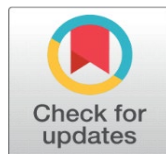
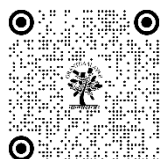


ROLE OF ARTIFICIAL INTELLIGENCE IN TRANSFORMING INDIAN HEALTHCARE

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ABSTRACT

In the technological era, artificial intelligence is a tool that works like a human mind. There are many instances where AI is being put to good use, from hospitals and clinics to research facilities, academic work and labs. In terms of healthcare, AI facilitates examination and management of medical treatment. The success of AI systems in healthcare is due to the creation of complex algorithms that can pull valuable information from vast amounts of healthcare data. Auto-learning capabilities may be added to the algorithms to boost efficiency and precision. Artificial intelligence (AI) technologies provide doctors with sophisticated medical information from journals, clinical papers, and textbooks for quick patient treatment. AI has the potential to reduce human error in both diagnosis and treatment. Medical data, especially that relating to patients, may be used for the learning process. Biomarkers, NLP, expert systems based on rules, and physical robots are all examples of forms of AI that have applications in healthcare. Treatment planning, illness tracking, diagnostic help, and patient monitoring are all areas where AI has found use. This article aims to study the significance of AI in healthcare by looking at the different technologies used in India's Central Government Health Scheme (CGHS) and Ayushman Bharat health protection schemes to enhance the healthcare quality and patient satisfaction. In India, proper health screening is one of the most important things. So, learning how AI will affect healthcare services, professional practice, and infrastructure is essential.

Keywords: Artificial Intelligence, Machine Learning, CGHS, Ayushman Bharat, Health, Challenges

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1. INTRODUCTION

Healthcare has joined the growing list of industries that have adopted artificial intelligence (AI) and its accompanying technologies. There are many places where AI is being put to good use, from hospitals and clinics to research methodologies. AI is also being used more in engines, tools, and other things, and it is also being used to improve areas like life sciences and neurosciences. Scholars define artificial intelligence (AI) as a “field of science” and “area of engineering” that studies how computations might provide insight into what it means for something to be intelligent or to behave intelligently and then designs tools and systems to replicate these traits. Also, artificial intelligence (AI) can be considered as an algorithm's capacity to act like an intelligent person by using specially designed computer software to do things generally requiring an human intellect in less time and for less money. The term “intelligent agent” describes

computer programs that mimic human thought and behavior, which is AI's primary goal. This might be understood as a computer-based machine that can easily do tasks that people would generally perform. To be precise, AI will remedy problems, including a lack of trained professionals, unequal access to care, and an excessive number of healthcare facilities in cities in Tier 1 and 2 that prevent providing high-quality medical services.

The success of AI systems in healthcare may be attributed to the development of sophisticated algorithms for learning several features from vast amounts of healthcare data, which aids in problem-solving and is impossible for humans to do on their own. Auto-learning capabilities may be added to the algorithms to boost efficiency and precision. AI systems use advanced medical information from journals and clinical articles to assist doctors and inform patient care and medical textbooks. AI has the potential to reduce human error in both diagnosis and treatment. Medical data, especially those relating to patient populations, may be used to aid in the learning process. AI systems use intelligent agents with a processing core, physical tools, and senses. These are called robots. An agent that only has a computing environment is called an infobot. A decision support system is what you get when you combine software that advises with real experts. AI has several potential uses in the medical field, including but not limited to conducting operations; simplifying patient care; analyzing the efficacy of treatments; managing the complexity of treatments; and aiding clinical research and drug development. Kiener argued that it provides medical diagnoses and guides scientists in developing costly companion clinical studies.

2. INDIAN HEALTH INDUSTRY

Healthcare in India is expected to generate US\$516 billion in revenue and employing more than a million individuals in the coming years. Factors that have contributed to this expansion include increased per capita income, an increase in lifestyle-related illnesses, a better educated public, and more affordable health insurance options. The Ayushman Bharat Scheme is the biggest government-funded healthcare program, with a budget of \$870 million. The Central Government Health Scheme (CGHS) provides healthcare services to registered employees and pensioners of central government. Participants in the program are eligible for cashless and reimbursed services. CGHS now provides coverage in 80 locations throughout the nation, serving an estimated 42 lakh people.

3. USE OF AI IN HEALTHCARE

Instead of being a single technology, AI is a collection of several. Healthcare technology encompasses many tools and applications, all aiding in delivering essential services. The following are examples of some of the most significant utilizations of AI in the medical field:

3.1. MACHINE LEARNING & DEEP LEARNING

One of the widely used types of AI nowadays is machine learning. It aids in estimating the process for treating patients and determining their precise state based on their characteristics and medical history. It was in the 1960s that complex neural network technology became practical. It has been widely accepted for many decades in the field of medicine. It processes messages similarly to how neurons do, although it is less effective compared to how the brain operates. Deep learning may be used to diagnose lacerations and contusions using radiological pictures. Voice recognition is one of the use cases of deep learning.

3.2. NATURAL LANGUAGE PROCESSING

Both organized and unstructured data types are included in the medical dataset. Natural language processing makes use of the unstructured healthcare data included in electronic health records. Natural language processing (NLP) transforms information into a format that can be read and analyzed. Natural language processing (NLP) analyzes patients' medical records and extracts relevant data such as prescriptions, medication programs, and health conditions. It may assess social media trends or predict the quality of clients. In order to integrate and organize clinical papers, AI is used to create NLP algorithms.

3.3. ARTERIAL SPIN LABELLING IMAGING (ASL)

ASL, a painless technique of measuring blood flow in the brain, uses several different evaluation modes to provide high diagnostic accuracy. It has helped keep tabs on those with Alzheimer's disease.

3.4. BIOMARKERS

Biomarker testing, also known as molecular analysis, is a battery of tests aimed at pinpointing molecular indicators of health in order to deliver the most appropriate care. The use of machine learning to find biomarkers has recently become popular. Based on the input characteristics, machine learning algorithms evaluate several hypotheses. Classification of algorithms and feature-based algorithms are two broad classifications that apply to these programs.

3.5. RULE-BASED EXPERT SYSTEMS

It aids clinical decision-making in healthcare. It has been used for decades. EHRs provide these regulations. The rule-based expert system uses data to optimize outcomes like humans.

3.6. PHYSICAL ROBOTS

Workers at factories, warehouses, and hospitals rely on them to carry out various routine tasks laid out for them in advance. Because robots and people can now operate efficiently together, teaching them is as easy as showing them instructions. In 2000, surgical robots provided doctors a "superpower" by allowing them to examine their patients better, make explicit and less invasive incisions, repair wounds, and much more.

3.7. ARTIFICIAL NEURAL NETWORKING

A type of computing model, Artificial neural networks (ANNs) are inspired by the human brain's neural networks. Voice, picture, and robotics recognition are examples of recent AI breakthroughs in ANN. The primary goals of ANN are, like the human brain, to maintain a correlation between data collection and mimic the activity of neural networks in the brain. While organic neurons respond instantly, the processing time for input slows the reaction time.

3.8. ROBOTIC PROCESS AUTOMATION

Compared to other AI software, it is cheap, readily configurable, and transparent. It is all virtual, with no physical robots present at all. They are used for billing, updating patient information, and endorsements in the healthcare system. They may also be used with image recognition technology to help extract information from a faxed picture.

4. GOVERNMENT OF INDIA INITIATIVES

Cost, quality, efficiency, and access to healthcare in underprivileged regions are all likely to be significantly impacted by the utilization of artificial intelligence in the health sector. However, the complete replacement of doctors and other medical professionals by automation is still controversial and will be discussed in the future. In India, however, AI has a far broader impact because it reduces economic disparity. The government has taken steps, like partnering with Google, to advance artificial intelligence research and build a more technologically advanced New India (National Institution for Transforming India Aayog, 2018). In addition, on a national scale, NITI Aayog is working to implement an analytical portal using AI to transform the National Health Scheme (NHS) into a unified database for patient records, facilitating more efficient healthcare data management through the application of data analytics. The government is also working to improve healthcare for rural citizens by increasing the use of artificial intelligence. The Ayushman Bharat National Health Protection Scheme was created to offer all Indians access to high-quality, cost-effective medical treatment. The government of India has used the concepts of AI, deep learning, and machine learning to address the problem.

5. CHALLENGES FACED BY HEALTHCARE IN INDIA

India has several potentials for artificial intelligence, but first, specific technological management issues must be resolved. There are significant ethical concerns related to AI use in healthcare, and we need to talk about them and the solutions we have for them. Prejudice, lack of knowledge, loss of data anonymity, and uniqueness will be AI's four main ethical concerns. The main strategy for addressing these problems is reinforcement learning in artificial intelligence (AI), which entails learning by doing to achieve the intended result and ensuring that the data implementation and backend programming are adaptable enough to be utilized by software engineers with varying social and cultural backgrounds.

Only with a solid legal foundation can development be made satisfactorily. Problems include information asymmetry and misperceptions, the need for answers to legal questions, and the regulation of power at the institutional level. India has no AI impact regulatory agency to guarantee data security and prevent data abuse.

Due to a lack of such a framework in India, clinical trials are costly, take too long, and provide unusable data due to a lack of standardized quality certifications. As a result, having medical professionals on advisory boards as they use AI in healthcare might be one option. Since the necessary cloud processing, fast internet, and processing capacity are still generally accessible in certain parts of India, hosting servers abroad has become necessary for AI deployment. The public sector in India is just beginning to invest in AI, and that investment is focused on a small number of niche applications. There is uncertainty about adapting and adjusting to new technologies due to information asymmetries and perceptions when physicians and coders need more standardized standards. There is also a significant body of unaddressed legal concerns that will ensure accountability in case of any mistake made by the experts engaged, as well as a lack of knowledge about the rules, terms, and conditions to employ such technology. Thus, it is crucial to explicitly define guidelines that correspond to the working conditions.

6. VARIOUS SECTORS OF INDIA USING AI IN HEALTHCARE

Artificial intelligence (AI) has been more critical in extensive data research with chatbots, individualized clinical diagnosis, and improved illness predicting accuracy in recent years. Descriptive and predictive AI has been used in several Indian hospitals. In its oncology department, for instance, IBM Watson has been integrated by the Manipal Group of Hospitals to aid physicians in providing precise care for cancer patients. Aravind Eye Care is another organization that uses AI to identify illnesses early on. The organization collects and analyzes patient data to spot signs of diabetes, hypertension, and other conditions. Artificial intelligence may improve the pharmaceutical sector's value proposition, sales automation, and market differentiation. To guarantee line optimization, for instance, Pharmarack employs AI throughout the supply chain.

Several companies are using machine learning methods to identify early signs and advise on the best course of individualized therapy. One of these businesses is Cure-Skin, which helps people with scars, acne, and warts. Another is Qure.ai, which uses deep learning to help find cancer early and plan surgeries. AI has also proved to be quite helpful in counseling psychology. Indian culture stigmatizes those who suffer from depression. Chatbots (like Wysa) made possible by AI provide sympathetic assistance and recommend that human professionals be consulted only when necessary. The patient's ability to remain anonymous is crucial because it allows them to open about their experiences without fear of labeling. In addition, AI eliminates the discriminating aspect among the populace, and telemedicine helps provide cheap healthcare to India's rural areas. SigTuple, a company with roots in India, analyzes samples of blood and produces findings without the assistance of pathologists. IntelliSpace Consultative Critical Care was developed by Philips and the Fortis Escorts Heart Institute in Delhi to monitor several ICUs remotely.

7. AYUSHMAN BHARAT

In 2017, under the National Health Policy the Indian government started its flagship program, Ayushman Bharat, to provide universal health care to all citizens. This program was developed with the SDGs in mind, namely the pledge to "leave no one behind." Ayushman Bharat is an idea to transform India's healthcare system from a sectoral and fragmented one to a universal, needs-based one. Through innovative interventions at the primary, intermediate, and tertiary levels, this program seeks to improve health care for the population. Some of Ayushman Bharat's most notable characteristics, as described by the Government of India, are:

- 1) The annual family coverage under the plan is set at Rs 5 lakhs.
- 2) It has a national scope and may be taken anywhere in the country. The insured may use their cashless benefit at any of the participating hospitals in the nation.
- 3) The government uses information from the Socio-Economic and Caste Censuses to determine the eligibility for the National Health Protection Mission.
- 4) The list of participating hospitals includes both public and private facilities.
- 5) Predefined treatment packages are created to limit out-of-pocket costs.
- 6) Cooperative federalism and state flexibility are at the heart of Ayushman Bharat.
- 7) To implement a complete digital and cashless system, the National Health Protection Mission has partnered with NITI Aayog.
- 8) Implementing AI will improve accuracy and diagnostic performance using machine and deep learning-based intelligent systems.

7.1. CENTRAL GOVERNMENT HEALTH SCHEME (CGHS)

For the present and former employees of central government, there is a healthcare program called the Central Government Health Scheme (CGHS). The program's inception dates back to 1954 in Delhi. Only currently employed Central government employees who needed help obtaining payment for outpatient department (OPD) drugs (now, CGHS dispensaries provide OPD medicines) were supposed to participate in the initiative. One of the reasons the program was initiated was because, at the time, there were very few private hospitals. Some of Central Government Health Scheme most notable characteristics, as described by the Government of India, are:

- 1) Outpatient care, including the distribution of medications.
- 2) Government-funded access to medical specialists.
- 3) Treatment at State and Private Hospitals.
- 4) Diagnostics at Government and Appointed Organizations.
- 5) Pensioners and other verified recipients may get care at any participating clinics and hospitals without worrying about paying out of pocket.
- 6) Costs incurred for emergency care received at non-accredited private hospitals will be reimbursed.
- 7) Costs associated with medically necessary devices, like hearing aids, prosthetic limbs, etc., may be reimbursed.

8. APPLYING AI TO AYUSHMAN BHARAT AND THE CENTRAL GOVERNMENT HEALTH SERVICE

The widespread adoption of cashless transactions is one of AI's many achievements for Ayushman Bharat. In an emergency, patients can care at any hospital of their choosing. Also, the recommendation system alerts them to the hospitals it thinks they should go to for a diagnosis. Doctors suddenly had a new resource for gathering patient data: the internet. Because of this, patients experience less anxiety, the transaction system is more straightforward, and they can get the care they need. Also, thanks to AI, no money is exchanged hands. Strategic management hurdles for both schemes include patient and citizen data management, reducing service costs, bolstering data security, and enhancing the quality of treatment.

Here are four obstacles and solutions that artificial intelligence can provide

8.1. ATTEMPTING TO REDUCE SERVICE COSTS WITHOUT COMPROMISING THE QUALITY OF CLINICAL CARE

Millions of people in India live below the poverty line and, as a result, cannot afford healthcare. There is a lack of standardization in the Indian healthcare delivery system, which drives up the treatment price. Therefore, lowering prices to match the volume and quality is one of the most significant difficulties both schemes confront. Using AI in emergencies when several tests must be performed quickly may help hospitals save money. Artificial intelligence shortens the waiting

period for test results and the time doctors spend conducting such tests. This allows physicians to treat more people with less money while also achieving standardization. To ensure that everyone has easy access to up-to-date information about medications, pharmaceuticals, and instruments, it is necessary to maintain online platforms and gateways. Managing a healthcare organization's supply chain is crucial. Artificial intelligence may be used in the healthcare industry, for example, to place automated orders for more medication when the stock drops below a specific level, considering the input of physicians and patients. AI systems would filter out such data and sound an alert to ensure prompt medical attention and appropriate medication management in the event of adverse drug reactions.

Many startups throughout the globe are already legally established as medical aid providers or are planning to do so.

- 1) **Ada:** Ada is a chatbot that uses machine learning to have conversations with patients and provide advice. The software may have a conversation with the user about their health problems and symptoms. Therefore, the chatbot gives appropriate responses and delivers expert information for remote consultation [20].
- 2) **Lunit:** Lunit is a medical artificial intelligence software firm with a focus on ending the cancer epidemic and bringing the field of medicine into the future of AI. Lunit creates and offers cutting-edge AI-driven diagnostic and therapy solutions for cancer. It makes use of deep learning and 3D visualization to spot previously undetected illnesses including cancer of the airways, colorectal cancer, and others. Its target accuracy range is between 83% and 86%.
- 3) **Sense.ly:** It is a chatbot that offers comparable features to Ada as well as more advanced ones, such as medicine and doctor's appointment reminders and insurance policy suggestions.
- 4) **Insilico:** One of the most crucial duties in medicine, drug development, is now being accomplished through Insilico Medicine, a 2014 invention. Company goals include "improving the standard of living for all people".
- 5) **PathAI (Boston):** It was created by Harvard University medical school alum Andy Back to aid in the discovery of disease-specific cell pictures.
- 6) **Aira (San Diego):** It is a device that restores sight to the visually handicapped. A smart glass enhances one's vision with the aid of artificial intelligence. A basic job like reading may be accomplished by the blind with it.
- 7) **Julia:** The correct use of deep learning aids in the diagnosis of diabetic retinopathy. Anantharaman and Shah found that the reports generated by it were reliable.

8.2. PROTECTING THE HEALTH OF PATIENTS

National Health Authority in 2018 estimated that with the guarantee of excellent treatment in both schemes, the hospitalization rate would rise from 2.45% to 2.75% annually for the poorer section of people. Artificial intelligence is crucial in maintaining high standards of care despite a growing patient population. Because AI makes work more efficient, fewer employees will be needed in positions like reception, diagnostic centers, medical stores, and similar ones, lowering costs while improving quality. Despite its importance in enhancing service quality, machines may spread pathogens and cause hospital-acquired infections. However, wholly automated bacteria or infection-tracking equipment may lower the infection rate. The spread of infection may be tracked, and an alert sent when a predetermined threshold is reached.

8.3. INFORMATION SAFETY AND INTEGRITY

Both schemes depend primarily on information that must be developed and updated. Security for stakeholders, service providers, and others depends on protecting their personal information. With a secure system, patients may obtain copies of their medical data, which might delay treatment or even be lethal if given to a different doctor during an emergency. The second difficulty is the securitization of data, or protecting personal information, while it is being collected, stored, standardized, and shared. Service providers must follow the Information Technology Act 2000 while collecting money, receiving, storing, and sending sensitive information to the proper authorities; the Information Technology Rules 2011 ensures this. Deep learning is the key to success in overcoming each of these obstacles. In healthcare facilities, for instance, specialized software ensures the safety and accessibility of patient records and other

vital data. Similarly, IT executives may lead and share data across healthcare facilities and authorities using programming languages like R and Python.

8.4. MINIMIZING FRAUD

According to Reuters estimates, annual healthcare fraud costs the world economy US\$260 billion, or 5.59 percent of total healthcare expenditure. Government healthcare systems, insurance policies, and programs are plagued by fraud because they fail to collect reliable data from their subordinates. This leads to malpractice, providers making unreasonable demands, phony policyholders and beneficiaries, and other forms of fraud. In order to detect and prevent dishonest and abusive activities in the system, the Ayushman Bharat framework has been submitted to the Anti-fraud Guidelines 2018. Overbilling or overcharging, unnecessary testing, incorrect beneficiary information, and misuse of the referral process are just some of the ways that the Indian government is using artificial intelligence as an added safeguard. Within two years, the program had helped almost 80,00,000.

9. CONCLUSION

While there are benefits to be had from Artificial intelligence, Machine learning, and Deep learning across every field, healthcare stands out as an up-and-coming sector for using these technologies to manage administrative burdens better, standardize processes, and cut costs, among other benefits. Moreover, the government's involvement has enhanced the AI environment by opening chances for new ventures to tackle this new initiative and motivating existing technology related companies to work with hospitals. However, experts have doubts about the long-term effects of this implementation due to difficulties such as the absence of an official regulatory body and software certification. As a result, the government should act as soon as possible to solve the widespread difficulties if it wants to enhance the level of acceptability. Artificial intelligence (AI) is being utilized in hospitals for illness detection, pharmaceutical supply chain management, fraud detection, and the organization of various administrative tasks. Government's Ayushman Bharat, aims to provide every Indian with health insurance. To provide a better healthcare in rural India, telemedicine has been successfully implemented, and data securitization has been validated with the help of AI. The administration has also instituted additional measures to prevent fraud and guarantee superior service. Thus, artificial intelligence will aid the healthcare industry in standardizing processes, lowering costs, eliminating fraud, and expanding access to high-quality treatment for everyone. It is vital to note that AI will not replace doctors and nurses completely, but it will help them provide better treatment by improving their efficiency and accuracy.

Conversely, worrying about losing one's employment may lead to emotional and mental discomfort. It can be mitigated by giving doctors plenty of notice and time to get used to AI deployment. About 50 crore low-income Indians can use the Ayushman Bharat program outside their districts and states in 2023. According to the original government plans and orders, the scheme's genuine efficacy shall be assessed by the end of 2023 using an ethnographic approach and firsthand experience with the service.

CONFLICT OF INTERESTS

None.

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