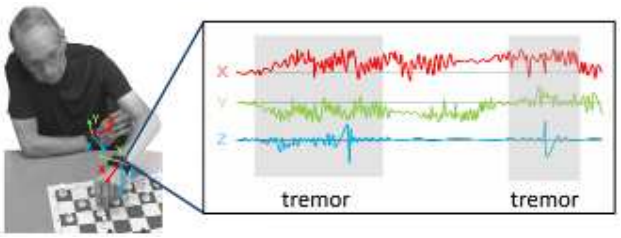
The FDA has approved a personal EKG recording device made by Kardia Mobile. The platform records an EKG during a 30-second period using a finger pad and a smartphone app. The device doesn't use wires or gels to function. The platform asserts to use AI-enabled atrial fibrillation detection.

Asthma tracking and control

A hand-held flow meter from AsthmaMD measures peak exhalation flow to determine lung function. The flow meter connects to an app that records data for those with respiratory conditions like asthma. Users can also keep track of their symptoms and prescriptions. Users of this software have the option to participate in a program that uploads their information anonymously to a Google database being built for research, which is an intriguing feature. According to AsthmaMD, "anonymous, aggregate data will help correlate asthma with environmental factors, triggers, and climate change."

Parkinson's tremors.

A smartphone software called CloudUPDRS can evaluate the signs and symptoms of Parkinson's disease. The program analyzes and measures tremors, walking patterns, and performance on a "finger tapping" test using the gyroscope present in many mobile devices. The difference between real earthquakes and "bad data," such as a dropped phone or the incorrect action taken in answer to the app's inquiry, is made by an AI algorithm. With the help of this instrument, Parkinson's sufferers can conduct tests at home and receive useful, quantitative data on how their lifestyle choices and drugs may affect their symptoms.



Tuberculosis (TB) Diagnosis

The Wadhwani Institute for Artificial Intelligence and the Central TB Division of the Ministry of Health and Family Welfare (MoHFW) signed a Memorandum of Understanding (MoU) in August 2019 to explore the use of artificial intelligence technology in the fight against tuberculosis (TB) (Ministry of Health & Family Welfare, Government of India 2019).As part of the partnership, Wadhwani AI will help the National TB Program create, test, and implement AI-

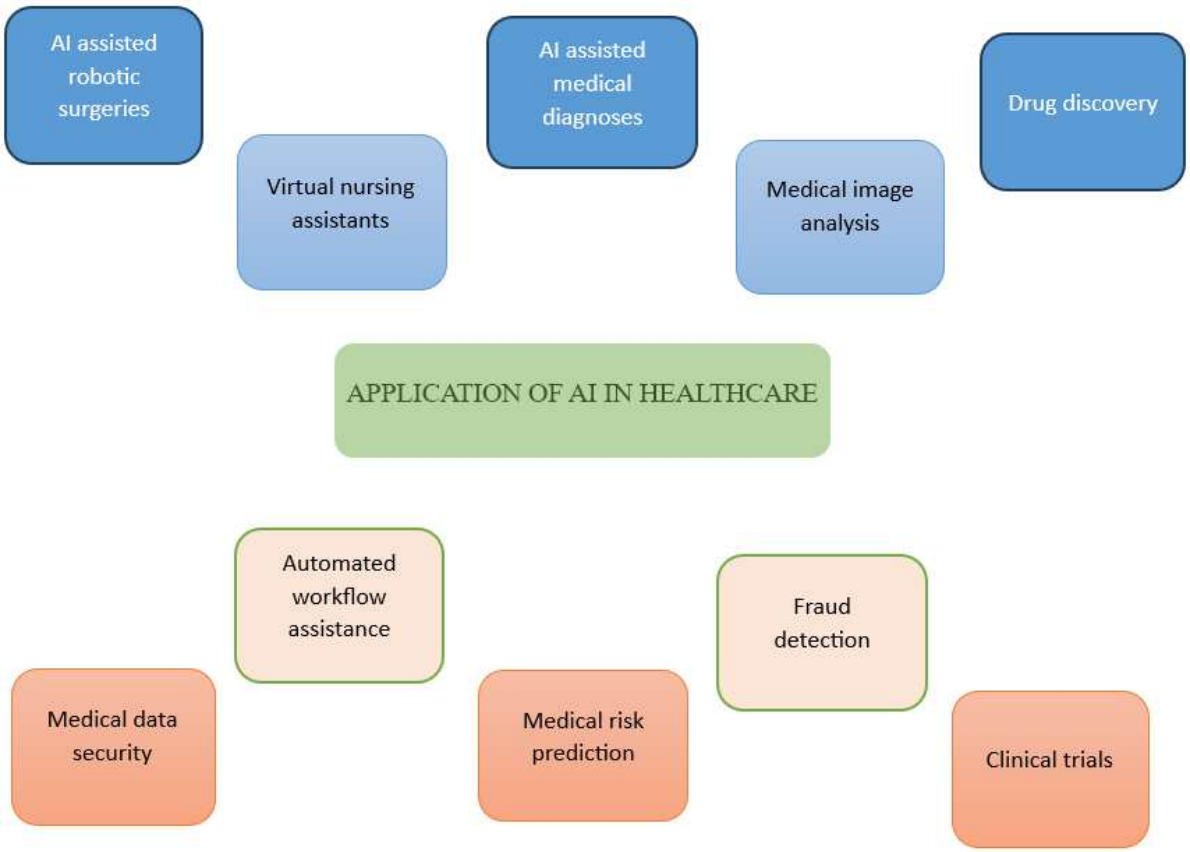
based solutions in order to make it AI-ready. In addition to aiding the RNTCP in adopting other AI technologies, it would support the program in vulnerability and hotspot mapping, modeling novel screening and diagnostic techniques, and enabling decision support for caregivers. (Ministry of Health & Family Welfare, Government of India, 2019).

Applications Of Artificial Intelligence In Healthcare System

Today, these methods are being actively used in healthcare. Analysis of the connections between prevention or treatment methods and patient outcomes is the fundamental objective of Al applications in the health domain. Many Al applications have been created to address some of the most serious issues the healthcare industry is currently facing. There has been an increase in research on A1 in the following medical disciplines.

1. **Radiology:** Radiology and physicians' ability to evaluate imaging results may help them spot subtle changes in images that they might otherwise miss. Although this is the widest use of Al in medicine, providers are only now starting to take advantage of all that Al technology has to offer. Deep learning techniques are well suited to the field of radiology, which depends heavily on images to make diagnoses. Since there is a dearth of doctors in many countries, Al's capacity to interpret radiography may be able to diagnose more patients with fewer doctors being needed. Some professionals view the development of Al technology in radiology as a threat.
2. **Oncology/Cancer:** Algorithms have been found to be superior to humans in the diagnosis of breast cancer and the detection of lung cancer. It has been shown that the IBM Watson for encology would be a trustworthy aid in making cancer diagnoses.
3. **Telemedicine:** Telemedicine, commonly referred to as telehealth or chealth, is the practice of transmitting medical pictures between healthcare facilities for remote diagnosis. Using telecommunications technology, it enables healthcare professionals to diagnose, treat, and monitor patients from a distance. Numerous medical professions, such as radiology, neurology, and pathology, use telemedicine. If suspected disease activity has occurred, the capacity to monitor patients using AI may enable for the conveyance of information to doctors.
4. **Electronic Health Record:** For the healthcare sector to go digital and become more information-rich, electronic health records are essential. They include a patient's clinical history and can be used to determine a person's risk of acquiring diabetes, cardiovascular disease, and other chronic disorders. The progression of a patient's illness can be precisely predicted by using an Al tool to scan EHR data.
5. **Mobile Heath:** The practice of medicine using a mobile device, such as a mobile phone, personal digital assistant (PDA), or wearable technology, is referred to as mobile health (or mHealth). It has become the innovative application of new mobile technologies to deliver and enhance healthcare procedures. Al Al algorithms, sensor technology, and advanced data are helping to transform smartphones into complete health-management systems. It merges mobile technology with the delivery of health care with the goal of promoting improved health and increasing efficiency. The evolution of mHealth is evident in the increased accessibility of healthcare services, improved treatment efficiency, decreased costs, and the creation of unprecedented opportunities for preventive care. MHealth assistants will become a popular alternative in developed countries where doctors are very scarce.
6. **Medical Research:** Large and complicated datasets can be analyzed using Al to find patterns. It can also be used to look for pertinent papers in the scientific literature. By assisting in the matching of suitable patients to clinical studies, all healthcare systems could be useful for medical research. Al can help in the early detection of epidemic causes and infectious disease outbreaks. Al has additionally been used to anticipate negative medication effects.

Al can also be utilized in the management of healthcare, urban healthcare systems, neurology, cardiology, stroke, aging, health surveillance, and health monitoring. Prediction of suicide risk, emerging medicine, disease diagnosis, chronic condition management, provision of healthcare, and medication discovery. Al has a virtually infinite number of healthcare applications.



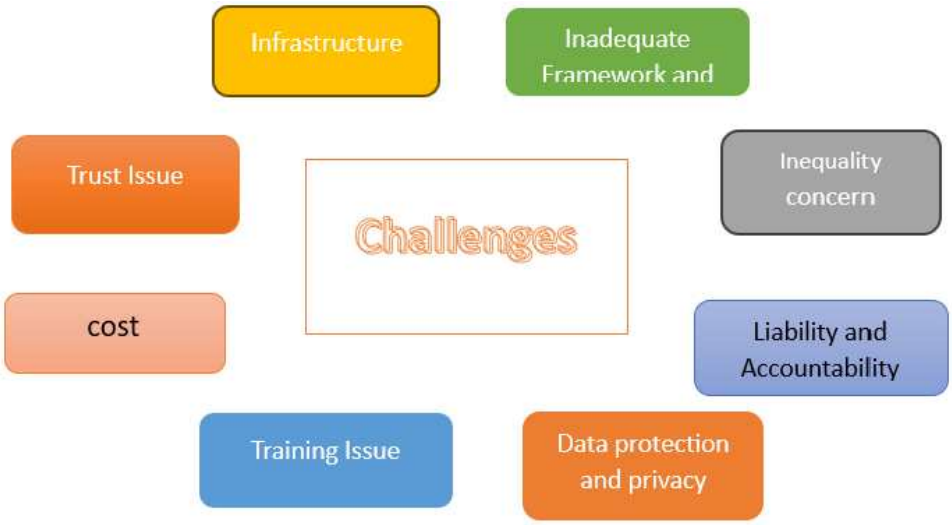
Benefit and Challenges

Al has unimaginable potential and, when used wisely, offers great advantages.

Al will result in significant improvements in the standard and security of patient care. More accurate diagnoses and more accurate treatment predictions will result in lower medical expenses. Al is destined to fundamentally alter the social roles and daily routines of Chinese people. An individual patient can be treated by a healthcare professional at a time, but automated, Al-powered health aides can handle millions of patients at once, increasing productivity. By streamlining time-consuming and expensive operations, preventing human error, and promising to bring in a new era of patient care, Al has already made inroads in the healthcare industry.

The successful deployment of Al technology has obstacles. Al has been widely adopted in some industries, but adoption in the healthcare industry has been slower because to its complexity. Healthcare professionals must understand that patient security and privacy must always come first. Therefore. All businesses should make use of priceless medical data while abiding by the rules controlling the privacy of patients' information and data ownership. It's a myth that Al will take the place of actual medical professionals. Some employees worry that their occupations may be replaced by machines as technology is used in the workplace more and more. The advantages that doctors and nurses still possess over Al are numerous and significant. They are capable of many tasks that an Al assistance cannot (touching, sensing, taking a blood test, coping with anxiety, memory, communication, learning, etc.).

Although AI has a lot of potential in healthcare, there are still certain obstacles. The necessity for ongoing human monitoring, legislative obstacles, and data privacy and security concerns are crucial factors. To retain trust in AI applications, it is crucial that AI systems are open, understandable, and impartial. The biggest issue facing AI in the healthcare industry is not whether the technology will be effective, but rather how to ensure that it will be adapted into routine clinical practice.



Opportunities of AI in the Health Care Safety Context

AI is crucial for expanding knowledge and enhancing outcomes in healthcare. AI has many uses in medicine, including disease prediction and diagnosis, managing massive amounts of data and synthesizing insights, and improving effectiveness and results in the treatment of disease states.11 Benefits of AI have been discussed for a variety of illnesses and outcomes, including the detection and categorization of malignant lesions, retinal diseases, pneumonia, and the prediction of sepsis in intensive care. Precision medicine has used 12–16 AI principles to create precise, safe, and tailored treatments.17The use of AI in healthcare has many advantages. In normal clinical practice and research, AI can be a huge help. enhanced outreach, simple access to information

AI gives decision-makers instant access to accurate and current information to aid in making better judgments.20 The use of AI has advanced radiological diagnostics by increasing the usefulness and precision of image processing.21,22 Deep learning-based designs have made it possible to use digital image analysis for precise early diagnosis of breast diseases.23 Another illustration is the training of an ML software library to recognize changes in Parkinson's disease using DaTscan image analysis.

Approaches to Achieving Safety in AI

Applications are made safe for use in healthcare by factors like prediction accuracy, predictive model causation, human effort to label out-of-sample cases, and reinforcement and system learning. The four main safety engineering techniques—safe design, safety reserves, safe fail, and procedural safeguards apply to the security of AI in healthcare.8 Design that is inherently safe indicates that possible risks will be eliminated rather than merely mitigated in systems. By removing the possibility that training data sets are not sampled from test data sets, systems used in the healthcare industry can be rendered safe. Changes in data domains continue to be difficult, despite the fact that this can increase system accuracy.

The systems must be built to fail safely, which means that they must continue to be secure even if they fail to perform as intended. When the model is unable to achieve the desired prediction, it should be trained to confidently reject. Human interventions can be added to make predictions in the event of such rejections. User experience design is one of the procedural protections that helps users set up and execute the program safely. Also said to improve safety are open data and open-source software. It's best to refrain from irrationally extrapolating ML algorithms. When used on larger and more diverse populations, algorithms developed on simple-to-obtain patient samples won't be optimum for patient safety.

AI implementation in the healthcare industry is not sufficiently controlled. Standardized evaluations of the effectiveness and security of AI applications are needed. Working groups have been established by the US Food and Drug Administration (FDA) and the European Medicines Agency to create and evaluate technical and digital health applications. Additionally, new additions to the European Patent Office's patent application guidelines for ML and AI-based products. In 2017, the FDA authorized Artery's medical imaging platform, the first deep learning clinical platform. The FDA is in favor of using real-world data and an adaptive design in clinical studies to evaluate the efficacy and efficiency of AI in healthcare. To make data sharing and exchange more effective and secure, regulatory adjustments are required.

Future of AI in healthcare

Future healthcare options will include a significant amount of AI that is rapidly evolving. There are numerous AI applications in the healthcare industry,

spanning from patient care and safety to diagnostics and treatment planning. AI plays a significant role in the care and safety of patients because it is utilized to develop novel medicines based on a patient's unique physiology. It is anticipated that AI systems would not substantially replace human clinicians in patient care, but rather support them. Future widespread use of AI systems will require regulatory approval, integration with EHR systems, standardization to the point that similar solutions can operate similarly, funding from public or private organizations, and more.

Conclusion

Artificial Intelligence is undoubtedly revolutionizing healthcare in unprecedented ways. From aiding diagnosis and treatment to transforming drug discovery and enabling remote care, AI's impact is reshaping the entire healthcare ecosystem. As technology continues to evolve, it is imperative for healthcare professionals, researchers, and policymakers to collaborate in harnessing AI's potential while addressing its challenges. By doing so, we can unlock a future where medical care is more accurate, accessible, and personalized, ultimately leading to better health outcomes for individuals and populations alike.

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