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Theoretical Review on Artificial Intelligence used in the Medical Sector

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Abstract- **Since the introduction of the term "artificial intelligence" in 1956, it has spurred several technical advancements in human medicine and fundamentally altered the conventional model of medicine. In this research, machine learning, intelligent robots, image recognition technologies, and expert systems are used primarily to demonstrate how artificial intelligence is being applied in several disciplines of medicine. We also go over current issues and potential developments in these fields. A lot of studies on this topic have been undertaken in recent years by several research organizations all over the world because of the growth of globalization. As a result, medical artificial intelligence has made great strides and will continue to grow in the future. The notion of artificial intelligence is emerging as the future of emerging technology, including automated cars, smart assistants, websites, digital creator software, speech recognition software, etc. Artificially intelligent systems assist people on a daily basis. Starting with the spam-free emails we receive in our inboxes, smart watches that use accelerometer sensor inputs to differentiate between routine activities and aerobic activity, and purchasing goods from online retailers like Amazon that make product recommendations based on our past purchasing histories.**

Keywords:- Artificial intelligence machine learning deep learning neural network Biomedical research healthcare applications Epileptic seizure

I. INTRODUCTION

John McCarthy, an American computer scientist who coined the phrase "Artificial Intelligence," convened the Dartmouth Conference in 1956. Prior to it, Alan Turing's Turing test and Dietrich Prinz's chess-playing software were among the works in the field of artificial intelligence, but substantial advancements only happened in the last thirteen years. AI uses computer systems that resemble machines to imitate aspects of human intellect and thought processes. This technology is capable of fast learning, forecasting, analysis, drawing conclusions, and even self-correction.

Speech recognition, facial recognition, and other forms of such limited AI are examples. These innovations show certain aspects of human intellect. Such intelligence is obtained from machine learning and deep learning methods used in artificial intelligence.

Machine learning is now the primary technique used in artificial intelligence. computer learning Machine learning technology, of which deep learning is a subset, currently shows a lot of potential in the medical industry. Due to their superior image analysis capabilities, deep learning algorithms are employed for medical picture categorization, text analysis, image quality enhancement, and segmentation.

AI has both a virtual and a physical presence during the healthcare process. Virtual applications are frequently conceived of as software-type algorithms that are integrated into the patient care episode frequently for decision-making reasons. On the other hand, physical presence frequently takes the shape of a material, tangible solution, like a robot or present machine that can communicate with the patient directly.

Building intelligent machines that can carry out activities that traditionally require human intellect is the focus of the broad field of artificial intelligence (AI).

Automated interfaces for speech recognition, decision-making, visual perception, and language translation are some uses of AI. AI is a multidisciplinary field of study.

The general public has embraced intelligent medical technologies (i.e., AI-powered ones) in part because they enable the 4P model of medicine (Predictive, Preventive, Personalized, and Participatory), which increases patient autonomy. For instance, smartphones are increasingly being used to fill out and distribute electronic personal health records, monitor vital functions with biosensors, and help to achieve optimal therapeutic outcomes.

FIGURE 1: 4P Model of Medicine

Medical professionals' ingenuity is increased by AI. These smart devices operate human-like and swiftly comprehend the language used to capture medical data, text, photos, bioinformatics, and financial transactions. For a choice that is absolutely accurate, these machines can comprehend human language. AI can boost research and discovery, save expenses, increase accuracy, and improve workflow and efficiency. To guarantee that patients receive the greatest

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results from AI-augmented diagnosis or therapy, it is our responsibility to take care of our patients.

It offers robotic surgery with AI assistance for a challenging situation. Through various virtual platforms, this technology generates information and often connects with the patient. There is a scarcity of healthcare professionals in rural places, and this technology can increasingly be utilized to fill this gap.
It raises the standard of medical students to meet any pressing need in rural areas.
Recently, scientists have predicted that AI would have a substantial influence on a variety of healthcare fields, including the treatment of chronic diseases and clinical decision-making. AI algorithms are showing promise in fields including radiology, pathology, ophthalmology, and cardiology even if they are still in the early phases of implementation.
Additionally, AI aids in illness prediction, which is, even under ideal circumstances, a difficult task for human doctors. AI can help the doctor determine the likelihood of developing cancer or compare the risk factors for heart attacks and strokes.
AI provides a potent toolbox for the quick and secure automation of laborious or repetitive activities and deep analysis that is beyond the capacity of the human intellect, giving doctors more time and energy to study patient data and interact with patients.

The broad spread use of Graphics Processor Units, which speed up parallel processing, and the availability of seemingly endless compute resources on demand in the cloud are both contributing factors to the rapid increase in computing power. Big data is also well supported by almost limitless cloud storage. As learning algorithms interact with training data, they become more exact and accurate, enabling fresher perspectives on patient outcomes, treatments, and diagnostics.

II. ADVANTAGES

AI can address a variety of medical issues, such as resolving various levels of complexity while carrying out the intricate operation with higher quality and results. The patient can now enjoy the benefits of prompt and precise decisions. The following are some of the several advantages of AI in the medical sector:

- To look for abnormalities and recommend medical treatment o to anticipate illnesses
- Accurate and effective diagnosis
- Assistance with complex and novel treatments
- Balance of the patient's blood/glucose levels
- Accurate and effective diagnosis
- Assistance with complex and novel treatments
- Balance of the patient's blood/glucose levels
- Proper patient monitoring
- Comfort for both doctors and patients
- Appropriate training for medical students; increased hospital safety
- Data collection during surgery that can be used to improve future procedures
- Favourable patient outcomes
- Improved doctor/surgeon experience.
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III. APPLICATION OF ARTIFICIAL INTELLIGENCE IN MEDICINE

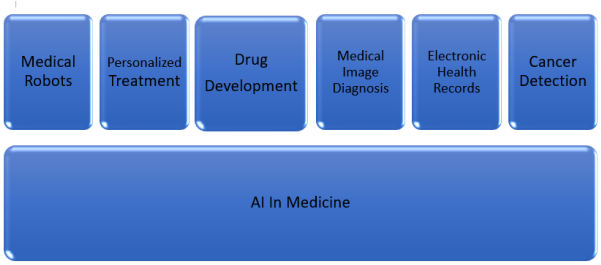

FIGURE (2): Application of AI in Medicine

One of the biggest problems for AI, ML, and DL is the application area of medicine.
AI can resolve a variety of medical-related issues, including some of the following:
Healthcare robots:
Robotic surgery is another field where AI-based tools are anticipated to make an influence. Robotic surgery can help doctors treat patients more precisely, with less blood loss, and with less discomfort. Because the robotic technology lowers gripping forces owing to tactile input and gives the surgeon the option for remote surgery, it lessens the likelihood of tissue harm.
Personalized Care:
AI techniques and systems have the potential to improve healthcare delivery beyond what any one could achieve on its own. Take precision medicine, which aims to customise medical care to each patient's unique traits. By making it possible for doctors to calculate the best medicine doses, detect the genetic abnormalities that cause certain malignancies, and sequence our microbiome, this is likely to revolutionise the way that healthcare is delivered.
Medication Development:
High-throughput screening data may be used to train AI and ML algorithms to create models that can forecast how patients and diseases will react to various drug combinations. By employing machine learning to develop and build reverse synthesis routes for chemicals, researchers are hastening the discovery of new drugs. A new drug's development generates a large amount of data. Artificial intelligence (AI) presents a wonderful chance to analyse chemical data and provide outcomes that will aid in medication development.
Diagnostic Radiology:
Both radiology and pathology are benefiting from AI's, and particularly ML's, capacity to analyse big datasets and derive valuable insights. Large volumes of complicated data may be found in the images produced by MRI machines, CT scanners, and X-ray equipment, making it challenging and time-consuming for medical professionals to analyse. Radiologists can benefit from clinical decision assistance from AI, which will also enhance patient care. AI is ready to automate picture segmentation, lesion identification, measuring, labelling, and comparison with prior images in radiology.

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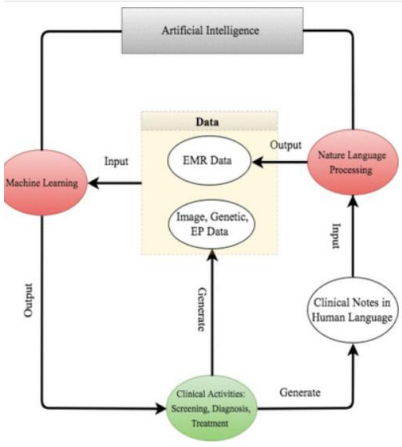
Electronic Health Records:
Thanks to artificial intelligence (AI), it is now feasible to identify people by studying their daily routines using data gathered by activity trackers like smartwatches and smartphones, connecting that information with demographic data, and so on. When combined with 20-minute data and numerous pieces of demographic information, the scientists claim that machine learning "effectively reidentified the physical activity data of most children and adults."
Cancer Detection:
The use of AI in cancer detection mostly entails identifying the cancer target region, outlining organs at risk, and creating a radiation treatment plan automatically. Without the need for human registration interpolation and other processes, the AI system can automatically achieve the intelligent delineation of radiative pictures. Additionally, AI can automatically create more individualised therapies by precisely predicting three-dimensional dosage distributions based on mapped organs and target locations.
Potential Aspect:
The clinical validation of recently created basic principles and techniques will be the use of AI in medicine during the next few years. Several well-known and commonly documented constraints of AI research are expected to make such validation more challenging, despite the fact that several studies have previously demonstrated the value of AI with obvious prospects based on encouraging results.

Systems like IBM's Watson can read innumerable medical journals, scan through millions of pages of data, and have a range and depth of knowledge well beyond that of any human doctor. An overburdened doctor could overlook a patient's susceptibility to a drug's negative effect, but an AI-based system won't. In addition, AI can help during surgery when used with augmented reality apps.
In several research, it has been shown that AI algorithms are more accurate at diagnosing worrisome skin lesions than dermatologists. This is due to the fact that AI systems may learn more from subsequent instances and can be exposed to many cases in a short period of time, considerably more examples than a physician could review in a human lifetime. In cases where professionals frequently disagree, such detecting pulmonary TB on chest radiographs, AI-based decision-making techniques are applied.
Many aspiring doctors and working physicians are concerned about the declining career chances caused by the rising use of technology. In the future, AI would be a crucial component of medicine.
Thus, it is crucial to teach the new generation of medical students the ideas and applications of AI, as well as how to interact effectively with robots in the workplace for increased efficiency, while also developing soft skills like empathy in them.
By evaluating the massive and varied volumes of data that patients and healthcare organisations continuously record, AI will help the medical field's future demands. By eliminating the mundane aspects of a doctor's job, AI is expected to assist and supplement doctors, boosting the human touch while allowing the doctor to spend more time with patients.

Around USD 18 billion was predicted to be invested globally in AI in 2021, up significantly from USD 650 million in 2011. By rising at a CAGR of around 45% throughout the forecast period, the worldwide artificial intelligence (AI) in the healthcare market is expected to generate significant revenue by the end of 2033.

SURVEY

Before AI systems can be used in healthcare applications, they must first be "trained" using data generated from clinical activities, such as screening, diagnosis, treatment assignment, and so on. This will allow them to identify groups of subjects that are similar to one another and identify relationships between subject features and desired outcomes. These clinical data frequently exist as demographic information, medical notes, electronic recordings from medical equipment, physical examinations, clinical laboratory data, and photographs, among other things.
A significant amount of the AI literature specifically examines data from electrodiagnosis, genetic testing, and diagnostic imaging at the diagnosis stage.
A.I. devices
According to the explanation above, there are primarily two groups into which AI devices may be divided. The first group consists of machine learning (ML) methods that analyse structured data, including genetic, imaging, and EP data. In the context of medical applications, ML techniques try to group the characteristics of patients or estimate the likelihood that a disease would manifest itself. 17 The second category comprises techniques for natural language processing (NLP) that draw information from unstructured data, such as clinical notes and medical journals, in order to complement and improve organised medical data. By converting words into machine-readable structured data, NLP methods aim to provide data that can be analysed by ML approaches. To provide a better argument.



The road map from clinical data generation to natural language processing data enrichment, to machine learning data analysis

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CONCLUSION

In this article, we examined the most recent advances in the use of AI in biomedicine, including illness diagnosis and prognosis, living aid, processing of biomedical data, and biomedical research. Many other biological fields have intriguing uses for AI as well. It is clear that AI is becoming more and more relevant in biomedicine, not just because AI is developing constantly but also because biomedical problems are inherently complicated, and AI is well suited to tackle them. New biomedical problems may be solved with the help of new AI skills, and the advancement of biomedicine necessitates higher degrees of AI capacity. This balance between supply and demand, along with related innovations, will allow both areas to make substantial advancements in the near future.

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