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AI in Healthcare

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Abstract: *Artificial Intelligence (AI) seeks to emulate cognitive processes in humans. Thanks to the expanding availability of healthcare data and the quick advancement of analytics tools, it is revolutionizing the healthcare industry. We examine the state of AI applications in healthcare now and talk about their prospects. AI is applicable to both organized and unstructured healthcare data. Popular artificial intelligence (AI) approaches include natural language processing for unstructured data and machine learning techniques for structured data, such as neural networks and contemporary deep learning. Among the major disease areas that use AI techniques are neurology, cardiology, and cancer. Through rapidly evolving innovation, AI-powered wearables are emerging not merely as gadgets but as integral partners in patients' journeys toward better health. These gadgets are at the forefront of a revolution in healthcare, helping to manage chronic illnesses and optimize exercise regimens. But these AI powered gadgets also have some ethical challenges which needs to be taken care of.*

Keywords: AI- health - Deep Learning – Machine Learning – Natural Language Processing.

I. INTRODUCTION

AI is the term for a group of technologies that let computers and other devices mimic human intelligence. Artificial intelligence (AI) systems have been created to assess a wide range of health data, including data from clinical, behavioral, environmental, and pharmaceutical studies, as well as data from patient records.

Artificial Intelligence (AI) has garnered significant interest from several fields due to its potential to automate numerous processes that now require human participation. These days, computer vision, speech recognition, and natural language processing (NLP) all benefit from the application of AI techniques. The quick advancement of computer hardware and software in the healthcare industry in recent years has made it easier to digitize health data and created opportunities for AI systems to be used to extract insights from that data.

AI systems are capable of simulating human intellect on a range of levels. AI includes both deep learning (DL) and machine learning (ML) as subcategories. Fundamentally, ML enables systems to learn from data. DL is a subset of ML that builds models using more intricate structures. According to Obermeyer and Emanuel [1] , conventional AI techniques (such expert systems) may "take general principles about medicine and apply them to new patients" in a way that is comparable to that of first-year medical residents. ML extracts rules from the data in a way that is akin to what a resident physician could encounter .

The labor-intensive nature of feature engineering in traditional machine learning (ML) techniques like logistic regression and support vector machine (SVM) methods is one of their drawbacks. The process of creating higher level feature representations from raw patient characteristics is known as feature engineering. This issue is addressed by DL techniques which use an end-to-end learning architecture, mapping patient data to outcomes via several layers of nonlinear processing units (i.e., neurons). The amount of human input required for high-level feature engineering is reduced by this method. Nonetheless, human intervention is necessary in order to create suitable deep learning model topologies and optimize model parameters. One of the field's major challenges is reducing the amount of human intervention needed to construct these designs.

AIM-

The primary objective of the present research is to examine the potential applications of AI in healthcare, taking into consideration relevant technologies, implementation possibilities, and outcomes.

II. MATERIAL AND METHODS

Publications over the past five years reporting the use of AI in health in clinical and biomedical informatics journals, as well as computer science conferences, were selected according to Google Scholar citations.

We made an effort to examine previous research on0 medical uses of automated systems. The research is analytical by design & bases itself on secondary information, including texts, web pages, educational magazines, & scholarly works.

III. TYPES OF AI OF RELEVANCE TO HEALTHCARE

Artificial intelligence is a group of technologies rather than a single one. Although the precise jobs and processes that these technologies assist vary greatly, the majority of them have immediate significance to the healthcare industry. The following lists and describes a few specific AI technologies that are very significant to the healthcare industry.

A. Machine Learning- Neural Networks and Deep Learning

Machine learning is a statistical technique for fitting models to data and to 'learn' by training models with data. Machine learning is one of the most common forms of AI; in a 2018 Deloitte survey of 1,100 US managers whose organisations were already pursuing AI, 63% of companies surveyed were employing machine learning in their businesses [2].

Precision medicine, which predicts which treatment regimens are likely to be effective for a patient based on a variety of patient features and the treatment environment, is the most popular use of classical machine learning in the healthcare industry.

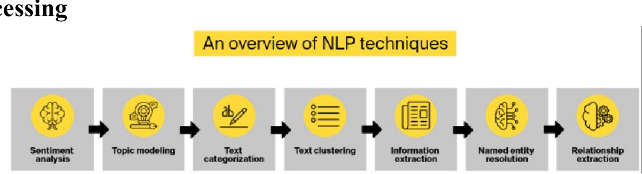
A more complex form of machine learning is the neural network – a technology that has been available since the 1960s has been well established in healthcare research for several decades and has been used for categorisation applications like determining whether a patient will acquire a particular disease. It views problems in terms of inputs, outputs and weights of variables or 'features' that associate inputs with outputs. [3]

Medical Imaging: Deep learning models can analyze medical images such as MR and CT scans to detect diseases and abnormalities. For example, deep learning algorithms can identify melanoma in dermatology images with more than 10% accuracy than experts, according to a study in 2018.

The most complex forms of machine learning involve deep learning, or neural network models with many levels of features or variables that predict outcomes.

A common application of deep learning in healthcare is Medical Imaging. Deep learning models can analyze medical images such as MR and CT scans to detect diseases and abnormalities. For example, deep learning algorithms can identify melanoma in dermatology images with more than 10% accuracy than experts, according to a study in 2018. Deep learning models can analyze large datasets of chemical compounds to predict their potential as drugs, which can accelerate the drug discovery process. Deep learning models can analyze electronic health records to predict the likelihood of diseases such as Alzheimer's, cancer, and heart disease.

B. Natural Language Processing



Natural language processing (NLP) is a branch of AI that uses algorithms to extract meaning from unstructured human language presented either in spoken or written format. NLP requires knowledge of computational linguistics and other machine learning skills Because it can evaluate vast amounts of unstructured medical data, including clinical trial results, doctor notes, medical records, and even service evaluations that patients post on social media, natural language processing is becoming more and more popular in the healthcare industry. Approximately 80% of healthcare data is unorganized and underutilized, according to research. By evaluating data and drawing conclusions to help physicians and pharmacists make better decisions, NLP can change that.

Another way of benefiting from NLP in healthcare is Sentiment Analysis. It aids medical professionals in compiling and analyzing user feedback from various social media channels. Thousands of reviews can be processed by natural language processing algorithms to determine how patients feel about the service they received. These systems are able to pinpoint the things that irritate patients, group them according to frequency, and begin making changes for the most persistently unfavorable comments.

A remark like "I waited for 30 minutes on the phone to talk to the receptionist," for example, suggests that the administrative personnel did not meet expectations.

IV. RESHAPING HEALTHCARE WITH AI-POWERED WEARABLES

How individuals and healthcare providers monitor and manage health has changed dramatically as a result of the integration of wearable technology and artificial intelligence (AI). These wearable tech devices are becoming more than just fitness trackers; they are becoming essential tools for managing chronic diseases and promoting holistic well-being.

This rapidly developing industry is exhibiting new developments that combine technology and health. They are giving consumers more understanding of their own health and raising awareness in order to help them better manage their stress, sleep, and other everyday activities. They offer vital information to medical professionals that can guide diagnosis and treatment decisions and track the development of chronic illnesses.

Health watches and fitness trackers have developed from simple data loggers into a $50 billion market, led by Fitbit, Apple, and Garmin. These smart devices are trackers that measure a wide range of health parameters and physical activity with precision. They serve as accountability partners as well, giving users the tools they need to move closer to their fitness objectives and providing real-time data on their accomplishments.

In a similar vein, the advent of wearable blood pressure monitors has fundamentally changed convenience and accuracy. These devices go beyond conventional at-home techniques by providing clinical-level blood pressure monitoring at the wrist, allowing for a smooth incorporation into users' daily life.

Wearables offer continuous monitoring of health markers and real-time data for managing chronic diseases, which improves and informs management plans. [4]

Groundbreaking innovations continue to redefine the scope of wearable devices. The next Apple Watch is rumored to introduce sensors for evaluating blood glucose levels, monitoring elevated blood pressure, and measuring breathing patterns during sleep. These potential developments exemplify the integration of cutting-edge technologies into

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everyday health monitoring, and they represent a momentum for a transition into tools that can better inform diagnoses and treatments.

Lumen, a metabolic measurement device, operates by analyzing breath composition to measure metabolism. This data-driven approach provides users with personalized nutrition and fitness recommendations, elevating the concept of wearables from passive observers to proactive health partners.

The Spire Health Tag takes a unique approach by focusing on stress management. By tracking breathing patterns and heart rate variability, it provides valuable insights into stress levels, facilitating informed strategies for stress reduction.

Biostrap, a holistic fitness tracking device, combines heart rate, oxygen saturation, and movement tracking. This comprehensive approach offers users deeper insights into their fitness levels, optimizing workouts and fostering a deeper understanding of overall health. [4]

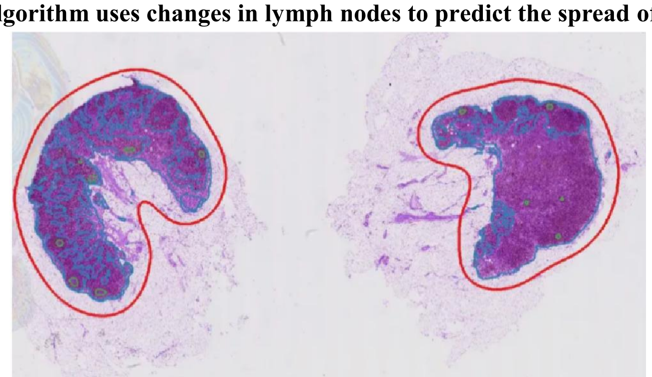
Some ethical challenges while using these wearable tech are –

1. Privacy and data security: Wearable technology continuously gathers private health information, which raises questions about security lapses and unwanted access. To protect patient privacy, it is imperative to have strong data encryption, stringent access controls, and open data management procedures.
2. Informed consent and autonomy: Before utilizing wearable technology, patients must give their informed consent, explaining how their data will be gathered, saved, and used. Respecting patients' autonomy means granting them control over their data and the freedom to revoke their consent at any moment.
3. Data accuracy and reliability: There is a chance that misinterpretations or poor medical decisions may result from the inconsistent quality and dependability of data gathered by wearable technology. It is essential to communicate openly about the limitations of the equipment and the significance of cross-referencing data with clinical evaluations.
4. Equity and access: Wearable technology access could make healthcare inequities worse since not all patients have equal access to these devices or the technical know-how to operate them properly. Maintaining fair access and removing obstacles to adoption are crucial in order to keep inequality from getting worse.

V. CASE STUDIES

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

A. May 26, 2023, An AI algorithm uses changes in lymph nodes to predict the spread of breast cancer.



Researchers at King's College London developed smuLymphNet, an AI model, to predict the likelihood of triple-negative breast cancer spreading. Tested on 5,000 lymph nodes from 345 patients, the model analyzes immune responses in lymph nodes to identify patterns indicating cancer spread. Even without visible spread, lymph node changes can predict metastasis. The model will undergo further testing across Europe and in clinical trials, potentially enabling tailored treatments based on cancer spread likelihood, thereby 1improving outcomes for patients (Verghese et al., 2023). [5]

B. A free artificial intelligence tool for creating high-resolution T1-weighted pictures for 3D morphometry from heterogeneous clinical brain scans

Harvard Medical School developed SynthSR, an AI technique, to enhance low-resolution MRI brain scans into high-resolution images, enabling broader use of neuroimaging tools. This innovation bridges the gap between clinical and research-grade scans, facilitating research on underrepresented populations and rare illnesses. SynthSR's potential extends to revolutionizing MRI use in critical conditions and medically underserved areas where MRI suites are inaccessible. Its impact could significantly advance understanding of neurological conditions and genetic linkages through improved neuroimaging capabilities (Iglesias et al., 2023). [6]

VI. DISCUSSION AND CONCLUSION

We reviewed the motivation of using AI in healthcare, presented the new age AI-powered technologies being used for the good health of patients

AI offers several advantages to the healthcare industry, its personnel, and the patients that deal with it on a daily basis.

AI has the potential to transform the health care sector in the years to come, just like it has many other industries. Artificial intelligence (AI) is anticipated to contribute to the creation and discovery of novel medical treatments, in addition to enhancing patient diagnosis, treatment plan formulation, and overall health outcomes in healthcare facilities. Over the next ten years, there will likely be a major increase in the application of artificial intelligence in healthcare.

In conclusion, deep learning, machine learning, computer vision, and natural language processing (NLP) are at the forefront of the rapidly developing field of artificial intelligence (AI), which has emerged as a transformational force in healthcare. It is clear from a thorough analysis of several case studies and academic publications that these AI technologies are transforming healthcare delivery on a number of fronts.

Deep learning has transformed the interpretation of medical imaging, improving diagnostic efficiency and accuracy through its capacity to comprehend complicated data patterns. Predictive analytics tools for early disease identification and individualized treatment plans are being provided to clinicians by machine learning algorithms, which are skilled at extracting insights from large datasets.

Moreover, automatic analysis of medical images has been made possible by computer vision technologies, which have streamlined workflows and decreased diagnostic errors. Similar to this, NLP methods are making it easier to extract and understand unstructured clinical data from electronic health records, which improves patient outcomes and allows for better decision-making.

It is clear from a synthesis of academic papers and a range of case studies that the use of these AI technologies is not only improving healthcare delivery but also sparking radical changes in research, clinical practice, and healthcare administration. The ethical implications of artificial intelligence (AI) in healthcare must be carefully considered, data privacy must be protected, and interdisciplinary collaboration must be encouraged in order to optimize the advantages and minimize the drawbacks of AI adoption in this field.

VII. ACKNOWLEDGEMENT

This research would not have been possible without the invaluable support of several individuals. I would like to express my deepest gratitude to my advisor, Dr. Papiya Mukherjee, for her constant guidance, encouragement, and insightful feedback throughout this project. Her patience and expertise were crucial in shaping this research and refining my understanding of AI in HealthCare.

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REFERENCES

[1]. Obermeyer Z, Emanuel EJ. Predicting the Future - Big Data, Machine Learning, and Clinical Medicine. N Engl J Med 2016; 375 (13) 1216-9

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[2]. Deloitte Insights State of AI in the enterprise. Deloitte, 2018. www2.deloitte.com/content/dam/insights/us/articles/4780_State-of-AI-in-the-enterprise/AICognitiveSurvey2018_Infographic.pdf. [Google Scholar]

[3]. Sordo M. Introduction to neural networksin healthcare. OpenClinical,2002. www.openclinical.org/docs/int/neuralnetworks011.pdf [Google Scholar]

[4]. https://www.captechu.edu/blog/how-ai-powered-wearables-are-reshaping-health-care

[5]. https://www.kcl.ac.uk/news/scientists-ai-model-predict-breast-cancer-spread

[6]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9891693/

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