Overview of Artificial Intelligence in Health Care System

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Artificial Intelligence (AI) is Computers perform tasks that are usually assumed to require human intelligence, is currently being discussed in nearly every domain of science and engineering[1]. Major scientific competitions like ImageNet Large Scale Visual Recognition Challenges are providing evidence that computers can achieve human-like competence in image recognition [1]. All of these developments raise questions regarding how these talents might assist or perhaps improve human decision-making in the areas of health and medical care. At least in very specific cases, two recent high-profile academic articles have shown that AI can conduct clinical diagnoses on medical images at levels equal to experienced physicians[1].

AI in healthcare can be a critical tool for analyzing vast volumes of unique patient and raw medical information to create more accurate diagnoses and treatment plans. It can quickly analyze data from a variety of sources, identify potential problems, and recommend solutions across many contexts, including clinical and administrative environments [1].

The emergence of artificial intelligence (AI) in healthcare has been groundbreaking, reshaping the way we diagnose, treat and monitor patients. This technology is drastically improving healthcare research and outcomes by producing more accurate diagnoses and enabling more personalized treatments[2]. AI in healthcare's ability to analyze vast amounts of clinical documentation quickly helps medical professionals identify disease markers and trends that would otherwise be overlooked[2]. The potential applications of AI and healthcare are broad and far-reaching, from scanning radiological images for early detection to predicting outcomes from electronic health records[2].

AI increases the velocity at which the healthcare industry can move by analyzing medical information via High-Performance Computing (HPC). This data can include everything from medical imaging and diagnostics to surgical workflows. And this capability isn't limited to a single location; cloud-based solutions can aggregate information from many networks and locations.

BENEFITS OF AI IN HEALTHCARE

For the benefit of patients, AI analytics allows for a more thorough evaluation of data without the danger of human mistakes (for example, spotting tumours or illness precursors). In turn, physicians and surgeons can use these findings to develop better treatment options, which can lead to better outcomes. AI's processing power isn't restricted to a case-by-case basis; it can sift through data from all over the world and unearth actionable insights that can lead to life-saving care and medical innovation. For example, during the COVID-19 pandemic, AI might be used to examine novel variants and develop new, effective treatments faster than human-based research and evaluation. Previously, AI was required for gene representation and other pioneering genetics studies.

AI can find possibilities to optimize operations, including surgery, and make them more productive in order to improve operational efficiencies. In turn, AI informs better decision-making by providing IT and medical managers with greater visibility, allowing them to avoid mistakes, resolve difficulties, and reduce operational expenses. Similarly to how AI can enhance patient medical results, it can improve how medical professionals and caregivers offer care, either by gaining faster access to more patient records or by discovering more effective ways to manage patient care. AI can even sift clinical notes (i.e., unstructured data) with the help of NPL, classify them, and use them to optimize healthcare operations. AI also assists medical companies in remaining compliant with increased security and safety. In addition to preventing unauthorized access to private medical information, AI offers intelligent video analytics (IVA), which allows employees to monitor their facilities and patients. Smart hospitals can recognize objects such as medical equipment and face coverings, identify and match faces of doctors and patients, and even detect rising body temperatures using IVA and smart sensors. These inputs are utilized to identify high-risk individuals and generate actionable results.

.CHALLENGES OF AI IN HEALTHCARE

The most difficult issues for AI applications are patient privacy and reliance on data analysis. As more data is collected and used, healthcare organizations will require the necessary infrastructure to store and organize that data. Similarly, any AI needs the correct algorithms to make sense of any data pool. Organizations that

do not have adequate infrastructure in place risk misusing patient medical information or making it exposed to cyberattacks and other risks. Inadequate algorithms can also result in unintentionally biased decision-making. In other words, AI can pick up on human prejudices. In one case, a healthcare AI accidentally deprioritized certain ethnicities for particular sorts of tailored care, while another discriminated against black patients seeking kidney donations. Organizations will need fine-tuned AI codes of ethics to guide how data and AI are managed, in addition to the necessary infrastructure, technological stack, and IT experience.

There are also established and stringent security protocols. HIPAA compliance rules govern how patient information is kept private and used, including how AI accesses, analyzes, and uses data. Without adequate safeguards, patient data could be used without consent, misappropriated, or gained (deliberately or unintentionally) by malevolent actors.

ROLE OF AI IN HEALTHCAREAI is being used to deploy efficient and precise inventions that will help take care of individuals suffering from chronic ailments, such as cancer, and hopefully find a cure for them. AI has significant advantages over traditional methods of analytics and clinical decision-making. AI algorithms improve system precision by allowing them to analyze training data, allowing people to gain
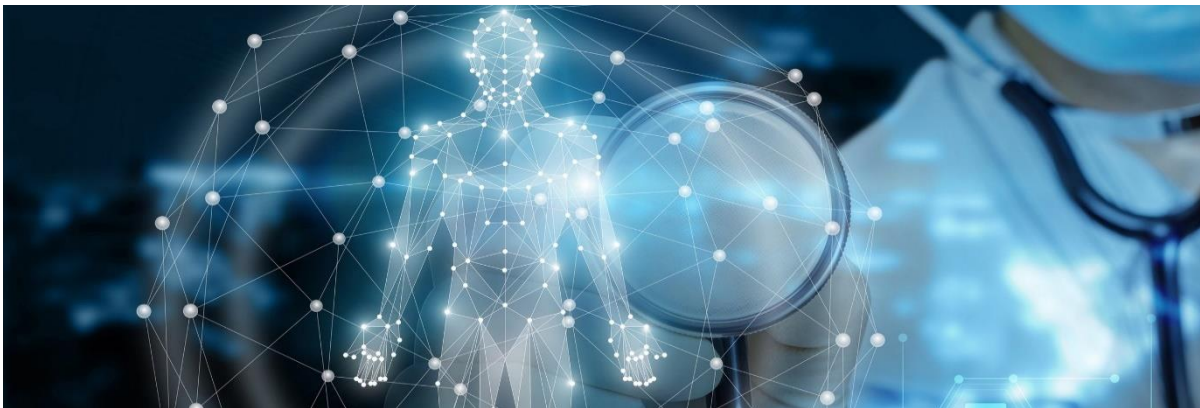
unprecedented insights into treatment variability, care processes, diagnostics, and patient outcomes [2].

1. ACCURATE CANCER DIAGNOSIS

One of the top artificial intelligence and machine learning tools in healthcare, PathAI enables pathologists to make precise diagnoses[3]. PathAI lowers errors in the cancer diagnostic process and provides a variety of fresh methods for customized medical care[3]. Numerous lives may be saved if cancer patients were diagnosed more accurately so that the majority of them could be treated or cured before it becomes fatal[3].
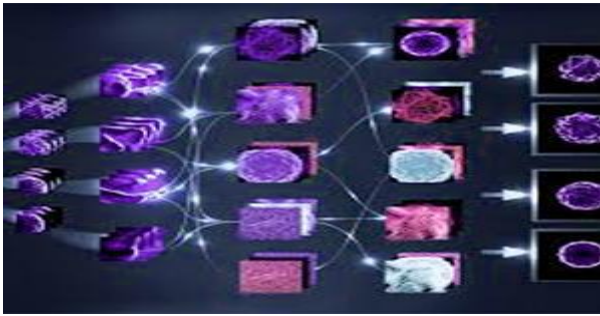
2. EARLY DIAGNOSIS OF FATAL BLOOD DISEASES

When it comes to early diagnosis of potentially fatal blood-related disorders, artificial intelligence is a huge asset[3]. Doctors are now able to check for dangerous compounds and germs in blood samples, such as Staphylococcus, E. coli, etc., at a far faster rate than they could with manual scanning thanks to AI-enhanced microscopes[3]. With the use of AI, bots were able to learn to recognize these bacteria in the blood and predict their existence in fresh samples with a 95% accuracy rate, significantly lowering the fatality rate.

3. CUSTOMER SERVICE CHATBOTS

The use of modern technologies like Natural Language Processing (NLP), chatbots enable patients to ask questions about appointments, bill payments, and other topics. Additionally, chatbots converse with patients about their ailments and symptoms, which lessens the workload placed on medical professionals.

the chatbots help patients by providing the necessary solutions, freeing up healthcare professionals to concentrate on other pressing responsibilities. In addition to engaging patients, this healthcare solution also provides them with cutting-edge care and improves outcomes.

4. VIRTUAL HEALTH ASSISTANTS:

Virtual health assistants are responsible for a variety of tasks, including responding to routine patient inquiries via phone and email, managing patients' medical information and protecting sensitive data, scheduling appointments with doctors, sending follow-ups and clinical appointment reminders to patients, and so on[5].

This is achieved by combining cognitive computing, augmented reality, and body and voice motions. It is one of the most useful AI applications in healthcare, providing patients with a tailored experience in terms of managing their health and answering their questions. It minimizes the number of hospital visits, which benefits both patients and healthcare professionals.

5. TREATMENT OF RARE DISEASES

BERG is an AI-powered clinical-stage biotech platform that works on disease mapping to accelerate the discovery and development of innovative breakthrough medicines and vaccines, revolutionizing healthcare. It employs research and development (R&D) as well as interrogative biology to enable medical practitioners to design robust products for people suffering from uncommon diseases.

BERG has also presented its discovery for Parkinson's disease treatment. This condition is a neurological disorder that causes stiffness, tremor, and difficulty doing simple functions such as balancing, coordinating, and walking. Parkinson's disease symptoms appear gradually and worsen over time, making it one of the deadliest diseases. BERG employs Artificial Intelligence to connect previously unknown relationships between human body molecules.

This demonstrates that the usage of AI is greatly assisting the healthcare business and will continue to do so in the future.

TARGETED TREATMENT:

Benevolent AI became capable of supplying the correct treatment to the appropriate patients at the right time with the use of technologies such as Deep Learning and AI, resulting in superior patient target selection and insights. The company is seeking to get its drugs approved for sale and to develop portable therapies for rare disorders.

7. AUTOMATION OF REDUNDANT HEALTHCARE TASKS

Important role of AI in healthcare is that they automate redundant, time-consuming procedures. This frees up time for administrators to focus on other critical and necessary responsibilities. Olive is an AI-powered platform that automates procedures such as determining the eligibility of unadjudicated medical claims,

transmitting relevant medical data to medical specialists, and so on. Olive merely interacts with a hospital's existing tools and software, eliminating the need for costly downtimes and integrations.

8. MANAGEMENT OF MEDICAL RECORDS

Healthcare is one of the next Big Data frontiers that must be conquered. Significant and useful data, like a needle in a haystack, may get lost in the massive mound of data, costing the industry billions of dollars each year[3]. Furthermore, without the ability to connect crucial data points, the creation of correct diagnostics as well as novel medications and drugs is slowed.

Data Science in healthcare has caused numerous healthcare companies to resort to artificial intelligence (AI) to stop data haemorrhaging [3]. AI enables them to break down data and connect the essential data, which formerly took years to analyze.[3]

9. REDUCTION OF DOSAGE ERRORS

Even a single excess dose of a prescription or drug can have serious implications for a patient's health, which is why it is critical that the patient takes the prescribed amount of medicine. Otherwise, there could be terrible consequences. The industry will be able to lower the margin of potential errors in medication with the help of Artificial Intelligence.

10. ROBOT-ASSISTED SURGERY

Robot-assisted surgery has grown in popularity. Several hospitals are using robotics to help them complete jobs that need precision, control, and flexibility. It is utilized in jobs that are beyond the capacity of humans, like open-heart surgery.

Robots equipped with mechanical arms, cameras, and the necessary surgical equipment supplement doctors' knowledge, abilities, and experience, resulting in a new type of surgery. Surgeons can sit at a computer console and direct the robot's mechanical arms, while the robot provides a magnified, 3-dimensional picture of the surgery site that is impossible to see with their own eyes.

Surgeries aided by AI-implemented robots result in fewer problems, less pain for the patients, and a faster recovery rate.

11. AUTOMATED IMAGE DIAGNOSIS

AI apps make it simple to understand imagery for analysis. These AI systems use Deep Learning technologies and programs to equip themselves with algorithms that allow for faster reading of complex images, such as those from CT scans and MRIs. The automated picture diagnosis system improves clinicians' performance by offering more accurate disease diagnoses[3]. Furthermore, it is an important tool in combatting the scarcity of radiologists and other medical personnel in hospitals. In recent years, artificial intelligence (AI) has made remarkable advances in medical imaging.

12. FRAUD DETECTION

While many patients are looking for cost-effective medical treatments, the number of fraud instances is increasing at an alarming rate. Most medical organizations and patients have suffered greatly as a result of this. These fraud efforts have been drastically decreased thanks to AI-based solutions, which allow for detailed navigation through procedures and detect fraud.

13. CLINICAL TRIAL PARTICIPATION

A vast amount of data must be collected and arranged in clinical trials in order to develop the best theory for a specific disease and its therapy. With the support of AI tools, hospitals may now facilitate a results-driven approach to clinical trials.

For these trials, AI allows neural networks to forecast each patient's bioactivity and features.

AI systems have aided researchers in identifying suitable candidates for testing and developing medications for a variety of ailments and conditions. In these circumstances, selecting the proper candidates is critical, and thanks to AI, the healthcare industry has seen a statistical increase in the success of clinical studies with faster speed and lower investment.

14. DEVELOPMENT OF NEW MEDICINES

It takes a long time and a lot of money to develop new medications for clinical trials. The unique feature of Artificial Intelligence technology is that it allows healthcare experts to scan pre-existing drugs and redesign them to tackle certain disorders. This reduces the cost of developing new medications.

15. THE CREATION OF THE FUTURE RADIOLOGY TOOLS;

MRI machines, CT scanners, and X-ray equipment all produce radiological pictures that provide non-invasive visibility into the interior of the human body[4]. However, a lot of diagnostic procedures still use actual tissue samples from biopsies, which come with hazards like the possibility of infection.

According to experts, artificial intelligence will make it possible for the next generation of radiological instruments to be precise and comprehensive enough to occasionally replace the need for tissue samples. If this effort is successful, practitioners may be able to make treatment decisions based on the behaviour of tumours as a whole rather than just a limited subset of their characteristics. Additionally, healthcare providers might be better equipped to categorize tumours' levels of aggression and better target their therapies.

The cutting-edge discipline of radiomics, which focuses on using image-based algorithms to identify the phenotypic and genetic characteristics of tumours, is being advanced by artificial intelligence by making "virtual biopsies" possible.

16. PROMOTING CARE ACCESS IN UNSERVED OR DEVELOPING AREAS:

Access to life-saving care can be greatly hampered in underdeveloped countries around the world due to a lack of skilled healthcare professionals.

By taking over some of the diagnostic tasks traditionally assigned to humans, artificial intelligence may be able to lessen the effects of this significant shortage of skilled clinical professionals.

AI imaging technologies, for instance, may frequently achieve a level of accuracy equivalent to people when screening chest X-rays for indications of tuberculosis [4]. A skilled diagnostic radiologist wouldn't necessarily need to be present if this capability could be implemented through an app made available to healthcare professionals in underdeveloped regions. Developers of algorithms must be careful to take into account the possibility that various ethnic groups or residents of various places may have distinctive physiologies and environmental factors that will affect how diseases exhibit themselves [4].

For instance, a disease's progression and the people it affects may differ greatly between India and the US.

We can't just design an algorithm based on a particular group and expect it to operate as well on others, so it's crucial to make sure the data represents a diversity of illness presentations and demographics as we're developing these algorithms.

17. EYE HEALTH:

According to a proverb, our eyes are the windows to our soul, but they are also a glimpse into our health. Early detection of eye issues can dramatically lower the risk of vision loss.

Several programs are investigating how to use AI techniques in conjunction with current medical knowledge about human eyes.

In order to improve the diagnosis of age-related macular degeneration (AMD), which is a leading cause of vision loss, and diabetic retinopathy, Google DeepMind has partnered with Moorfields Eye Hospital in London. Over 625,000 people in the UK and over 100 million people globally are affected by all of these eye illnesses combined.
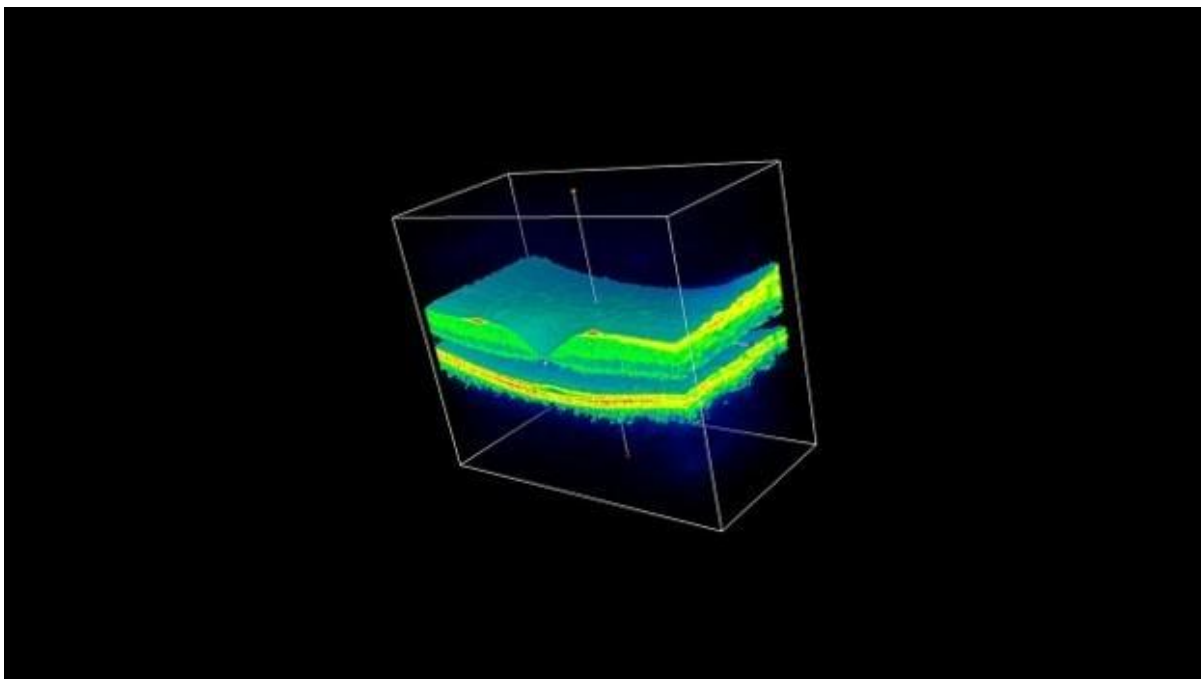

SOURCE: DEEP MIND

18. DETECTING DEPRESSION

The WHO estimates that more than 300 million individuals worldwide experience depression.AI may change how the disease is identified and offer technologically assisted therapies.

For instance, MindStrong, a company based in California, has just released a study demonstrating how its system can detect depression and other mental problems by analyzing how individuals use their smartphones. Their onsite developed software analyzes keyboard input, comprising taps, scrolls, and clicks, to predict an array of cognitive characteristics and emotional states.

Furthermore, there are encouraging indicators that artificial intelligence may be able to lessen the symptoms of depression. Woebot, a chatbot created in accordance with the principles of cognitive behavioural therapy, recently underwent a trial that demonstrated its efficacy in treating the disease.

In the study, 70 people between the ages of 18 and 28 either received an ebook from the National Institute of Mental Health or Woebot for two weeks (up to 20 sessions). Over the course of the trial, depression symptoms considerably decreased for those in the Woebot group.

Reduction in depression symptoms — Study conducted over two week period
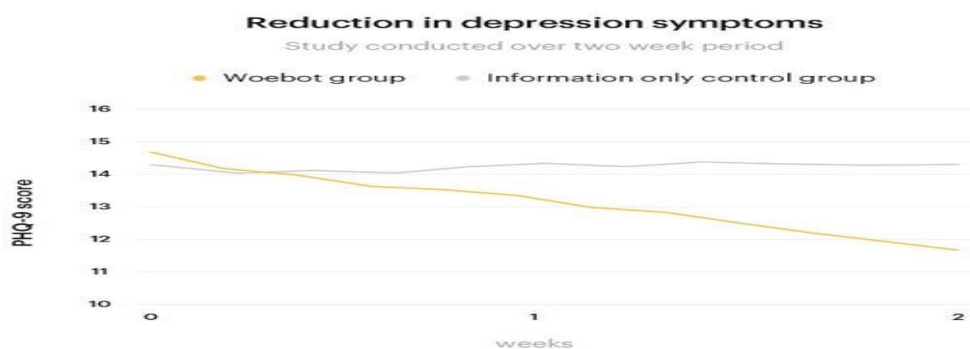
PROS AND CONS OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

There should be a balance in everything, including in the uses of AI. While there are several benefits of this technology in the field of healthcare, it has some flaws as well. Apart from the benefits, you will now learn the AI challenges in healthcare in the table below3.

Pros	Cons
Improved diagnosis	Complications in Learning AI
Serves rural communities better	A difficult change to adapt to
Better clinical decisions	Requires human assistance
Streamlines several processes	Requires the implementation of the correct AI platform

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