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Artificial Intelligence in HealthCare

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Abstract

Artificial intelligence (AI) has emerged as a promising technology in healthcare research, with the potential to revolutionize the way healthcare is delivered. AI can be applied to various aspects of healthcare research, such as improving disease diagnosis, predicting patient outcomes, and developing personalized treatment plans. This research paper aims to provide an overview of the current state of AI in healthcare research and its potential impact on the industry. We explore the various applications of AI in healthcare research, including natural language processing, image recognition, and machine learning. We also discuss the challenges associated with the integration of AI into healthcare research, such as data privacy concerns, ethical considerations, and the need for rigorous validation and testing. Finally, we highlight some of the recent advances in AI-based health research and the potential for future developments in this area. Overall, this research paper demonstrates that AI has the potential to transform medical research and improve patient outcomes, but requires careful consideration of ethical and regulatory issues to ensure its safe and effective integration into clinical practice.

Key Words

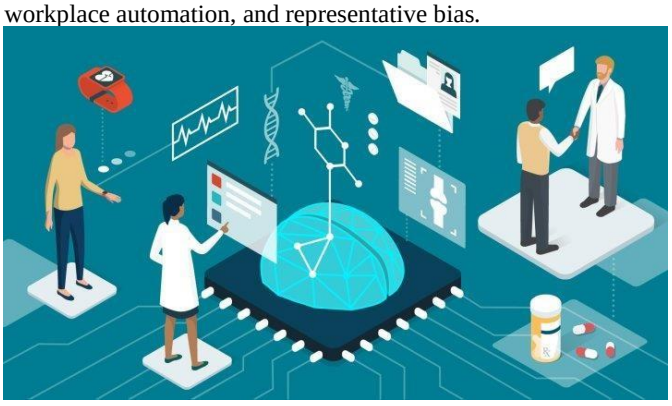
Artificial Intelligence, Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Medical Imaging, Electronic Health Records, Clinical Decision Support Systems, Predictive Analytics, Patient Monitoring, Drug Discovery, Precision Medicine, Telemedicine, Remote Patient Monitoring, Personalized Treatment, Digital Health, Wearable Technology, Health Informatics, Healthcare Data Analytics, Disease Diagnosis

INTRODUCTION

Artificial Intelligence (AI) has the potential to revolutionize healthcare by improving patient outcomes, reducing costs and increasing efficiencies. The use of AI in medical research has become increasingly popular in recent years thanks to advances in computing power, big data analysis, and machine learning algorithms. These tools allow researchers to analyze large amounts of patient data, spot patterns, and generate prior insights to win cannot be achieved with traditional methods. In this article we will examine how AI is used in issues to consider. Our goal is to provide a comprehensive overview of the current state of AI in medical research and to highlight some of the most promising areas for future research. By understanding the potential of AI in healthcare, we can work to design more effective and efficient healthcare systems that improve the quality of life for patients around the world.

Artificial intelligence in healthcare is an umbrella term used to describe the use of machine learning or artificial intelligence (AI) algorithms and software to mimic human cognition in the analysis, presentation, and understanding of complex healthcare and medical data . Specifically, artificial intelligence is the ability of computer algorithms to make approximate conclusions based solely on input data.The primary goal of health-related AI applications is to analyze the relationships between clinical techniques and patient outcomes. AI programs are being used in practices such as diagnosis, development of treatment protocols, drug development, personalized medicine, and patient monitoring and care. What sets AI technology apart from traditional healthcare technologies is its ability to collect data, process it, and generate well-defined outcomes for the end user.Artificial intelligence uses machine learning and deep learning algorithms for this. These processes can recognize behavioral patterns and generate their own logic. Machine learning models must be trained with large amounts of input to provide actionable insights and predictions. AI algorithms behave differently than humans in two ways: (1) algorithms are literal: once they set a goal, the algorithm only learns from inputs and can only figure out what it was programmed to do, (2) and about deep- Learning algorithms are black boxes; Algorithms can make predictions with extreme accuracy, but apart from the data and the type of algorithm used, they offer little or no understandable explanation of the logic behind their decisions

.Since the widespread use of AI in healthcare is relatively new, research is being conducted into its application in various areas of medicine and industry. Additionally, heightened attention is paid to unprecedented ethical issues related to its practices, such as privacy, workplace automation, and representative bias.



Literary Survey :

Will artificial intelligence solve the human resource crisis in healthcare

Meskó ,et al. (2018). There is a huge crises of healthcare workforce because of doctors shortage worldwide , aging and burnout physicians and more demand for chronic health care. There is over 17 million shortage of healthcare workers globally in addition to aging work-force. Because of increasing number of patients and shortage of physicians , we can see sleep disorder and burnout of healthcare workers can be seen these problems and gaps in society can be solved by the use of technology and artificial intelligence very easily. Artificial intelligence could help diagnose illnesses much faster than a doctor, and it can also ease administrative work by relieving staff. Deep genomics can help identify disease associations in genetic information sets and medical records. Supercomputers could help find new ways to treat diseases and facilitate clinical trials. AI could be used to reduce virus infectivity in less than a

day instead of years. Technology will not only reduce the cost of care, but also make it faster and more efficient, and solve healthcare crises.

How AI will transform primary healthcare

Lin, S.Y., Mahoney, MR, et al.(2019). As the shift from per-service fees to value-based payments is expected to grow the population of the healthcare management industry, many companies are exploring the role of artificial intelligence to enhance their ability to identify and optimize their performance with population-based healthcare tools for physicians. . Many companies are developing AI-assisted physicians who can give health advice directly to patients with joint problems, reducing the workload for more complex treatments. As technology advances, many people carry devices that detect early signs of disease. Doctors may be able to use data from these devices to treat diseases at an earlier stage. AI- powered machines diagnose diseases with greater precision than doctors in treating skin cancer3, breast cancer, colon cancer, brain tumors3 and cardiac arrhythmias. These tools in the hands of GPs can bring measurable benefits to patients. AI can be used to automate parts of primary care more efficiently and quickly for patients and physicians.

Artificial intelligence in neuroscience: a clinician's perspective

Ganapathy, K., Abdul, S.S. et al. (2018).The human brain is very complex to understand and perform operations. The human brain is a very active part of our body, so human error can occur during an operation. Applying artificial intelligence to neuroscience will help us understand how the brain works intelligently. AI aims to mimic human cognitive functions. AI can help doctors stay informed by sharing the latest research on specific diseases and help them better care for their patients. The AI outperformed many doctors by

redicting surgeries active layouts. Patients suffering from mental health issues can be helped by using AI , it may also reduce risk of suicide. Machine learning algorithms could help in medication therapies and curing for many mental Diseases. Accurate prediction of tremor can be achieved by using machine learning but prediction accuracy is dependent on the quality of the clinical measurements. AI will be adopted in neurological treatments only when there is evidence that AI leads to better outcomes, efficiency and reduces costs.

Hopefully, the AI enabled clinician will now spend more time with his patient for the wellbeing of patient mentally rather than struggling with the data.

Artificial Intelligence in Thoracic Surgery: Past, Present, Prospects and Limitations

Etienne, H., Hamdi , S., (2020) et al. Thoracic surgeries are showing significant improvements thanks to recent advances in artificial intelligence technologies. Advances in fields such as radiology, pathology, and pulmonology have helped surgeons treat patients effectively. Great advances have been made in the field of radiology thanks to deep learning. Helps identify lung nodules on chest X-rays. The algorithm-based system has outperformed many surgeons in x-ray classification and nodule detection. The robot is a tool that mimics the skills of a surgeon and cannot be used as a substitute for a surgeon. The surgeon will control every movement of the robot; The system mimics the surgeon's hand movements in real time. With the help of robots, we can perform operations with great precision and efficiency. This development has helped not only patients, but also surgeons. Artificial intelligence technologies can improve clinical practice and surgeon efficiency.

Artificial intelligence in heart management

Nadikattu, R R (2017). Heart disease is one of the leading causes of death worldwide. As such, there is a constant need to create new ways to treat heart disease, and artificial intelligence is having a tremendous impact on the healthcare industry in diagnosing and treating disease. An unhealthy lifestyle puts blood in the arteries, increasing the risk of heart attacks, including in children. The AI records patients' responses to doctors' questions to help determine problems and symptoms. AI will make it easier for doctors to analyze a patient and determine which patient needs further treatment and care. a high- risk patient has a better chance of survival. AI can also enable multiple person monitoring, making it easier for doctors to monitor more than one person at a time. Cardiologists using artificial intelligence and machine learning can make decisions based on data and new field research to treat the patient effectively. It also helps the person by lowering the price by offering better treatment. Integrating technology into medicine helps treat people cheaper and more efficiently so no one dies from a disability.

How artificial intelligence is transforming care.

Robert N (2019). Artificial intelligence has introduced new algorithms and methods into nursing and medical practice. As new algorithms are integrated into the system to assist nurses in patient care, it will be very important that nurses acquire sufficient knowledge to interpret the many data findings and integrate the new information into nursing practice. Currently, some robots are designed to respond emotionally to circumstances and provide psychological support to patients. As robots learn to perform nursing tasks such as mobility aids, vital signs, drug delivery, and infectious disease protocols, the role of nurses in healthcare will change. . You will have nurses with a robot spend enough time and more time with patients. And support them mentally. Technology will change the way nurses do their jobs, but the need for nurses will remain the same.

Integrating AI and technology into medicine will help patients receive better care and treatment.

CURRENT APPLICATIONS IN AI:

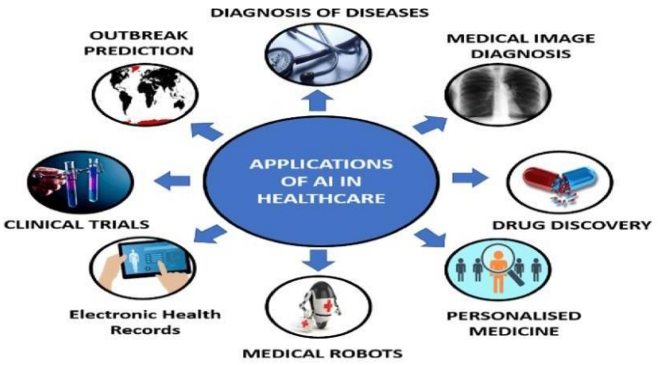
AI has already found applications in a variety of healthcare areas, including:

1.Medical imaging: AI algorithms can analyze medical images such as X-rays, MRIs and CT scans and help diagnose diseases such as cancer and cardiovascular diseases.

Electronic Health Records (EHR): AI can improve the accuracy and completeness of electronic health records and provide physicians with relevant data to support clinical decision- making.

Drug Discovery: AI can accelerate the drug discovery process by identifying potential drug targets and candidates, reducing the time and costs associated with traditional drug discovery. Remote Patient Monitoring: Artificial intelligence enables remote patient monitoring, allowing doctors to monitor the patient's health status in real time and intervene quickly if necessary.

Predictive Analytics: Artificial intelligence can use patient data to predict the risk of developing certain conditions, such as diabetes or heart disease, enabling early interventions to prevent or treat those conditions.



Roles of Artificial Intelligence in healthcare cardiovascular system -

Artificial intelligence algorithms have shown promise in the accurate diagnosis and risk stratification of coronary artery disease patients and show potential as a screening tool, although few studies have directly compared precise machine learning models to clinical diagnostic capabilities. Used to predict patient mortality, drug effects and adverse events after treatment of acute coronary syndrome. Wearables, smartphones andweb technologies have also demonstrated the ability to monitor patients' heart data points, increasing the amount of data and various metrics that AI models can use and potentially enabling early detection of heart disease and cardiac events occurring outside of the hospital. Another burgeoning area of research is the use of AI in heart murmur classification and valvular heart disease diagnosis.[30] AI challenges in cardiovascular medicine included limited data available to trainmachine learning models, as well as limited data on social determinants of health related to cardiovascular disease.

Dermatology-

Dermatology is an imaging specialty and the development of deep learning is strongly tied to image processing. Hence, there is a natural correspondence between dermatology and deep learning. There are 3 main types of dermatological imaging: contextual imaging, macro imaging and micro imaging. For each modality, deep learning has made tremendous strides. Han et al. demonstrated the detection of keratinocytic skin cancer based on facial images. Esteva et al. Dermatologically confirmed classification of skin cancer based on lesion images. Noiano et al. demonstrated a convolutional neural network that achieved a 94% success rate in identifying skin cells from Tzanck smear microscopic images.In 2018, an article published in the journal Annals of Oncology claimed that skin cancer could be more accurately detected by an AI system that uses a convolutional neural network for deep learning. only by dermatologists.On average, dermatologists accurately identified 86.6% of skin cancers from images, compared to 95% with the CNN device.

Gastroenterology

AI can play a role in various aspects of gastroenterology. Endoscopic tests such as esophagogastroduodenoscopy (EGD) and colonoscopy rely on the rapid detection of abnormal tissue. By augmenting these endoscopic procedures with artificial intelligence, doctors can identify diseases faster, quantify their severity and visualize blind spots.Early attempts to use AI detection systems in early-stage gastric cancer have shown sensitivity similar to experienced endoscopists.

Infectious Diseases-

AI has shown potential in both the laboratory and clinical setting of infection medicine. As the novel coronavirus ravages the world, it is estimated that the United States will invest more than $2 billion in health-related AI research by 2025, more than four times the amount spent in 2019 ($463 million). Neural networks were developed to quickly and accurately detect host responses to COVID-19 from mass spectrometry samples. Other applications includeauxiliary vector machines to identify antimicrobial resistance, automated blood smear analysis to detect malaria, and improved Lyme point-of-care testing based on antigen detection.

Oncology-

AI has been studied for use in cancer diagnosis, risk stratification, molecular characterization of tumors, and anticancer drug discovery. A particular challenge in cancer treatment for which artificial intelligence is being developed is the ability to accurately predict which treatment protocols will be most appropriate for each patient based on their genetic, molecular and cancer-related characteristics. mathematical sequences, artificial intelligence was tested incancer diagnoses by reading out imaging tests and pathological specimens. In January 2020, scientists unveiled an AI system based on Google's DeepMind algorithm that could outperform human experts in detecting breast cancer. In July 2020, it was reported that an AI algorithm developed by the University of Pittsburgh has achieved the highest accuracy in detecting prostate cancer, with a sensitivity and specificity of 98% of 97%.

Ophthalmology-

The eyes should not be overlooked when using AI-assisted technology to screen for eye diseases. In 2018, the US Food and Drug Administration approved the launch of the first medical device to diagnose a specific type of eye disease, diabetic retinopathy, using an artificial intelligence algorithm. Detection time can be shortened.Additionally, the implementation of digital pathology is expected to save the university center more than

$12 million over five years, although the cost savings associated with artificial intelligence have not yet been extensively studied. The use of augmented and virtual reality could prove to be a stepping stone to the wider adoption of AI-assisted pathology, as it can identify areas of concern in a pathological sample and present them to the pathologist in real-time for further

evaluation. AI also has the potential to identify histological findings at levels beyond what the human eye can see and has demonstrated the ability to use genotypic and phenotypic data to more accurately identify the origin of metastatic cancer. One of the major obstacles to the widespread adoption of AI-assisted pathology tools is the lack of multi-center, prospective, randomized, controlled trials to determine the true clinical utility of AI for pathologists and patients. , highlighting the current area of research needs in AI and health.

Primary care-

Primary health care has become one of the key areas for the development of artificial intelligence technology. AI in primary care has been used for decision support, predictive modeling and business analysis. There are only a few examples of AI-supported decision support systems that have been prospectively evaluated for their clinical effectiveness when used in practice by physicians. However, there are instances where the use of these systems has had a positive impact on physicians' treatment choices.

Psychiatry-

In psychiatry, applications of artificial intelligence are still in the proof-of-concept stage.Areas where evidence is rapidly accumulating include predictive modeling of diagnosis and treatment outcomes, chatbots, chatbots that mimic human behavior, and which have been studied for anxiety and depression. Challenges include the fact that many apps in the industry are developed and offered by private companies, such as the suicidal ideation test launched by Facebook in 2017. Such non-healthcare apps raise a variety of professional, ethical, and regulatory issues. Another problem is often the validity and interpretability of models. Small training datasets carry the overhead of legacy models and compromise the generalizability and stability of those models. Such patterns can also potentially discriminate against minority groups that are underrepresented in the samples.

Radiology-

Artificial intelligence is being studied in the field of radiology to detect and diagnose diseases using computed tomography (CT) and magnetic resonance imaging (MRI). This can be particularly useful in situations where the demand for human expertise exceeds supply, or where the data is too complex for readers to interpret effectively. Several deep learning models have shown that they can be almost as accurate as medical professionals in detecting diseases using medical imaging, although few of the studies reporting these results have been externally verified. AI can also offer non-interpretative benefits to radiologists, such as: B. the reduction of image noise, the generation of high-quality images with lower radiation doses, the improvement of MRI image quality and the automatic assessment of image quality. Further research on the use of AI in nuclear medicine focuses on image reconstruction, anatomical mapping and the possibility of lower doses in imaging studies.

BENEFITS IN HEALTHCARE:

The benefits of AI in healthcare are many, including:

1. Improving Accuracy: AI can improve the accuracy of medical diagnoses, reduce errors, and improve patient outcomes.
2. Increased efficiency: AI can automate repetitive tasks, reducing the burden on healthcare workers and improving efficiency.
3. Personalized Medicine: AI can analyze patient data to create personalized treatment plans to improve patient outcomes.
4. Reduced Costs: AI can reduce healthcare costs such as hospitalizations and unnecessary testing.
5. Faster diagnoses: AI can analyze medical images and patient data in real time for faster diagnosis and treatment.

CHALLENGES WITH AI IN HEALTHCARE:

Despite its many benefits, AI in healthcare also faces several challenges, including:

1.Data Quality: AI requires high-quality data to function effectively, which can pose a challenge in healthcare, where data is often incomplete, inconsistent, or inaccurate.Privacy and 2.Security: The use of artificial intelligence in healthcare raises privacy and security concerns, particularly around patient data. 3.Ethical Concerns: AI in healthcare raises ethical concerns about the use of patient data, the potential bias of AI algorithms, and the impact on the role of healthcare professionals.

4.Regulatory framework: The use of AI in healthcare is still relatively new and a regulatory framework is needed to ensure the ethical and safe use of AI.

ADVANTAGES:

1. Expensive surgeries are replaced by robotic surgeries, which are not only cost-effective but also beneficial for treating patients.
2. AI will help to manage hospital records, which is a tedious work, but with the help of AI, it will be fast and efficient.
3. Diagnosis of diseases will be more effective and earlier than the doctor, which will help timely treatment.
4. With real-time data, clinical decision-making becomes much easier with the KI.
5. Patient-specific data can be easily monitored with the KI, making treatment easier.
6. AI will reduce people's work and help them focus on more productive work, such as B. Taking care of the mental health of patients, which is very important.
7. All the administrative work, which accounts for 30% of healthcare costs, is done much faster and more efficiently with the help of artificial intelligence, saving money.
8. AI in wearable medical devices will detect problems faster than traditional methods.
9. Using artificial intelligence will reduce health care costs and make basic health services accessible to all.
10. The time required for diagnosis and treatment is reduced through the use of artificial intelligence.

CONCLUSION:

Artificial intelligence will be very useful in a country like India, where healthcare services are not accessible to all and a luxury for some people. With the use of artificial intelligence,

the cost reduction in basic health care facilities is implemented and everyone can afford the necessary services for life. As the number of non-communicable infectious diseases increases and new viral infections spread, AI becomes more useful to humans as it detects diseases much faster and treats patients' lives more effectively. Population growth puts a strain on our medical staff, resulting in medical staff not sleeping properly and being mentally exhausted, reducing their effectiveness in caring for and treating patients. Using artificial intelligence, smart robots will be able to help our medical staff. It will also reduce the burden on medical staff by providing much more efficient care and treatment to patients. In this way, more than patients will be treated with AI, which will help reduce the gap between supply and demand in our country. Ordinary men and women will be able to self-diagnose minor illnesses with AI-powered smart watches and bracelets, saving them not only time in the hospital but money as well. The potential of artificial intelligence is enormous and it will grow every year thanks to new innovationsin society and the great help of mankind.

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