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Current Application of Artificial Intelligence in Diagnosing Medical Conditions.

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Abstract

Artificial intelligence (AI) is the theory and development of computer systems able to perform tasks normally requiring human intelligence.AI is transforming healthcare, particularly in the area of medical diagnosis, by implementing cutting-edge machine learning and deep learning algorithms that improve diagnostic speed and accuracy in cardiology, radiology, and pathology. Predictive analytics is made possible, which lowers healthcare expenses while improving access. However, the integration of AI is hindered by ethical issues, data security, algorithmic biases, and professional training. Young professionals' surveys regarding AI's role in healthcare show an overall sense of optimism, with a focus on how AI can democratize access to high-quality healthcare globally. AI is not here to replace human doctors but to complement them in improving the clinical accuracy of all, while retaining empathetic, patient-centred care. This demonstrates once more how crucial it is to have strong ethical guidelines, rigorous validation, and training before AI can be used in the workplace. Technology-human interaction balancing becomes crucial if AI is to realize its full promise as a transformational force for health systems around the world.

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Keywords: Artificial intelligence (AI), Medical diagnosis, Healthcare

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1.Introduction

Just as the human form changed over time to reach its current pinnacle, so have all aspects of our lives, both physically and biologically. As a result, health is a sector that may play an essential role in our lives, and its development is ongoing as technology advances. As a result, in the present 21st century, artificial intelligence (AI) is being employed in healthcare. Artificial intelligence (AI) is the theory and development of computer systems able to perform tasks normally requiring human intelligence. On an operational level for business use, artificial intelligence (AI) is a set of technologies that are based primarily on machine learning (ML) and deep learning (DL) and are used for data analytics, predictions and forecasting, object categorization, natural language processing, recommendations, intelligent data retrieval, and more. [1] Machine learning (ML) and deep learning (DL) algorithms are widely used in the prediction and diagnosis of several diseases, especially those whose diagnosis is based on imaging or signalling analysis. Artificial intelligence (AI) can also help identify demographic or environmental areas where disease or high-risk behaviours are prevalent. ML techniques have achieved significant success in medical image analysis due to the advanced algorithms that enable the automated extraction of improved features.[2] In today's world, there are unexpected, unsalvageable diseases in the health sector. So, in recent years, the integration of artificial intelligence (AI) into various sectors has revolutionized the way tasks are accomplished, and healthcare is no exception. Artificial intelligence (AI) holds tremendous potential to enhance healthcare delivery, improve patient outcomes, and streamline clinical processes. From predictive analytics to image recognition, AI-powered solutions offer a plethora of opportunities to revolutionize healthcare, highlighting its potential benefits, challenges, and implications. [3] And the current application of artificial intelligence in diagnosing medical conditions is also being developed. For instance, artificial intelligence (AI) applications are being used in important diagnostic functions such as cardiology, nephrology, and gastroenterology. Not only that, but some more healthcare systems are also being developed, such as clinical decision supporting systems, remote patient monitoring and predictive analytics, and medical imaging diagnosis.[2].

2. Literature Review

Artificial intelligence has gained significant attention in the healthcare industry due to its ability to process vast amounts of data efficiently and derive meaningful insights. Several studies have demonstrated the diverse applications of AI in health care, including diagnostic support, personalized treatment recommendations, drug discovery, and patient monitoring. For instance, machine learning algorithms have shown promising results in accurately predicting disease outcomes and identifying high-risk patients, thereby enabling proactive interventions to improve health outcomes.(Mittal et al., 2023)

Moreover, AI-powered imaging technologies have enhanced diagnostic accuracy and efficiency in various medical specialties, such as radiology and pathology. Deep learning algorithms have been particularly successful in interpreting medical images, enabling early detection of abnormalities, and assisting clinicians in making more informed decisions. Additionally, natural language processing (NLP) techniques have facilitated the extraction of valuable information from unstructured clinical notes and electronic health records, enabling researchers to analyse trends, identify patterns, and generate actionable insights.(Kaur et al., 2020)

2.1. Pathological Diagnosis Methods in Humans

Accurate disease diagnosis is essential for effective medical therapy. In humans, pathological diagnosis is essential to this procedure. It goes into the microscopic realm, analysing tissues and organs for irregularities that could indicate disease. This through study takes a multifaceted approach, integrating multiple methodologies to get a conclusive diagnosis.(Kaur et al., 2020)

Identifying a disease from its signs and symptoms to conclude its pathology. Diagnosis can also be defined as the method of figuring out which disease is based on an individual's symptoms and signs. The data gathered from medical history a physical examination of the individual with medical pathology constitutes the knowledge required for diagnosis, often, at least one diagnostic procedure, such as medical tests, is done during this procedure. And the following diagram explains the diagnosis process in simple tests:(Kaur et al., 2020)

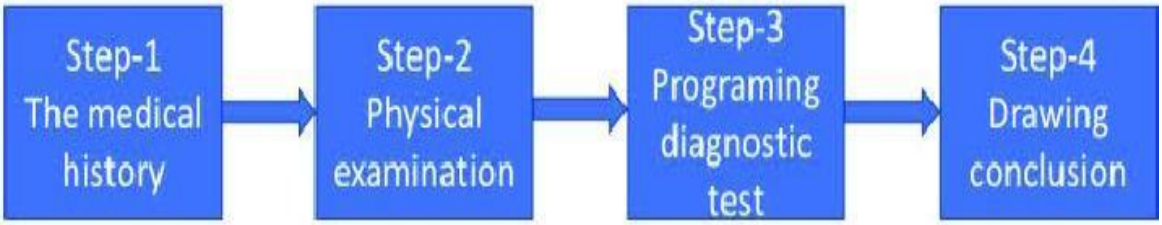

Figure 1

Therefore, even with the advances in contemporary science, identifying medical diseases can be a complex and challenging work for clinicians. These are, unfinished details: Obtaining a comprehensive picture might be challenging since patients may not always offer all pertinent information regarding their symptoms or medical history. Subtle symptoms: Some illnesses have non-specific or ambiguous symptoms, which makes it challenging to determine the precise cause and distinguish between several scenarios. uncommon circumstances rare diseases are infrequent, and medical professionals may lack the expertise to identify them promptly. limits of the test, Diagnoses can be delayed, pointless tests ordered, or even misdiagnosed in situations where medical professionals are unable to make the best decisions for a variety of different reasons. Fortunately, advanced technologies such as AI are evolving to help doctors analyze data, identify patterns, suggest possibilities, and ultimately achieve more accurate and timely diagnoses.(Kaur et al., 2020)

There is a need for an automatic diagnosis system that combines human knowledge with machine accuracy. A cost-effective and reliable diagnosis process requires an appropriate decision support system. AI can aid in disease classification based on complicated characteristics, making it easier for human professionals to detect and detect and manage such situations. AI approaches are being applied in medicine to diagnose illnesses more precisely. AI is a key component of computer science that helps computers grow more intelligent. Learning is essential for intelligent systems to function well. AI strategies based on learning include deep learning and machine learning, among others.(Kaur et al., 2020)

2.2. AI approaches and treatments.

Artificial intelligence (AI) techniques have completely changed how diseases are diagnosed and managed in medicine. AI systems are able to identify trends and generate precise predictions by analyzing large volumes of medical data, such as genetic data, diagnostic imaging, and patient records, using machine learning algorithms. With the help of these AI tools, medical personnel may diagnose patient more quickly and accurately, which results in early interventions and better patient outcomes. AI-based decision support systems also assist physicians by suggesting treatment strategies that are customized to each patient each patient's unique traits and medical background. AI has the potential to improve medical diagnostics even more as it develops, ultimately changing how diseases are identified and treated.(Goswami et al., 2023) AI-powered systems can analyse medical images, such as X-rays and CT scans, with a high degree of accuracy, potentially reducing the need for human interpretation. This can lead to faster diagnoses and more effective treatment plans. In one example, a study published in the journal Radiology found that an AI algorithms cloud accurately identify breast cancer on mammograms with an accuracy of 96%. Thus, in light of this, Chatbots have emerged as a dimension of AI in the current era. AIpowered chatbots are making significant strides in the field of medical diagnostics. These chatbots use machine-learning algorithms trained on vast datasets of medical information. By analysing the user's symptoms and medical history through conversation, they can provide preliminary diagnoses and suggest ways to empower patients with a better understanding of their health and guide them to seek professional AI chatbots may not replace qualified physicians, but they provide valuable support as a first point of contact or as a tool for ongoing health monitoring. (Examples: Babylon Health, Sensely, YourMD) The above names are examples of chatbots in the health sector.(Mittal et al., 2023)

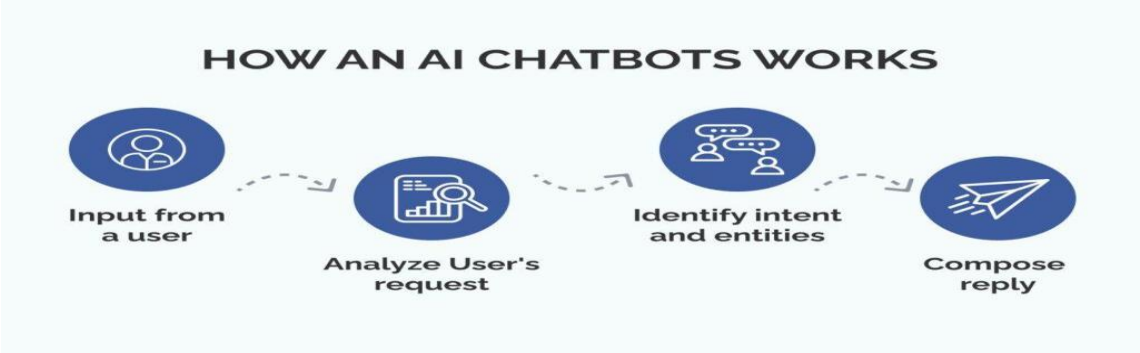

Figure 2

Despite the promising potential of AI in healthcare, several challenges and concerns need to be addressed. These include issues related to data privacy and security, algorithm bias, regulatory compliance, and the ethical implications of AI-driven decision-making in healthcare settings. Moreover, the integration of AI solutions into existing healthcare workflows requires careful planning and stakeholder engagement to ensure seamless adoption and maximize the benefits while minimizing risks.(Student, n.d.)

2.3. Objectives

The current use of artificial intelligence (AI) in detecting medical disorders involves a diverse strategy aimed at transforming healthcare delivery. One key goal is to improve diagnosis accuracy

and efficiency by using AI-powered algorithms to analyse massive volumes of medical data, such as patient records, imaging scans, and genetic information, in order to uncover patterns and anomalies that humans may miss. Another goal is to facilitate early disease identification and

intervention, which will improve patient outcomes while lowering healthcare expenditures associated with delayed diagnoses. Furthermore, AI-incorporation of AI into medical diagnostics aims to enhance clinician decision-making, optimize resource allocation, and ultimately elevate the standard of care in healthcare systems worldwide. (Goswami et al., 2023)

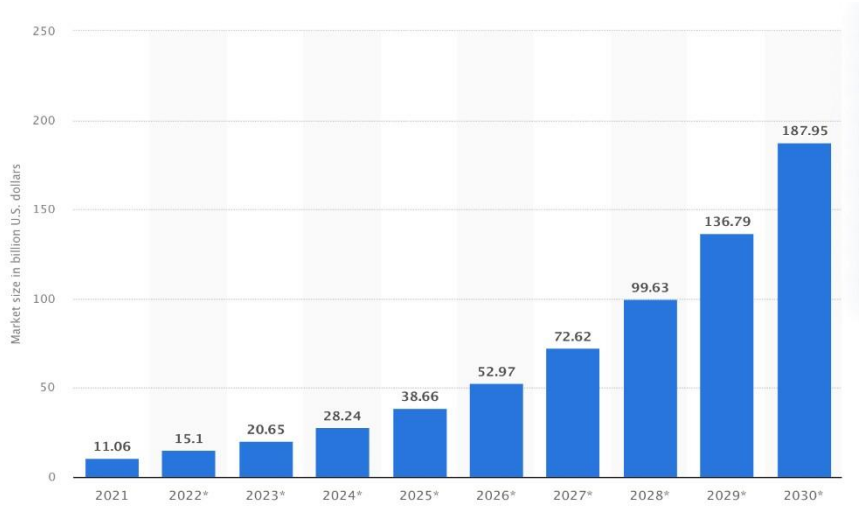

Figure 3

The market for healthcare analytics experienced a 37%annual growth from 2021to 2022, reaching $15.1 billion by the end of 2022. The market is projected to reach $187.95 billion by 2030, largely driven by efficiency in data storage and diagnosis. Legacy systems have been replaced at a starting rate since artificial intelligence (AI) and machine learning (ML) were healthcare. Medical imaging processors, diagnosis software, and healthcare data management systems are a few examples of these. One of the most important developments in the healthcare sector in the upcoming years is undoubtedly the integration of AI into an increasing number of healthcare specialties.

The global survey has been mentioned above, but in Sri Lanka, the medical healthcare field is facing a significant demographic shift, with an over-65 population projected to reach 1billion by 2050. This exacerbates health challenges like aging and lifestyle -related diseases, affecting around 1.5 billion people. Because of the unusual circumstances that exist in our nation, certain instructions will be handled by chatbots using enhanced artificial intelligence technology in healthcare.

Based on recent times in Sri Lanka AI's transformative impact in medical healthcare is supported by statistical evidence, including demographic shifts, non-communicable diseases, value-based models, and curative and preventive service delivery. Despite a doctor-to-patient ratio of 1.2 per 1000, inequities exist in domestic distribution. Sri Lanka's director general of health services reported around 700 medical officers, including consultants, migrated overseas in 2022.

A survey by the GMOA (Government medical officers associations) revealed that 477 doctors, including 125 consultants, had migrated for overseas jobs between January and August 2022. This increase in migration was exponential compared to previous years. The majority of postgraduate trainees who went abroad returned to Sri Lanka, with only 50% of consultant's vacancies expected to be filled by 2024-25. Limited data on the health workforce's outflow makes it difficult to quantify the issue. In the event that this kind of AI technology working with doctors in such a situation can solve the future shortage of medical professionals in the healthcare sector, especially not only in Sri Lanka but also in the world.

3. Methodology

3.1 AI Based validation

AI-Based application validation. The main steps of deployment for medical diagnosis applications based on AI, intended for clinical use, need to be validated to assure reliability, accuracy, and safety. The strong validation would require testing of the AI model using various datasets to test generalizability and robustness. This performance usually comes with respect to clinically relevant metrics for diagnosis, including sensitivity, specificity, accuracy, and F1 scores [1]. Many of the validation studies further compare the performance of AI in real-world settings to those of expert physicians. For example, AI models used in the diagnosis of sacroiliitis, such as DenseNet121, have shown very good diagnostic accuracy and consistency upon testing on test datasets. It also employs explain ability metrics, such as Grad-CAM or SHAP, to interpret AI judgments, building clinician trust to ease workflow integration. Lastly, to get regulatory approval, such as from the FDA or, in Europe, a CE certification, tight clinical and ethical criteria need to be proven. AI applications may successfully bridge the gap between innovation and real application by strongly underlining that they offer considerable help in medical diagnosis [2].

3.2 Should be possible AI application replace doctors

AI is gaining momentum in most industries; health is one of the topmost sectors where it is implemented. The survey captured a broad spectrum of opinions on the current and future applications of AI in medical diagnosis. This report will synthesize the key findings from the responses, analysing perceptions, advantages, concerns, and future expectations of AI-driven diagnostic systems. Most of the respondents answered that they were familiar with AI, specifically in the field of diagnosis. Some had personal experiences in using AI-based tools, while others knew of the possible applications of AI. The main sources of information identified were social media, Google searches, and professional conferences. Most participants belonged to the 18–34 age category, being either undergraduate student of medicine or young professionals who would have come across AI at an educational or professional level. The respondents have pointed out that AI is being integrated into healthcare mainly in the form of diagnostic tools, chatbots, and systems for

data analysis. However, the active use of these tools was reported mainly in academic or exploratory contexts rather than routine medical practice. The responses were very optimistic about the future of AI in healthcare, with caveats. Respondents saw a game-changing role for AI, provided its implementation is carefully managed. The predictive capability of AI emerged as a game-changer. Analyzing historical and real-time patient data can help AI predict disease progression and its prevention. Such a shift from diagnostic to predictive diagnostics could take a load off the healthcare systems and go a long way in helping improve population health. Most of the respondents commented that AI could lower healthcare costs by making processes more efficient and reducing the occurrence of errors.

This is particularly important in resource-constrained settings where AI could democratize access to quality care. The respondents envisioned that AI would facilitate equal access to health services around the world. Advanced algorithms can find correlations and patterns that human doctors may miss, hence closing gaps in diagnostic capabilities across different regions. The ideal future of many of the participants is one in which AI and human practitioners collaborate. The AI would, in these models perform data-driven. The AI systems shall work under the supervision of qualified medical professionals to ensure accountability and reliability. Strong ethical guidelines and data protection laws are required to avoid misuse and build public trust. Extensive testing and validation of AI tools should be performed before their deployment in clinical settings to reduce risks. Training Programs: Successful integration will require healthcare professionals to be equipped with AI literacy.

4. Results and Discussion

4.1 AI in Healthcare

AI technology lowers the economic burden and optimizes the quality of health care. AI helps to recommend an appropriate diagnosis and make suitable medical decisions. AI allows analysing large amounts of information and has the means to improve efficiency in diagnostics, speed in making decisions, and customization of treatment options Never in the history of humanity have we had such a tool in approaching problems of improving the quality of medical care. Equally interesting is the potential of AI to automate trying different treatment approaches. AI can take into account the significant amount of information related to the patient’s medical history, their lifestyle and DNA as well to make more precise recommendations. AI enhances decision-making—how a patient with certain genetic polymorphisms may be affected by certain medicines [3]. AI augurs well for patient care and satisfaction in the most cost-effective manner. AI adds value to predictive analytics which will allow nurses and doctors to anticipate the likelihood of complications, use of resources, and other possible events that may interfere with proper treatment. AI's primary contribution to healthcare lies in its ability to enhance medical diagnoses. Advanced algorithms now excel in analysing medical imaging, such as X-rays, MRIs, and CT scans, to detect anomalies that might escape human eyes. MIT's CSAIL and Massachusetts General Hospital have developed Mirai, an AI model capable of predicting breast cancer risk up to five years in advance from mammograms. The model outperformed the Tyrer-Cuzick model and other deep learning approaches, achieving a C-index of 0.76. Mirai demonstrated superior sensitivity and specificity across different racial groups, age ranges, and breast density categories. IBM Watson for Oncology has been widely used in the regions where there are few oncologists and medical resources by achieving more than 90 percent agreement with the oncologist recommendations in cancer treatment planning although it is also still challenged by its necessity to work in localized forms

and their costs. ENDEX by Enclitic has shown high accuracy rates in men's healthcare for detecting disease applications such as lung nodule and fractures which in turn has lightened the work load of the radiology department however its operation requires more inclusion to the existing systems. Similarly, the first AI system approved by the FDA for autonomous use, IDx-DR system has been efficient in detecting diabetic retinopathy in primary health care with a performance as good as that of the ophthalmologists, but so far, it's use is restricted only to that disease. Zebra Medical Vision has relatively inexpensive tools in imaging but they have also been cleared for several algorithms. However, the deployment of it and the embedding in the healthcare system is problematic. Artery Cardio AI has improved the dices cardiac MRI analysis workflow by cutting the time taken for the procedure and instead making it more consistent, but the cost of the equipment and the demands in infrastructures limits the factors of expanding the use. Overall, these tools have been tested in clinical trials and shown to be able of performing a variety of tasks that are on par with or exceed trained professionals. This therefore leads to improved scope of diagnosis in previously unreached regions. These tools are especially valuable in identifying early-stage diseases, where timely intervention can save lives. Integrating AI technologies within the healthcare industry is a matter that is somewhat contentious due to the key issues such as the protection of privacy and the potential abuse of private medical information. The survey respondents regarding this issue highlighted a need to have sufficient regulatory policies in place for AI and ensure that it is used ethically. [4]AI lack of empathy particularly in fields such as psychiatry is also worrying. The trust level in AI systems is varying; some people hope AI will work well under supervision in the context of healthcare while some are nervous about having complete dependence on AI for important choices. It is vital that the working paradigm is one where AI is an adjunct rather than a replacement as this will ensure that accuracy, efficiency, and the constituent parts of care that are human in nature and thus indispensable are not lost [5]. Wearable devices and AI predictive diagnostics are just some of the ways that AI will someday advance healthcare and overcome disparities in care delivery. In a number of instances, AI has the potential to overcome human limitations that will eventually ensure a higher proportion of accurate care is delivered. Barriers to this shift, on the other hand, remain in the form of factors contributed mainly by human variables like overdependence on the said tools, a lack of proper training of medical workers to enable effective and smooth application, and regulatory policies among others [6].

5. Conclusion

Artificial Intelligence is transforming healthcare through better accuracy, speed, and access to diagnosis. Applications range from radiology and cardiology to nephrology and pathology. AIdriven systems are capable of doing wonderful things, from imaging tools to natural language processing for the early detection of diseases and providing insights on the same. Provides cost savings, clinical workflow optimization and democratizes quality healthcare AI is not a replacement for the doctor but collaborates with doctors in augmenting clinical efficiency, albeit gently and compassionately. There is a guarantee that the systems protect patients, follow ethical guidelines of data security and regulation. Besides, there could be several problems connected with privacy concerns, algorithmic bias, and workforce training gaps. For example, AI can support several workforce and demographic challenges of most countries, such as Sri Lanka. This is the use of balancing technological advancements against human, centred care, attaining full potential of ethical and empathetic AI health delivery.

References

Goswami, M., Sachan, P., & Goswami, K. (2023). Artificial intelligence applications in disease diagnosis and treatment: recent progress and outlook. *Research in Pharmacy*, 27–42. https://doi.org/10.25081/rip.2023.v13.8632

Kaur, S., Singla, J., Nkenyereye, L., Jha, S., Prashar, D., Joshi, G. P., El-Sappagh, S., Islam, M. S., & Riazul Islam, S. M. (2020). Medical Diagnostic Systems Using Artificial Intelligence (AI) Algorithms: Principles and Perspectives. *IEEE Access*, *8*, 228049–228069. https://doi.org/10.1109/ACCESS.2020.3042273

Mittal, A., Dumka, L., & Mohan, L. (2023). A Comprehensive Review on the Use of Artificial Intelligence in Mental Health Care. *2023 14th International Conference on Computing Communication and Networking Technologies, ICCCNT 2023*. https://doi.org/10.1109/ICCCNT56998.2023.10308255

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Mittal, A., Dumka, L., & Mohan, L. (2023). A Comprehensive Review on the Use of Artificial Intelligence in Mental Health Care. *2023 14th International Conference on Computing Communication and Networking Technologies, ICCCNT 2023*. https://doi.org/10.1109/ICCCNT56998.2023.10308255

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