Artificial Intelligence Enhancing Healthcare Services

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"AI has truly been a game-changer in our healthcare system, enabling us to deliver more personalized and effective care to our patients."
- Dr. Emma Sinclair, Chief Medical Officer, NHS Midlands Trust

Abstract-**Human brain functions are what artificial intelligence (AI) aims to mimic. It is transforming healthcare through a paradigm shift fueled by the growing accessibility of healthcare data and the quick development of analytics techniques. Healthcare could undergo a transformation with the use of artificial intelligence (AI), despite the ethical, legal, and safety concerns it raises. Artificial intelligence (AI) has emerged as an influential player in the healthcare industry due to its numerous potential uses. The broad spectrum of AI applications in healthcare, including administrative simplification, customized treatment, analytics for prediction, and diagnostic assistance, is examined in this paper. AI is being used to identify illnesses in medical imaging and testing, manage electronic health records, control the coronavirus disease 2019 (COVID-19) outbreak with early detection, enhance patient involvement and treatment plan regulation, reduce the administrative strain on healthcare professionals (HCPs), determine prescription errors, find new medications and vaccines, store and analyze enormous quantities of data, and offer technology-assisted rehabilitation. This chapter presents an extensive and up-to-date description of the current state of artificial intelligence (AI) in clinical practice, including information on potential applications of the technology in disease diagnosis, treatment recommendations, and patient contact. Furthermore, it discusses multiple instances where AI has been applied for better patient care.**

***Keywords*:** Artificial Intelligence, Applications of AI, Healthcare, Case studies

1. INTRODUCTION

Technology provides the drive to offer healthcare companies the tools they need to deliver healthcare more quickly and efficiently. AI-powered solutions and telehealth have emerged as the newest means for patients to interact with medical professionals and exchange medical data, even when they are located far away. Patients are now treated in remote locations by to technologies like telemedicine and artificial intelligence (AI), which allow medical data and information to be shared across locations using cutting-edge technical innovation. In addition to facilitating contactless doctor appointments and maintaining social distance, this offers patients an appropriate course of treatment. The initiation of AI technology has caused a substantial shift in the healthcare industry. The healthcare sector aims to fully utilize AI as we enter a period of unparalleled digitization in order to transform patient care and enhance general well-being. AI in healthcare has the latent to improve diagnostic precision, tailor treatment plans, rationalise administrative procedures, and enable patients to aggressively contribute in their own health management. Due to exponential rises in medical expenses that have significantly outpaced GDP growth rates, health systems worldwide are at a crossroads for the sustainability of their systems [1]. This issue was rather simple because of the 2019 coronavirus disease epidemic and the conflict in Ukraine. A number of factors are contributing to this, including limited funding, aging populations, an upsurge in lingering illnesses, and the pressure on medical facilities that have historically found it difficult to meet the growing demand for service availability and accessibility. Additionally, the COVID-19 pandemic is causing several nations, like Brazil, Indonesia, and India, to experience health system failure [2]. The strain on doctors and health services is unprecedented due to evolving population trends, administrative requirements, a shortage of employment, rising rates of complications, and changing demands and standards for information technology [3]. In recent years, substantial breakthroughs have been made in artificially intelligent technologies (AI) and its application in healthcare [4]. How AI techniques might be applied to clinical studies and delivery of healthcare is becoming more and more apparent. Research has shown that powered by AI medical applications appear promising

and effective. To stay up with these technological breakthroughs, governments and tech companies are now making significant investments in the use of AI in healthcare, and the Food and Drug Administration of the United States is strongly promoting the market release of medical devices that are powered by AI [5]. Artificial intelligence simplifies the lives of patients, doctors, and hospital administrators by performing jobs that are often performed by people in a fraction of the time and expense.

Artificial intelligence (AI) has multiple applications in healthcare, including powering robots that assist with surgery, identifying novel genetic code interactions, simplifying administrative tasks, customizing treatment options, and much more.

2. ARTIFICIAL INTELLIGENCE

Artificial intelligence has been the focus of extensive formal research since the 1950s, despite being one of the more modern technical specialties. John McCarthy, a pioneer in the field, defined artificial intelligence as "the engineering and scientific method of making intelligent machines." Alan Turing asserts that for a computer to be considered intelligent, it must display behaviour that is precisely the same as that of a human. Because of its developments and ability to imitate elements of human intelligence, such as reasoning and decision-making, sight and language, knowledge representation, complex task processing, and communication, some have suggested that AI is on the verge of enacting the Turing test and could even be the main force behind the next wave of industrialization.

Simply described, artificial intelligence (AI) is a system that solves issues in a specific field by combining computer science with data from reliable sources. AI makes it possible for machines to simulate human intelligence with ease. That is, it describes a machine's capacity to perform analytical functions such as discriminating, reasoning, and making decisions. Narrow, general, and strong artificial intelligence are the three groups into which AI is divided according to its capabilities. With limited intelligence, narrow AI follows instructions to do a specific task; it lacks the capacity for thought. One of the greatest instances of this is Alexa, an internet-based voice assistant that can do a variety of tasks including making lists, sharing weather updates, and setting timers. With comparable efficiency to the human brain, general artificial intelligence can execute any intellectual work. AI that deciphers and comprehends human intelligence, but in which machines attain self-vigilance to the extent that they surpass both human intelligence and behavioural ability. These days, AI can also be divided into many disciplines based on its functionality, as machine learning, deep learning, expert systems, and natural language processing. Artificial Intelligence (AI) in healthcare encompasses the use of deep learning, neural networks, natural language processing, and other AI technologies to improve the interactions between patients and healthcare professionals. The predictive and data-processing abilities of AI empower healthcare professionals to more effectively oversee their resources and take a proactive approach to many aspects of healthcare. Medical professionals can find electronic health information easier to access, physicians can diagnose patients quicker and more accurately, and patients can receive more timely and personalized care thanks to these technologies. as machine learning, deep learning, expert systems, and natural language processing. Artificial Intelligence (AI) in healthcare encompasses the use of deep learning, neural networks, natural language processing, and other AI technologies to improve the interactions between patients and healthcare professionals. The predictive and data-processing abilities of AI empower healthcare professionals to more effectively oversee their resources and take a proactive approach to many aspects of healthcare. Medical professionals can find electronic health information easier to access, physicians can diagnose patients quicker and more accurately, and patients can receive more timely and personalized care thanks to these technologies.

The generic term for the ability to make computers accomplish responsibilities that would normally essential human intelligence is AI. Neural networks (NN) and machine learning (ML) are the two main subfields of AI. Under the umbrella of artificial intelligence, each disciplines have their own approaches and algorithms for resolving issues.

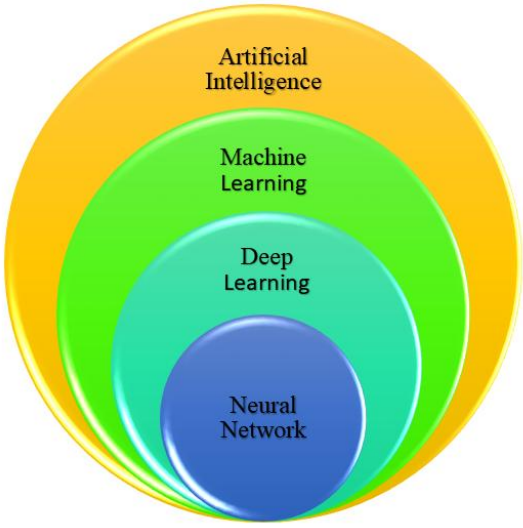

Fig1: AI Approaches

2.1 BACKGROUND

Building machines that have imitation skills and perform a range of jobs more precisely and effectively is the most important goal of artificial intelligence. Features of our everyday lives could be revolutionized by the field of AI. From basic rule-based systems to complicated ML and deep learning models accomplished of handling stimulating tasks, artificial intelligence has advanced over time [6]. AI is developing at an unprecedented rate, and it's important to comprehend its origins in order to understand the ways we arrived to this point. With notable turning points in almost every decade since the 1950s, artificial intelligence has a lengthy history. We'll go over some of the significant occasions that happened throughout the AI timeline in this post.

Table1: Brief History of AI

Year	Event	Description
1950	Alan Turing's "Computing Machinery and Intelligence"	Turing proposes the famous "Turing Test," a method for evaluating a machine's ability to exhibit intelligent behaviour.
1956	Dartmouth Conference	John McCarthy used the term "Artificial Intelligence" to describe this technology. The meeting officially recognizes AI as an area of science.
1950s-1960s	Early AI Programs (e.g., Logic Theorist, General Problem Solver)	Computational reasoning is demonstrated by programs such as the General Problem Solver (1959) and Allen Newell and Herbert A. Simon's Logic Theorist (1955).

1960s	ELIZA (1966)	Joseph Weizenbaum creates ELIZA, one of the first chatbots, simulating a psychotherapist.
1970s	AI Winter	A period of reduced finance and attention in AI owing to limited progress and unmet hopes in solving real-world problems.
1980s	Expert Systems	AI shifts focus to "expert systems," like MYCIN, which used knowledge bases and inference rules to solve specialized problems (e.g., medical diagnosis).
1987-1993	AI Winter (Second)	Another decline in AI research funding due to the limitations of expert systems and high costs of computing.
1997	Deep Blue defeats Garry Kasparov	A significant advance toward AI's capacity to overcome human champions in difficult competition is taken as IBM's Deep Blue defeats global chess champion Garry Kasparov.
2002	Roomba Robot	iRobot launches the Roomba, an AI-powered autonomous vacuum cleaner, showcasing the consumer potential of AI in robotics.
2006	Deep Learning (Hinton et al.)	Geoffrey Hinton and colleagues revive neural networks, laying the foundation for deep learning, a breakthrough in AI that would dominate the following decades.
2011	IBM Watson wins Jeopardy!	IBM Watson defeats champions in the game show Jeopardy! Showcasing natural language processing and machine learning.
2012	ImageNet and Convolutional Neural Networks (CNNs)	AlexNet, a deep convolutional neural network (CNN), wins the ImageNet competition, significantly improving the field of computer vision.
2014	Google's AlphaGo development begins	Google DeepMind develops AlphaGo, an AI designed to play the complex game of Go, which would later defeat world champion Lee Sedol.
2015	OpenAI founded	OpenAI is founded by Elon Musk, Sam Altman, and others to ensure that AI benefits all of humanity and to promote safety in AI development.

2016	AlphaGo defeats Lee Sedol	DeepMind's AlphaGo defeats world champion Lee Sedol, a landmark event for AI, showing its capabilities in complex games.
2017	AlphaGo Zero	AlphaGo Zero, a new version of AlphaGo, achieves superhuman performance in Go without human training, relying purely on self-play.
2018	BERT by Google	Google introduces BERT (Bidirectional Encoder Representations from Transformers), revolutionizing NLP by using transformers for improved language understanding.
2020	GPT-3 by OpenAI	OpenAI releases GPT-3, one of the largest and most powerful language models, capable of generating human-like text across diverse domains.
2021	AI for Drug Discovery (AlphaFold)	DeepMind's AlphaFold solves the protein-folding problem, offering a major breakthrough in biological research and drug discovery.
2022	ChatGPT launched	OpenAI releases ChatGPT, an AI chatbot based on the GPT-3.5 and GPT-4 models, with a major focus on human-like conversational abilities.
2023	AI in creative fields (e.g., DALL·E, MidJourney)	AI tools like DALL·E and MidJourney become popular for creating art, demonstrating AI's increasing role in creative industries.
2024	Generative AI in Mainstream Use	Generative AI models continue to influence industries ranging from entertainment to education, with increasingly sophisticated models shaping new possibilities.

2.2 FEATURES OF AI

The rapid developments in AI technology have transformed numerous facets of modern life. Top businesses like Meta, Google, and OpenAI, the company behind ChatGPT, are fighting for the interest of customers, and new announcements appear frequently. With AI, machines can acquire knowledge and resolve problems nearly as well as humans.

Huge volumes of data are used to train AI systems to see patterns in the data so they can do jobs like conversing like humans or forecasting what a consumer on the internet might purchase. By automating processes, improving decision-making, and opening up new avenues for creativity, these characteristics allow AI to revolutionize sectors including healthcare, banking, transportation, manufacturing, and entertainment.

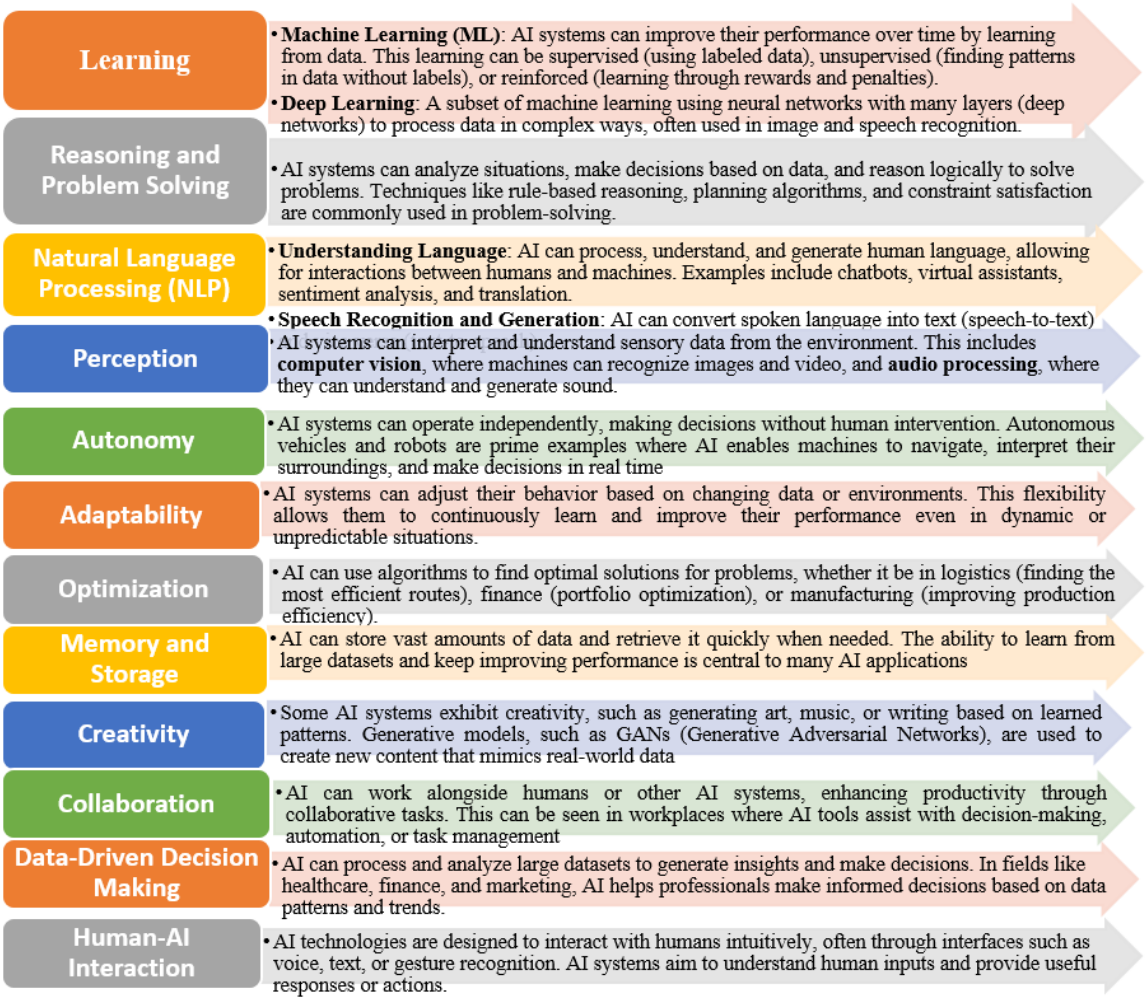

Fig2: Features of AI

2.3 APPLICATIONS OF AI

Applications for artificial intelligence (AI) have proliferated in many different industries, using its data-driven capabilities to advance production, competence, and decision-making. In the subsequent significant areas, AI is having a big impact:

Table2: Areas of AI

Healthcare	AI is revolutionizing healthcare by assisting with medical diagnosis and analyzing patient data and medical pictures through machine learning to make more precise diagnoses. Additionally, it is essential to drug discovery since it can sort through large datasets to find promising drug candidates. AI also makes personalized treatment plans possible, which allow healthcare interventions to be tailored according on a patient's medical history and genetic profile.
Finance	AI offers several advantages to the finance sector. AI-driven Fraud Detection systems detect unusual transactions and guard against financial scams, while Algorithmic Trading uses AI algorithms to analyse market data and make high-frequency trades. AI also helps with Credit Scoring, which evaluates a person's creditworthiness by examining their financial past and behaviour.
Transportation	AI is driving the advancement of autonomous vehicles, which aim to provide more secure and effective transportation by using sensors and machine learning algorithms to operate

	on their own. Drones, which are useful for duties like delivery, inspection, and monitoring, also use AI.
Retail	AI-powered recommendation systems in the retail industry improve consumer experiences by making product recommendations based on past exchanges. It streamlines inventory management, assisting merchants in cutting waste and maintaining ideal stock levels. Additionally, AI chatbots efficiently respond to queries and provide automated customer service.
Natural Language Processing (NLP)	NLP is a crucial component of AI that makes language translation easier by empowering robots to comprehend and translate speech and text between languages. AI is also capable of sentiment analysis, which uses news and social media data to determine public opinion and attitude. Furthermore, NLP is the foundation of virtual assistants like Siri and Alexa, which facilitate task completion through voice instructions.
Manufacturing	AI is essential to industry through Predictive Maintenance, which lowers maintenance costs and downtime by forecasting equipment breakdowns through sensor data analysis. AI also guarantees product quality with Quality Control, which uses picture analysis to quickly detect and fix flaws.
Entertainment	AI improves gaming experiences in the entertainment sector by creating realistic visuals and intelligent non-player characters. Additionally, it helps with content generation by producing music, artwork, and even TV program and movie screenplays.
Agriculture	With Precision Farming, AI transforms agriculture by using sensor and satellite data to improve planting crops, water supply, and allocation of resources for increased yields. AI also aids in the management of agricultural pests and illnesses by more accurately identifying and reducing them.
Cyber security	By analysing network traffic and patterns, artificial intelligence (AI) helps in threat detection, which involves recognizing and reacting to cyber security risks instantly. It also plays a key role in anomaly detection, which finds odd behaviours or departures from accepted standards that could point to security lapses.
Energy	AI improves grid management, which improves the energy sector and guarantees smart grid stability and effective distribution. AI can also forecast patterns of energy consumption, which helps with resource allocation and energy generation for more environmentally friendly energy practices.

3. AI IN HEALTHCARE

Global healthcare systems deal with a number of serious problems, such as a mature populace, waste, excessive expenses, and partial access. A few of the effects of pandemics like the coronavirus (COVID19) include a lack of defensive gear, insufficient or imprecise diagnostic testing, overworked doctors, and a collapse in information sharing (Greenberg et al., 2020). More importantly, the glaring truth about our health care systems' shortcomings is brought to light by a medical emergency such as COVID-19 or the emergence of HIV in the 1980s.

AI in healthcare has revolutionized patient outcomes, medication predictions, and disease prognosis [7]. Through the use of deep learning, machine learning, and methods for processing natural language, artificial intelligence (AI) has made it feasible to examine an enormous amount of healthcare data. This analysis has assisted in the determination of complicated sequences, early identification of illnesses, and the creation of customized therapies [8]. Artificial intelligence (AI) has recently upended the healthcare sector, sparking an explosive conversation regarding whether or not AI physicians would eventually replace human physicians. Experts think that machines won't soon replace human doctors, even though AI can improve medical judgments or even substitute human judgment in some functional areas of healthcare (like radiography). The increasing availability of healthcare data and the quick development of big data analytic methods have rendered AI in healthcare more effective nowadays [9].

3.1 AI APPLICATIONS IN HEALTHCARE

Some medical artificial intelligence applications used in the healthcare sector include the following:

1. AI for Drug Discovery

Pharmaceutical businesses have benefited from AI technology in healthcare by expediting the drug discovery process. In contrast, it automates the process of identifying targets. Additionally, AI in healthcare 2021 facilitates drug

repurposing by identifying off-target molecules (Díaz et al., 2019). Consequently, AI drug research eliminates repetitive effort and streamlines processes in the healthcare and AI sectors. (Chan and others, 2019) There are a number of solutions that the top biopharmaceutical companies have found. Pfizer is looking for immuno-oncology medicines with the use of IBM Watson, a machine learning-based system (P. Agrawal, 2018). Genentech, a Roche firm, is working with an artificial intelligence (AI) system from Cambridge, Massachusetts-based GNS Healthcare to assist with its hunt for cancer treatments, whereas Sanofi is going to use the Exscientia. (AI) platform to identify treatments for metabolic illnesses. Nearly every significant biopharmaceutical company has analogous internal programs or collaborations.

2. AI for Clinical Trials

Newly formulated treatments are given to participants in a clinical study in order to evaluate how well they work. This has taken a significant amount of time and money. Yet, the rate of success is quite low. Consequently, clinical trial automation has proven beneficial for AI and the medical field. Additionally, tedious data monitoring operations have been reduced with the use of artificial intelligence and healthcare. Additionally, clinical trials with AI support handle enormous data sets and provide extremely precise outcomes. In medical clinical trials, these are among the greatest popular AI applications.

i. Clinical investigations with intelligence
ii. Collaboration on clinical trials and sharing of concepts

3. Patient Care

Medical professionals' patient outcomes are impacted by artificial intelligence. Medical AI businesses have developed systems that assist patients on various levels. Clinical intelligence also assesses patients' medical data to help them enhance their standard of life. The following important clinical intelligence resources enhance patient care:

i. Maternal Care

One possible method for detecting high-risk mothers and lowering postpartum maternal mortality and issues is the following:

a) Estimating the likelihood that pregnant women will experience major delivery complications utilizing artificial intelligence (AI) with data from electronic health.
b)) Making use of digital technologies to increase patient access to high-acuity and routine therapy (i.e., more frequently and progressive care) across pregnancy.

ii. Healthcare Robotics

In addition to medical personnel, likely medical robots support patients. For instance, paraplegic people can regain their independence and walk again with the aid of exoskeleton robots (Shi et al., 2019). One further example of contemporary technology in operation is a smart prosthesis. For instance, to make these prosthetic appendages more precise and responsive than genuine organs, you may either attach sensors to them or wrap them with prosthetic skin and attach them to the user's muscles. Robots may be used to help with surgery and rehabilitation. For instance, Cyber Dyne's Hybrid Assistive Limb (HAL) exoskeleton uses skin-mounted sensors to help patients recover from conditions including injuries to the spinal cord and strokes that result in deviations of the lower limbs. Recognize electrical impulses in the patient's physique and cause the joint to move in reaction (Cruciger et al., 2016).

iii. Genetics AI Data-Driven Medicine

Today's healthcare consumer is more involved in their own medical care, from genome sequencing to creating a personalized health plan based on information from their fitness and movement monitors. Big data is being collected and connected to produce a more precise evaluation of our health or condition. Data-driven healthcare has the ability to enable personalized medical treatments as well as enhance the accuracy and rapidity of genetic disease detection (Hummel & Braun, 2020).

iv. AI-powered Stethoscope

The ability to obtain readings throughout noisy environments, unlike traditional stethoscopes, is a significant benefit that allows for more accurate diagnosis. The computerized instrument does not require any training, therefore anyone is able to gather the records and send them to the doctor via telemet. It also lowers their chance of contracting COVID-

19 and makes it easier to provide superior medical care to patients in rural areas and those with chronic conditions. Thanks to machine learning and artificial intelligence (AI), computers can now recognize patterns and anomalies in large amounts of clinical data. Since blood flowing through healthy arteries varies from blood flowing around a blood clot in the blood vessels, the same idea works here.

v. Disease Outbreak and Epidemic Prediction

Epidemiology: AI algorithms examine health data from around the world to forecast disease outbreaks and monitor the spread of illnesses like COVID-19 and influenza. Early detection and reaction to public health issues can be aided by AI.

Global Health Surveillance: AI systems analyse enormous amounts of epidemiological data to spot patterns and trends in infectious diseases, providing public health officials with important information for prevention and containment.

The use of AI in healthcare continues to expand as it enters modern business and daily life. Artificial intelligence might assist healthcare professionals in several areas, notably patient care and handling administrative duties. Most advances in AI and healthcare are advantageous to the healthcare industry, even though the strategies they support can differ.

4. Government's Initiatives

PwC claims that during the pandemic, India saw the biggest increase in the use of AI. In India, 73% of the pharmaceutical and healthcare sectors have used artificial intelligence. In addition, 71% of physicians in Australia and New Zealand thought AI improved medical practice. Therefore, medical tourism operators can improve patient experiences, optimize treatment outcomes, and streamline operations by incorporating AI technologies.AI-driven healthcare is growing significantly in India. The Indian healthcare AI market is predicted to develop at a compound annual growth rate (CAGR) of 40.5% from 2020 to 2025, reaching USD 1.6 billion. The NITI Aayog has been working with Microsoft and Forus Health since 2018 to create AI for the initial recognition of diabetic retinopathy. The developed AI system could be utilized as a tool for diagnosis in basic care. Similarly, the Tata Medical Centre and IIT Kharagpur established India's first de-identified cancer image collection, the Comprehensive Archive of Imaging (CHAVI),that allows AI technologies to use oncological pictures to uncover biomarkers to enhance cancer research findings. AI has the power to transform Indian healthcare by lowering costs, increasing accessibility, and improving efficiency. Even if there will be difficulties along the way, the investment is crucial for the future of Indian healthcare since technology promises better diagnosis, individualized treatment, cost reductions, and operational efficiency. AI is being used in Indian healthcare more and more frequently, and there are many opportunities to do so. AI will undoubtedly change the way healthcare services are provided in India since it can automate tedious tasks, simplify data administration and analysis, and allow for more precise diagnoses [10, 11].

Table 3: Healthcare AI Companies in India [12]

Company	Focus	Explanation
Qure.ai	Medical Imaging & Diagnostics	Leading the way in AI-powered diagnostic imaging is Qure.ai. Their algorithms provide highly accurate analysis of radiology scans, including CT and X-rays, assisting physicians in promptly and effectively identifying abnormalities. Solutions from Qure.ai are used all around the world and have a special effect in rural healthcare, where radiologists are hard to come by.
Niramai	Breast Cancer Screening	A non-invasive, artificial intelligence (AI)-based thermal imaging method for initial breast cancer diagnosis has been created by Niramai. Their system is accessible, accurate, and reasonably priced; it spots malignant abnormalities in thermal scans using machine learning algorithms.
Tricog Health	Cardiovascular Diagnostics	Tricog is an expert in cardiovascular diagnostics and AI-based ECG interpretation. By enabling real-time ECG analysis, their platform helps physicians identify heart attacks and other cardiac

		problems in a matter of minutes, potentially saving countless lives.
SigTuple	Pathology Automation	Blood analysis and pathological testing are automated by SigTuple using AI and machine learning. Blood smears, urine, and other samples are analyzed by their AI-powered devices, improving diagnostic precision and speeding up results. It is regarded as one of India's top healthcare artificial intelligence firms.
HealthPlix	Clinical Decision Support	An AI-powered EMR (Electronic Medical Records) system developed by HealthPlix helps physicians make clinical decisions. The platform enhances diagnosis, therapy, and patient management by examining medical information and offering useful insights.
Artivatic.AI	Health Insurance & Claims Automation	Artivatic.AI is a platform powered by AI that expedites the evaluation and claims processing of health insurance. Their cutting-edge solutions use AI and data analytics to streamline processes, guaranteeing quicker fraud detection and claims settlements.
Practo	Patient Engagement & Virtual Consultations	Practo is a well-known brand in India that provides patient management tools, appointment scheduling, and virtual consultations driven by AI. Their technology improves relationships between patients and doctors while increasing the effectiveness of healthcare delivery.
InnAccel	Medical Devices Powered by AI	As a leader in medical technology, InnAccel creates AI-powered medical equipment to meet vital healthcare requirements. Their technologies, which make healthcare solutions scalable and reasonably priced, include AI-driven diagnostic tools for ENT, respiratory disorders, and emergency care.
Predible Health	Oncology Diagnostics	Predible Health is an expert in using AI to diagnose cancer, specifically in oncology imaging. Their artificial intelligence (AI) tools help radiologists analyse complicated images, enhancing the results of early cancer identification and therapy.
AiHeal	Chronic Disease Management	AI is being used by AiHeal to provide individualized treatment plans for chronic conditions like obesity, diabetes, and high blood pressure. To give individualized food, medication, and exercise regimens, their AI systems evaluate patient data.

4. FIVE GROUND-BREAKING AI USES IN INDIAN HEALTHCARE

AI-enabled tools and changes are making the Indian healthcare system smarter and more effective. In this article, we follow the creation and implementation of five of these solutions that are ushering in a new age in Indian healthcare.

Advanced stroke management using AI:

Apollo Hospitals and India Medtronic have teamed up to employ AI-powered stroke therapy, which will cut the diagnosing time down from 60 minutes to two minutes. Additionally, the doctors' mobile phones will provide them with remote access to stroke patients' brain scans and AI analysis. With the aid of artificial intelligence, the software will produce superior, sophisticated images from non-contrast CT, CT angiography, CT perfusion, and MRI diffusion and perfusion scans, assisting hospitals in making better transfer or triage choices in real time. Since two million

additional brain cells die for every minute of delay, the time saved translates into brain cells.

Preventing breast cancer with AI-powered early detection tools:

Fighting breast cancer with AI-powered early detection software: NIRAMAI Health Analytix's cutting-edge breast cancer screening solution is based on an artificial intelligence-led diagnostic platform that uses patented thermal image processing and ML algorithms for precise and consistent diagnosis of tumors. The foremost constituent of the system is Thermalytix, an artificial intelligence-powered computer-aided diagnostic engine. Big data analytics, AI, and ML are utilized to automatically produce a report that identifies specific factors and recommends a breast health score when a patient's breast health condition is assessed. This screening technique can find tumors five times smaller than those found by a clinical examination. It is a portable, automated, accurate, and reasonably priced cancer screening device that even a novice doctor may use. This imaging technique, in contrast to mammography, is painless, non-touch, radiation-free, and suitable for women of every age.

Using AI to triage suspected Covid-19 patients:

In order to detect the likely COVID-19 cases, Wadhwani AI is creating a novel triaging method that will integrate self-reported symptoms with an objective evaluation of solicited cough sounds. By making the best use of testing kits and expanding the testing's reach, the goal is to assist public health authorities in better managing the situation. In order to gather the cough and related data required for the tool's development, Wadhwani AI has been collaborating with the governments of Bihar, Odisha, and Rajasthan and Maharashtra. The organization has so far gathered around 9,000 noises of coughing and other relevant information from 3000 likely Covid patients.

Eye care screening for children using AI:

Microsoft Intelligent Network for Eyecare (MINE) was implemented by the Telangana government in order to address the large number of incidences of blindness and vision impairment that occur in children as a result of a shortage of qualified ophthalmologists. The screening tool employs a variety of patient datasets from different regions to develop machine learning predictive models for visual impairment and eye illnesses. It can also predict whether a patient will have a favorable outcome from LASIK, cataract surgery, or another type of surgery. At the 174 locations of L V Prasad Eye Institute in India, the Microsoft model is presently integrated and being verified in EMR systems.

AI screening tool for diabetic retinopathy detection:

Diabetic retinopathy detection AI screening tool: In 2013, Aravind Hospital and Google collaborated to create an algorithm that would aid in the early identification of diabetic retinopathy. Google's deep learning algorithm was used to construct the entire screening tool. This system has a 98.6% accuracy rate in identifying the condition, which is comparable to the performance of retinal experts and ophthalmologists. This tool is being used by 71 vision centers that were founded by Aravind Eye Hospital in rural Tamil Nadu.

5. The Main Technologies for Healthcare AI

These technologies are giving healthcare AI firms previously unheard-of levels of accuracy, speed, and accessibility.

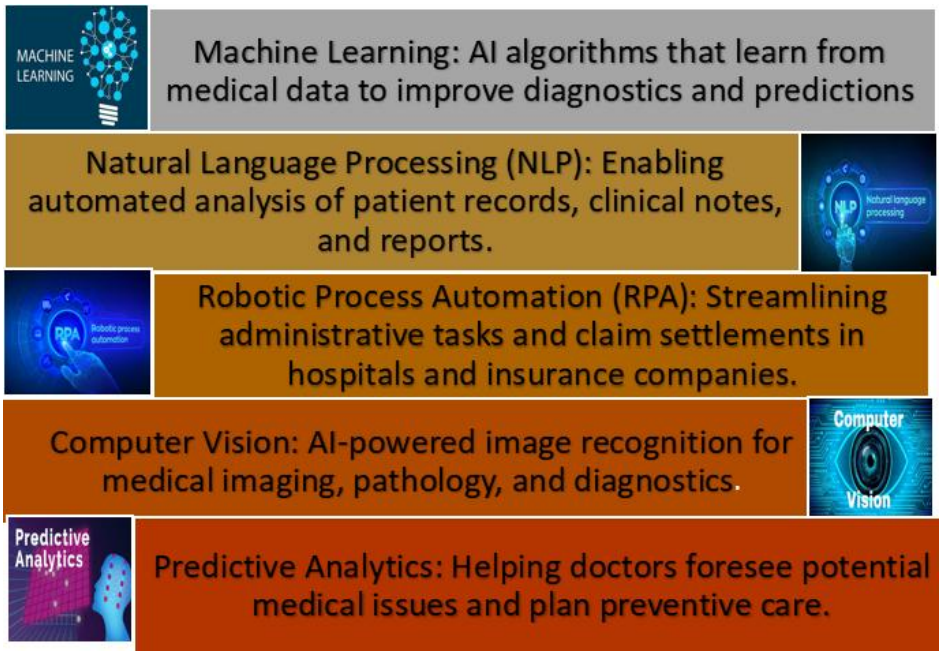

Fig 3: Technologies behind AI

6. CASE STUDIES

For better patient care and operational efficiency, healthcare providers are looking to artificial intelligence (AI) technologies. Health care teams are benefiting from AI in many ways, including data collection and analysis, result interpretation, scheduling, and patient communications. Here, we examine a few instances of AI in action within the healthcare industry. AI is revolutionizing healthcare by bringing cutting-edge technologies that advance clinical results, improve patient care, and streamline healthcare delivery procedures. AI-powered diagnostics is one area with a big influence; algorithms there examine genetic information, medical pictures, and patient records to help doctors make prompt and precise diagnoses. This improves treatment planning, lowers mistakes, and speeds up diagnostics.

Table 4: Different Case Studies Using AI in Healthcare [13]

Case Studies	
AI-Powered Diagnostic Imaging at Mayo Clinic	To improve the precision and speed of disease diagnosis, the Mayo Clinic, a pioneer in medical research and care, has successfully integrated AI into diagnostic imaging. **Enactment:** Developed an artificial intelligence algorithm for reviewing brain MRIs for stroke symptoms**.** Connected the AI system to the workflows existing in place in radiology **Consequences:** Substantial vessel obstructions can be detected with 95% accuracy. More Effective patient outcomes in cases of time-sensitive stroke; 60% shorter time to determine the cause, allowing for earlier therapy. (Mayo Clinic, 2023)

Predictive Analytics for Hospital Readmissions	Predictive analytics powered by AI was used by a sizable metropolitan hospital network to cut down on avoidable readmissions. **Enactment:** Using past information about patients, an AI model was created, and the model was connected to electronic health record, or EHR, systems. **Results:** Improving satisfaction with care ratings; a 20% decrease in 30-day readmission rates; and a $4 million annual cost savings.(Johnson et al., 2022)
AI-Assisted Drug Discovery at Atomwise	AI was used by the biotech business Atomwise to speed up the pharmaceutical research process for novel pharmaceuticals. **Enactment:** Together with academic universities, we developed AtomNet, an AI framework for molecular structure analysis, and evaluated thousands of molecules. **Results:** Drug discovery time reduced from years to weeks. Viable drug candidates had a 30% greater success rate. A possible therapy for the Ebola virus was discovered in a single day (Atomwise, 2024).
Case Study 4: Virtual Nursing Assistants at Boston Children's Hospital	Virtual nursing assistants driven by AI have been used by Boston Children's Hospital to improve patient care and minimize the pressure of nurses. **Enactment:** Integrated with IoT devices and hospital information systems; placed controlled by voice artificially intelligent assistants in patient rooms **Results:** Reduced unnecessary nurse calls by 40% and raised patient satisfaction levels by 25%. Enhanced tracking of medication regimens and patient health indicators. (Boston Children's Hospital, 2023)
AI in Mental Health – Woebot Health	Woebot Health developed a chatbot driven by AI that provides accessible mental health services. **Implementation:** Applying the concepts of cognitive behavior therapy, a conversational artificial intelligence system was constructed. The chatbot became accessible around-the-clock via a smartphone app. **Results:** A notable decrease in users' experiences of nervousness and hopelessness; improved access to psychological services, particularly in underprivileged areas; and an 89% satisfaction rate after thirty days.(Fitzpatrick et al., 2023)

7. CONCLUSION AND FUTURE SCOPE

Artificial Intelligence (AI) has a bright future ahead of it, with both benefits and problems. We may anticipate increased integration of AI technologies into many facets of our lives as they develop further. This includes increasingly complex virtual assistants, better medical diagnostics, the widespread use of driverless cars, and AI-powered solutions in fields like drug development and climate modelling. Justice, transparency, and data privacy will become much more crucial, as will ethical issues and responsible AI development. A crucial component of determining how AI develops in the future will be finding a balance between utilizing its innovative potential and addressing its moral and societal ramifications. Future aspects of AI in healthcare:

- More individualized treatment regimens based on lifestyle and genetic information

- Advanced robotics for patient care and surgery
- Population health management powered by AI
- Wearable technology for continuous, real-time health monitoring
- Additional use of AI in medical training and education

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