Artificial Intelligence in Healthcare

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Abstract: *Artificial intelligence is now widely used in people's production and life in many developed countries, providing significant convenience to people's lives and production. Furthermore, in the field of medical health, artificial intelligence has been widely used and developed, particularly in health management, hospital administration, medical imaging, risk management, and so on. Artificial intelligence is being utilized to apply a wide variety of care expertise. Typical AI techniques include machine learning algorithms for structured knowledge, such as the classic support vector machine and neural network, and therefore the popular deep learning, as well as the tongue process for unstructured knowledge. Cancer, neurology, medical specialties, and strokes are all important illness areas where AI technologies are being used. As a result, we will go through AI applications in stroke in greater detail, concentrating on the three main areas of early detection and diagnosis, outcome prediction, and prognosis analysis. Globally, a huge number of big technological firms, such as Google, Microsoft, and others, have begun to investigate the application of artificial intelligence in the medical area. For example, in the detection and treatment of diabetes and neurological disorders, Google has undertaken extensive studies and achieved significant progress. This thesis elaborates on the particular use and development of AI in the medical sector, pointing out that with the continual advancement of AI technology, revolutionary growth in the medical industry can be accomplished with great sincerity, and patients can recover well.*

Keywords: Artificial Intelligence, Healthcare Industries, Machine Learning, Data Availability, Privacy

I. INTRODUCTION

Business and society AI and related developments are becoming highly common, and they are also beginning to be used in healthcare services. These advancements have the potential to alter various aspects of patient consideration, as well as administrative procedures inside medicine associations, insurers, and suppliers. In Healthcare, AI is a broad phrase that refers to the use of AI software and algorithms, or Artificial Intelligence, to simulate perception in the investigation, introduction, and cognizance of complicated clinical and Healthcare data. It is, in particular, the ability of computer algorithms to draw conclusions based on given data.

"Recently in Healthcare, AI systems have made major waves, sparking a serious debate on whether AI specialists would eventually replace human doctors in the future [1]."What distinguishes AI innovation from traditional technologies in Healthcare services is the ability to gather various information, measure it, and provide a highly distinct output to the end-user; this may be accomplished utilizing Deep Learning and Machine Learning. These algorithms are capable of detecting patterns and rules and reasoning for themselves.

'This AI system built for healthcare may also help doctors by delivering the most up-to-date knowledge from clinical practices, manuals, and journals. They cannot, however, take the role of human physicians. Typically, both software and hardware components are required to build an AI-based solution that can operate in the healthcare sector. It is an area where there is a high need for automation since the majority of older people who live alone require assistance. According to studies in [1,] around 89 percent of older people are anticipated to live alone, and this figure is predicted to grow by 22 percent (2 billion people) by 2050. Chronic illnesses are those that people suffer from over an extended period of time. As a person ages, these illnesses grow more deadly. Elderly persons who live alone are more vulnerable to chronic illnesses than those who live with their carers. Creating such a system needs the use of an interconnected

network, i.e. an artificial neural network, as a software component for performing the queries represented by various learning algorithms.

These networks' learning is divided into three types: supervised learning, unsupervised learning, and reinforced learning. The goal of supervised learning is to create a function that can translate input into an output based on examples. The system can learn from test data via unsupervised learning. Reinforcement learning enables a system to respond to an environment by maximizing rewards and minimizing costs.

Year	Techniques/Technology
2008	AI based Mobile Agents
2010	SVM
2011	Pervasive Computing
2013	SVM
2018	SVM
2017	IoT
2018	Fuzzy Logic
2010	AI based Mobile Agents
2015	AI based Mobile Agents
2019	AI based Mobile Agents
2020	Optimization
2020	CNN

Figure [1]

AS you can see in figure 1 in the last 12 years, several technologies have been used to improve the healthcare system.

II. LITERATURE REVIEW

An m-Health Care System Based on Multi-Agents Intelligent Architecture [2] suggested a system that is a convenient mobile application that assesses patients' normal and emergency statuses using real-time and historical data and warns them. It is made up of six agents who each perform a distinct role, and they are as follows:

- Patient Monitoring Agent
- Gate's agent
- Agent for supervising Supervisors
- Agents for Administrators
- Agents for Healthcare
- Agent in charge of making decisions

A web-based SVM technique called e-Doctor is proposed for automatic medical diagnosis [6], in which statistical medical information consisting of arithmetic or logical parameters describing a condition is given as input by the user, and prediction is generated by this system. This paper's numerous usage scenarios are as follows:

- Diagnose in which the input is picked from a specified list of diseases and the system predicts the existence of the disease in the patient.
- Train in which a fresh illness record is produced, updated, and the doctor is re-trained on how to utilize cases, therefore training the system.

The author of this study promotes the increasing application of AI in medical sciences as technological assistance for decision making.

In this work, the author discusses how a positive characteristic emerges when two strong qualities in the same system, namely mathematical correctness and the power of current technologies, are united. The author has given two methods for clinical decision-making throughout this work, together with examples, algorithms, and advantages and

disadvantages in both cases [6]. The author of this research conducted an early investigation on M2M technology to assist cardiovascular patients in their healthcare and health remedy system [6].

III. APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE

The following are some medical artificial intelligence applications that are used in the healthcare business.

3.1 Doing Repetitive Jobs

Analyzing tests, X-rays, CT scans, data input, and other routine chores may all be performed considerably more quickly and precisely by robots. The amount of data to review in cardiology and radiology may be overwhelming and time-consuming. IBM began work on another algorithm called Medical Sieve. It is a long-term research effort aimed at developing the next generation "cognitive assistant" with analytical and reasoning ability as well as a broad variety of clinical expertise. Medical Sieve has the potential to aid with clinical decision-making in radiology and cardiology. The "cognitive health assistant" may study radiological pictures to highlight and identify problems more quickly and accurately [3].

3.2 Managing Medical Records and Data

Healthcare information managing is the process of obtaining, reviewing, and maintaining patient records to provide excellent treatment and other healthcare-related services to end-users. To accomplish this goal, the use of Artificial Intelligence (AI) is used in healthcare data management, where it uses complex algorithms and methodologies to process medical data in order to conduct different healthcare-related decision-making processes. The usage of AI algorithms, in particular, employs both supervised and unsupervised learning models, allowing it to perform effectively even in the absence of present learning models.

Over the last decade, there has been an increase in the amount of health information that is now available. Every day, large amounts of data (patient information, diagnostic information, new research results, and so on) are created in the healthcare business [3]. The combination of large data analysis tools has assisted organizations in achieving the insights required to collaborate much more efficiently with patients and make excellent decisions, and this reliance on large data and storing it to reducing wastage; from cutting coast to streamlining hospital staff timings; from enabling remote patient monitoring to anticipating epidemics, the utilization of bog data has been growing noticeably.

Analysis may also be used to improve administrative processes in order to provide better care. In the Netherlands, 97 percent of healthcare invoices are digital, containing information on the treatment, the doctor, and the hospital. These bills were simply recoverable. Zorgprisma Publiek, a local firm, analyses invoices and extracts the data with IBM Watson. They can detect if a doctor, clinic, or hospital makes the same error over and over again when treating a certain illness in order to assist them to improve and minimize unnecessary hospitalizations of patients [4].

3.3 Virtual Nursing Assistants

Working with patients requires a great deal of administration, planning, and documentation. In primary care, doctors and nurses frequently encounter patients who have minor illnesses that may be handled without the assistance of a medical expert, people who just want prescriptions or those who have administrative questions. A virtual assistant driven by AI provides patients with customized experiences. It assists people in identifying their disease based on the symptoms, monitoring their health status, scheduling doctor visits, and other tasks.

Instead of looking for the causes of the symptoms you're experiencing, you may ask the virtual healthcare assistant to help you. When you have common diseases or complaints, the healthcare assistant will not only give medical advice but will also allow you to make an appointment with a doctor or a specialist. Furthermore, the virtual assistant would be available 24 hours a day, seven days a week, allowing it to answer your inquiries and offer responses in real-time. This AI application may be used to promote patient engagement and improve self-management abilities in order to avoid chronic conditions from increasing.

Instead of speaking with a healthcare expert over the phone or through video conference, applications like MedWhat offer a chatbot experience in which users may register their daily exercise and fitness habits and ask questions such as

"What are the symptoms of the flu?" This sort of software is beneficial to both individuals and healthcare providers since it allows them to examine and comprehend personal health data that may contribute to an illness or condition.

3.4 Drug Creation

Drug development is an expensive, time-consuming, and progressive process that begins with the identification of a successful molecule and concludes with the final new molecular entity. The primary goal is to identify an active particle whose ultimate purpose is to impact the human body and demonstrate its quality, purity, and use in treating patients. The preceding criteria ensure that new drugs approved by regulators improve patients' quality of life, not just by treating their illness, but also by ensuring that the treatment does not become the cause of additional difficulties, such as bad effects.

The initial stage of R&D in the drug discovery process might span up to six years. On average, the next step of clinical testing takes more than 5 years. During this time, only 10 out of 10,000 originally tested candidates for new medicines make it to clinical trials. In general, only one medical product out of every ten that enters clinical trials is eventually approved for use in patients by regulators at the end of this protracted drug design process.

Artificial intelligence has the potential to improve the current system in a variety of ways. It can assist companies in gathering and analyzing a large amount of information required for clinical trials, therefore reducing the drug development process. It may also help with understanding disease processes, establishing biomarkers, generating data, models, or innovative medication candidates, designing or redesigning medicines, running preclinical investigations, designing and running clinical trials, and even analysing real-world experience. The number of currently existent A.I. firms in medication research reflects the technology's widespread use: they are numerous and growing by the day.

For example, BenevolentAI is a drug discovery and development firm. It integrates cutting-edge science with powerful AI and machine learning to discover new medicines to cure disease. BenevolentAI is actively interested in the research and development of medications for diseases such as Amyotrophic lateral sclerosis (ALS).

3.5 Patient Management

Innovative care management technologies aim to empower individuals to control their own diseases and relieve physicians of some of the load.

Doug Kanter, a diabetic patient, gathered data about himself for a whole year - blood sugar readings, insulin dosages, meals, athletic activities, and so on. His company, Diabetes, evolved from his personal diabetes experiences. It assists patients in better managing their condition by offering a solid method for logging and monitoring data, as well as a new idea for analyzing the large data underlying one person's sickness.

Bots like as HealthTap, Your. Md and Ada Health use artificial intelligence to assist patients to discover solutions to the most prevalent ailments. A chatbot, on the other hand, will never be able to take the position of an expert doctor. The bot itself encourages the user to schedule an appointment with a doctor for The National Institutes of Health-sponsored AiCure software uses a smartphone's camera and power of ai to autonomously validate that patients are sticking to their medications. Or put it another way, assisting them to ensure they understand how to treat their illness.

3.6 Robotic Surgeries

Artificial intelligence and collaborating robotics have transformed surgery in terms of speed and depth while performing delicate cuts. AI robot that allows surgeons to work in narrow areas where a hand would be ineffective. Because robots do not sleep, the issue of exhaustion during lengthy and critical operations is avoided. AI robots can use data from previous procedures to create new surgical approaches. The precision of these devices eliminates the likelihood of tremors or other unintentional or inadvertent movements during surgery.

A few examples of surgical robots include Vicarious Surgical, which combines virtual reality with AI-enabled robots to allow surgeons to perform minimally invasive operations, and Heartlander, a miniature mobile robot developed by Carnegie Mellon University's robotics department to aid in heart therapy.

IV. LIMITATIONS OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

The efficacy of AI in improving aspects of healthcare administration has been demonstrated. AI will very certainly be integrated with normal clinical treatment in the near future. However, questions have been raised about the ethical and legal issues of implementing AI in healthcare. These problems include the possibility of bias, confusion in some AI algorithms, privacy concerns for data used for AI model training, and security and AI implementation responsibilities in clinical contexts. Here are some of the ethical issues that clinical applications confront. They are safety, efficacy, privacy, information, and consent, the freedom to choose, "the right to try," prices, and accessibility.

4.1 Data Availability

Large amounts of data are required to train AI systems from sources such as electronic health records, pharmaceutical records, insurance claims records, or consumer-generated information such as activity trackers or shopping histories. However, health data is frequently problematic. Data is frequently spread across several systems. Aside from the above-mentioned variations, patients frequently see different doctors and transfer insurance carriers, resulting in data fragmentation across many systems and formats. This fragmentation raises the danger of mistakes, reduces the completeness of datasets, and raises the cost of data collection, limiting the types of entities that can build successful healthcare AI.

4.2 Errors and Injuries

The most obvious risk is that AI systems will sometimes be incorrect, resulting in patient injury or other healthcare issues. If an AI system prescribes the wrong medicine to a patient, fails to detect disease on a radiological exam, or assigns a hospital bed to one patient over another because it incorrectly anticipated which patient would benefit more, the patient may suffer harm. Of fact, many injuries occur in today's healthcare system as a result of a medical mistake, even without the assistance of AI. AI mistakes may differ from one another for at least two causes. First, patients and doctors may react differently to injuries caused by software than to injuries caused by human mistakes. Second, if AI systems become more widely used, an underlying issue in one AI system may cause harm to thousands of patients, rather than the small number of patients hurt by any single provider's error. While errors may occur in human medical experts as well, what makes this important is that an underlying problem, an error in an AI system, might result in damage for thousands of people.

An AI software was used in a 2015 clinical study to identify which individuals were likely to suffer problems after pneumonia and thus should be hospitalized. Due to its failure to take environmental information into account, this app incorrectly instructed clinicians to send asthmatic patients home? The effectiveness of AI-powered symptom checker applications has been called into doubt. It has been discovered, for example, that app suggestions may be too conservative, thus boosting demand for unnecessary testing and treatments.

4.3 Privacy

Another set of risks arises in the context of privacy. The necessity for huge datasets incentivizes developers to collect such data from a large number of patients. Some patients may be worried that this gathering may breach their privacy, and lawsuits have been brought as a result of data sharing between big health institutions and AI companies. AI may also threaten privacy in another way: AI may anticipate sensitive information about patients even if the algorithm has never seen such information. (In fact, this is frequently the objective of health-care AI.).

For example, an AI system may be able to detect Cancer illness based on the trembling of a computer mouse, even if the user has never disclosed this information to anybody else (or did not know). Patients may regard this as a breach of their privacy, especially if the AI system's inference is made available to third parties like banks or life healthcare companies.

4.4 Malicious application of AI

While AI has the ability to be used for good, it also has the potential to be used for harm. for example, that AI may be used for secret monitoring or screening. AI technologies that analyse motor behaviour (such as how a person types on a

keyboard) and movement patterns identified by tracking cell phones might reveal health information about a person without their awareness. AI has the potential to be utilized to carry out cyber-attacks at a lower financial cost and on a larger scale. This has prompted demands for governments, researchers, and engineers to consider the dual-use nature of AI and to plan for potential harmful uses of AI technology.

V. CONCLUSION

With the quick development of healthcare, it is important to implement new changes in the system and provide better services to patients.AI offers enormous promise for learning from previous data or experience and making better decisions in the future. Artificial intelligence is hugely helpful in the field of healthcare. Combining AI, ML, and DL assists in the identification of illnesses, the allocation of appropriate medications to patients, and the reduction of drug side effects. AI also aids in the identification of real-time health information by continually monitoring the behaviors and emotions of users. This Paper showed many applications of AI in healthcare, which show many applications of Artificial Intelligence in Healthcare and how Artificial Intelligence changes healthcare industries. AI using machine learning algorithms can assist identify TB, brain tumors, and other diseases? AI can also be used in medical diagnostics and clinical care. Many medical practitioners think that technology offers numerous advantages over traditional procedures, such as the ability to analyze big datasets concurrently, provide unsupervised discovery that reveals hidden patterns, and increase the time by recommending auto-generated treatment paths. Artificial intelligence is a technique that aids medical practitioners in early diagnosis and can assist reduce death and medical pricing. The most difficult challenge in artificial intelligence is collecting and securing health data.

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