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CURRENT STATUS AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE (AI) IN MEDICAL FIELD

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ABSTRACT

As things stand, artificial intelligence (AI) will transform nearly every aspect of the medical industry. Examining the research done on this technology is necessary in order to determine its various medical applications.Artificial intelligence (AI) has transformed many industries by providing unmatched breakthroughs in automation, technology, and judgment. This review paper offers a thorough examination of the state of artificial intelligence (AI), covering its development, a wide range of industry applications, underlying technology, ethical issues, and potential future uses. This study seeks to provide a comprehensive overview of AI's varied influence by synthesizing recent research, methodology, and case studies, highlighting both its potential and problems. The summary of this analysis opens the door for more breakthroughs and responsible AI research by illuminating the critical role that AI plays in transforming industries, social norms, and human-machine interactions.

KEYWORDS:- *Artificial intelligence (AI); AI Application; AI Technologies; Medical; Treatment; Decision making*

INTRODUCTION

One of the 21st century's most significant and transformational technologies is artificial intelligence (AI). Its development has sparked a paradigm shift in a variety of industries, fundamentally altering how humans view technology, engage with it, and make decisions. AI's many uses have drawn a lot of attention as it continues to enter more and more areas of our life, igniting discussion and excitement about what that means for society, ethics, and the future. The origins of artificial intelligence (AI) can be found in the early days of computer technology, when visionaries imagined devices that could mimic human intelligence. This vision has developed over the years from theoretical ideas to real-world applications, thanks to exponential advances in algorithmic creativity, data accessibility, and computing power. From a professional systems and artificial intelligence The course of AI research has been characterized by incremental advances that have pushed the limits of what machines can accomplish, from deep neural networks and reinforcement learning. The ability of AI to learn from data, see patterns, and make remarkably accurate predictions or judgments is its defining characteristic. This ability has driven AI into a wide range of fields, erasing borders and changing entire sectors. AI-driven diagnosis and tailored therapy suggestions have the potential to improve patient outcomes in the healthcare industry. Algorithmic trading platforms and predictive analytics are transforming investment methods in the finance industry. Autonomous vehicles are the cutting edge of transportation, with the potential to completely transform mobility. These are only a few instances of AI's widespread impact on various industries.But despite AI's astounding potential, moral questions and societal ramifications remain significant. Discussion topics now center on issues including data privacy, algorithmic bias, employment displacement from automation, and the moral application of AI. Ensuring accountability, fairness, and openness is crucial as AI systems grow more independent and integrated into crucial decision-making processes. Maintaining a balance between creativity and moral obligation is still a major obstacle to the further advancement and application of AI technology.[13]

Benefits of Artificial Intelligence in medical field

AI can handle a variety of medical problems, such as determining a patient's level of difficulty while carrying out sophisticated operation with improved results and quality. The patient can now experience the benefits of their prompt and precise decision.[1,2]. The various advantages of AI in the field of medicine

- Assess abnormalities and recommend medical intervention;
- Forecast impending illnesses;
- Provide accurate and timely diagnosis;
- Support complex and novel treatments;
- Maintain blood and glucose levels in patients;
- Offer consolation to physicians and patients
- Adequately instruct medical students

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• Enhance hospital safety
• Gather information during surgery to help with future procedures.
• Positive patient outcomes;
• enhanced pathology results;
•improved physician and surgeon experiences;
•lower diagnostic costs;
•maintenance of the clinical record; and superior patient care In the medical field, artificial intelligence is useful for a range of jobs, including automated measurement tasks like pulmonary artery diameter, aortic valve analysis, and carina angle assessment. Currently, it is employed to determine the extent of damage and fracture in orthopaedic patients [3 ,4]

Different types of Artificial Intelligence technologies for medical field

AI has a significant impact on the medical field, with the help of different innovative technologies. It helps nurses, doctors and surgeon to make their work easy. These technologies support to form individualized treatment plans for patients. It is applicable in the medical diagnostic support system for the diagnosis of congenital heart diseases[5,6]The computerized storage of health records is important. It can improve diagnosis consistency, speed, and accuracy. These technologies are useful in capturing additional information that doctors may have overlooked and in precisely predicting the result for the patient. These are used in large medical organizations to monitor cost recovery, health expenditure, and treatment responses in order to properly manage the health system. The many kinds of AI technologies utilized in the medical industry are shown .

1. Machine Learning (ML)

In the medical field, this technology is used to determine the likelihood of disease. In addition, machine learning systems are programs that are self-improving and learning without experience or after being trained over time. They can evaluate medical results automatically and present them with a probabilistic degree of accuracy. ML algorithms can make decisions using the following algorithms and methods: supervised learning, unsupervised learning, semi-supervised learning, and reinforced learning.[7]

2 . Artificial Neural Networks (ANN)

Artificial Neural Networks (ANN) function similarly to neurons because each ANN neuron has weight and is connected. ANNs are inspired by the neural structure of the human brain and operate on the principles of backpropagation and layers (input layers, hidden layers, and output layers). • Useful in forecasting disease occurrence and decision-making since big data sets are used to train artificial neural networks (ANNs). The best weight corresponding to bond strength in human brain neurons ensures that the optimal path is obtained through ANNs.[8]

3.Natural Language Processing (NLP)

NLP is the study of speech recognition and language assessment using various methodologies. • In the medical field, this technology is helpful for clinical decision trials, supports, and analyses the unstructured data. It is also used for automated coding and maintains clinical documentation of the patient. • There are numerous independent NLP algorithms, such as parsing, POS, and tagging using HMM (Hidden Markov Model).[9]

4.Support Vector Machines (SVM)

Support Vector Machines address the primary basis data classification problem by identifying the class groupings of the input data. • When an SVM classifier is trained, they are utilized in email spam filters so that it may use and see fresh and unknown data-points for future correlations. • Helps create and process medical data; • Manages patients appropriately and supports the use of evidence in decision-making[10,11]

5.Heuristics Analysis (HA)

The basic algorithm on which heuristic work is to employ such a practical solution that it may not yield the optimal goal but works sufficiently to full fill that goal. Heuristic analysis is the best approach for patient safety and efficiently identified different problems. This technique uses a trial and error method to detect and discovery in order to solve a problem.[12]

Advancement of Artificial Intelligence

In the medical field, artificial intelligence offers disruptive innovation. In order to deliver quicker and more reliable results, it effectively analyzes data from medical records, systems, and information while enhancing digital automation. Digital consultation and patient-appropriate medication management are made possible by this technology1,6, 8. It aids physicians in achieving more success, some of which are covered below:

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Medicine
Artificial intelligence advances medicine development, personalized treatment, and diagnosis. It completes the laborious medical procedure with accuracy. Clinical trials can benefit from this technology, which also helps with efficient monitoring to produce reliable results. It is capable of carrying out appropriate patient monitoring and information sharing.

Surgery
By collecting data during the whole surgical process, physicians and surgeons are effectively incorporating AI. has a bright future ahead of it in terms of offering the best possible patient care. It produces a clinical judgment based on evidence to enhance surgeon workflow and patient care. It appropriately delivers effective outcomes from intricate surgery.

Radiology
Surgery aided by AI improves precision and consistency while learning in real-time operating environments. They could help the surgeon get better results during surgery and after treatment. The possibility of effective therapies is increased and the patient's active recovery is supported by all the modifications and improvements. In order to pre-define concepts, this technology can also post-set and pre-set procedure-related data variables. A more accurate representation and interpretation of complex data is now possible thanks to recent major advances in AI's perception—that is, its comprehension of sensory data.

Hospital Administration and Medical Records
This system maintains the record in digital format for the health care sector, increasing accuracy and efficiency. On the other hand, AI in hospital management systems improves and synchronizes many aspects and data, while also automating the storage, gathering, and analysis of customer and patient data. This technology assists in monitoring the patients' vital signs and gives the doctor and the patients' families access to real-time information. As a result, it helps with health system verification, which essentially runs the hospital. It accurately forecasts the etiology of an individual's illness. AI increases the productivity of physicians, surgeons, and hospital employees by providing digital control over hospital administration.[14]

Process chart of Artificial Intelligence in the medical field :
AI enables quick and precise communication throughout complex surgical procedures. It automatically plans, checks, and creates follow-up procedures during the hectic schedules of doctors. It increases therapy effectiveness while lowering the chance of diagnosis. Researchers, scientists, and doctors employed this technology to help people51, 52. Artificial intelligence (AI) can scan a patient's lab results and notify or remind the patient when necessary. The automatic electrocardiogram (ECG), cardiac monitoring, clinical laboratory analysis, medical imaging, electroencephalography, respiratory monitoring, and anesthesia are among the effective application areas. This cutting-edge technology can analyze blood tests, blood sugar levels, medical images, and a variety of other jobs quickly53,54. AI can get the knowledge needed to address a particular medical issue when patient data is integrated into algorithms. The artificial intelligence process chart is displayed in Figure 1.

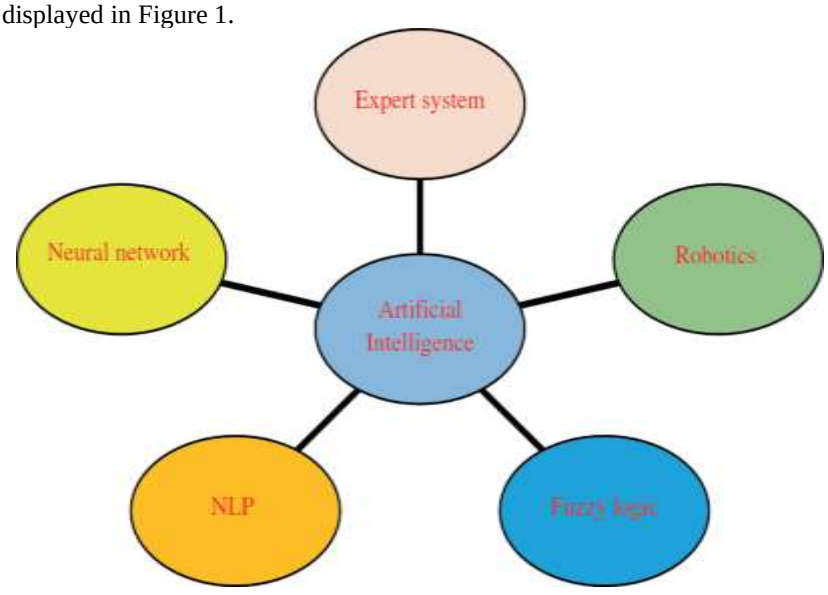


Fig.1 Process chart of Artificial Intelligence in the medical field [15]

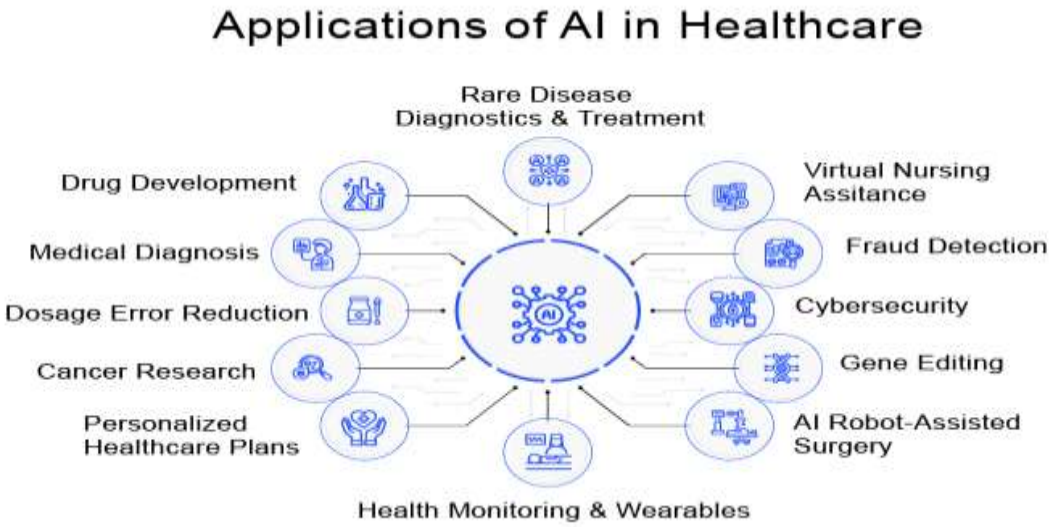
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Future Direction

AI will help medical professionals in the future years make better clinical judgments across the board. With the use of this technology, patients can receive the most recent knowledge and information possible. When AI is used properly, healthcare will improve in the future. Its main goal is to transfer unstructured text to a computer and then electronically record data. AI will be applied to innovation and financial management. It can effectively complete a necessary medical duty faster and for less money. With the use of technology, data may be digitally gathered, stored, and categorized to improve health. AI is able to respond to a variety of patient questions without the need for medical personnel. It is more capable than a human of gathering all unstructured data and visual images. It is going to create new opportunities for training, research, and development. It lowers the death rate with the aid of appropriate care. With the use of its speech recognition technology, it will suggest a suitable course of action to prevent illnesses. The primary shortcoming of this technology is that it lacks emotional intelligence because it is currently unable to adequately simulate or display human emotions.[14]

Artificial Intelligence applications in the medical field

There are needs for new, cutting-edge technologies in our daily lives that improve people's lives. AI has several benefits for fostering innovation in the medical sector. With the use of this technology, a doctor can examine a patient without going to a clinic or hospital. Thus, patients can now access online services thanks to this technology. Any question the patient may have about a range of medical concerns can be promptly addressed.[17,18] It can be used in a variety of ways to arrange a therapy to get better results. The various uses of artificial intelligence in the medical area are covered in under.



Artificial intelligence (AI) offers a superior capacity to carry out necessary tasks in the medical industry with less human participation. AI appears to be the greatest instrument for training, analysis, and clinical judgment. It has been demonstrated that when this technology is used properly, diagnosis may be completed quickly and accurately. Artificial intelligence has the potential to decrease human error in treatment and surgical procedures, while ensuring optimal patient safety—the patient's first concern.[19,20] The complex medical test and data obtained can be examined by the medical team. It is employed to analyze each patient's unique genetic makeup. This technology records information on medical issues, case studies, and patient histories [21,22]. It can sufficiently notify the patient about the need for a healthy diet, exercise regimen, and medicatio**n.**

DISCUSSION

Artificial Intelligence (AI) analyzes large amounts of intricate medical data using specialized software and sophisticated algorithms. It produces accurate and workable results without the need for direct human interaction. With the use of intelligent devices, this technology can comprehend information and develop with it. Analyzing the link between patient outcomes and treatment/prevention strategies is the primary goal of AI. AI technologies help the hospital meet its workforce and staffing needs while also lowering costs and increasing patient satisfaction. This technology allows for faster data collection and more processing power. It is possible to improve Robot-Assisted Surgery by utilizing this EHR system. With the use of this technology, a better outcome from surgery or therapy is produced. It has the ability to convey information regarding potential diseases.

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CONCLUSION

Artificial intelligence can support patient monitoring and appropriate care. It evaluates a picture or result without the need for a physician, surgeon, or other healthcare professional. Medical emergency predictions can be aided by the decision-making capabilities of AI-based technologies. Using a digital app to give medical advice is beneficial. This technology will improve treatment and diagnosis accuracy in the real world. It can be applied to lower medical expenses and avoid illness. By using this technology, unneeded hospital visits can be decreased and patient inquiries can be addressed. AI is a great resource and can spot issues when there is a physician shortage. In order to provide patients with better care, this technology first determines the biological cause of the illness. It completes the task accurately and can visualize medical images with ease.

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