Mesopotamian Journal of Artificial Intelligence in Healthcare
Vol.2023, **pp**. 45–51
DOI: https://doi.org/10.58496/MJAIH/2023/009; ISSN: 3005-365X
https://mesopotamian.press/journals/index.php/MJAIH

Review Article

Operating Artificial Intelligence to Assist Physicians Diagnose Medical Images: A Narrative Review

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ARTICLE INFO

Article History

Received 23 Jun 2023
Accepted 5 Sep 2023
Published 13 Sep 2023

Keywords

Artificial Intelligence

Medical Images

Healthcare

Machine Learning

Mammography

ABSTRACT

Medical image diagnostics is crucial to healthcare since it aids in the diagnosis and treatment of a variety of diseases and conditions. However, the process is time-consuming and prone to human error. In recent years, artificial intelligence has been a powerful tool for enhancing medical imaging diagnosis. Using AI algorithms for medical picture interpretation has the potential to revolutionise the field by improving accuracy, efficacy, and standardization. These algorithms can quickly sift through enormous amounts of medical imaging, finding anomalies, quantifying features, and providing useful information to help medical professional-s make judgments. AI-based systems can be used to track the evolution of diseases, plan treatments, and highlight particular areas of interest in medical pictures. Additionally, AI systems can aid in case triage by classifying cases according to urgency, enabling quick response to life-or-death situations. Healthcare practitioners can gain from increased diagnostic accuracy and efficiency, improved workflow management, and standardized interpretations by utilizing AI in medical imaging diagnostics. However, it's crucial to understand that AI complements human expertise rather than replacing it. To ensure a safe and efficient application in clinical settings as AI technologies continue to evolve and advance, continuing research and collaboration between AI developers and healthcare practitioners is essential. Medical image diagnosis is poised to advance significantly with continued AI integration, ultimately improving patient outcomes and healthcare delivery.

1. INTRODUCTION

In the sphere of healthcare, using artificial intelligence (AI) to improve medical imaging diagnosis has become a ground-breaking strategy. AI algorithms can analyse the ever-increasing amount of medical pictures, including X-rays, CT scans, and MRI scans, and offer insightful findings to help medical personnel make a correct and fast diagnosis [1-3]. Diagnostic interpretation of medical images has traditionally relied significantly on the training and experience of radiologists and other specialists. However, this procedure can take a while and be prone to mistakes made by humans. On the other hand, AI-powered systems can process massive amounts of medical imagery and extract vital data to aid clinicians in their decision-making [4][5]. There are various benefits to incorporating AI into medical image diagnosis. First off, medical images may be swiftly and precisely scanned for abnormalities or suspected diseases using AI algorithms. They can draw attention to particular areas of interest, assisting radiologists in concentrating on relevant areas and thus lowering the chance of missing significant results. Second, AI algorithms can help with the quantification and measurement of medical imaging properties. This skill is especially helpful for tracking the evolution of an illness over time or assessing the efficacy of treatments [6]. Artificial intelligence-based solutions can offer objective and consistent measures, lowering inter-observer variability and enhancing the accuracy of diagnosis. AI can also assist in the triage process by ranking cases according to the gravity of the results. AI can increase workflow efficiency by automatically classifying photos into urgent, less urgent, or typical scenarios, ensuring that urgent situations are handled right away [7]. It's crucial to remember that AI is intended to complement, not replace, healthcare personnel. AI systems serve as supporting tools, offering more data and insights to help with diagnosis. The healthcare expert, who weighs all relevant information, the patient's past, and the clinical setting, ultimately has the last say.

2. BREAST CANCER DETECTION

Artificial intelligence has mostly been used in the realm of medical imaging for the diagnosis of breast cancer. AI algorithms have been developed to examine mammograms and increase the precision of diagnoses [8]. Mammography detection for breast cancer is common [9]. By recognizing and categorizing mammography abnormalities, artificial intelligence-based approaches

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can help in the early detection of breast cancer. These algorithms can examine a large number of images, and they might be able to detect small changes in breast tissue that the human eye could miss. AI-powered solutions may lessen inter-observer variability and steer radiologists to suspicious areas of interest, which can improve diagnosis accuracy. Prioritisation of mammography cases for additional screening can be improved using artificial intelligence methods [10]. AI-based solutions can aid the triage process by detecting lesions or anomalies of concern, flagging cases that need further investigation, and helping prioritise patients based on the potential severity of their condition. Deep learning algorithms contribute to identifying areas where cancer has spread in the breast [11]. These algorithms can handle and analyse vast amounts of data, including medical images and patient health information, to build prediction models to assess the risk of developing this severe disease. By considering various risk factors, including family history, age and breast density, AI-based systems can assist in identifying individuals at high risk of developing breast cancer, enabling earlier identification and more effective treatments.

3. DIAGNOSIS OF EYE DISEASES

Artificial intelligence (AI) has a lot of potential for use in medical imaging, particularly for the diagnosis of eye problems. Traditional eye diagnosis techniques frequently call for specialized education, practical expertise, and occasionally invasive testing. AI-based solutions, on the other hand, can offer a non-invasive and more objective method of diagnosis. To assist in the diagnosis of many eye disorders, AI algorithms can examine many diagnostic imaging modalities, such as fundus photography, optical coherence tomography (OCT), and visual field testing [12]. These algorithms analyse the images for patterns and look for potential anomalies, such as retinal or optic nerve damage, that may be caused by common eye disorders like glaucoma, age-related macular degeneration, diabetic retinopathy, and others. Diagnoses are more accurate, quicker, and more precise thanks to AI-based systems that recognize emergent patterns in medical pictures using cutting-edge machine learning algorithms and deep neural networks [13]. They can process vast numbers of photos more quickly than humans, enabling earlier abnormality diagnosis than conventional techniques, and allowing for the administration of more effective illness therapies to patients even before symptoms manifest. Additionally, AI algorithms have the potential to track the development of diseases over time by observing changes in eye tissue and forecasting results [14]. AI can assist healthcare providers in creating individualized treatment regimens for individuals by offering a more accurate and reliable technique of disease monitoring. To diagnose eye problems, artificial intelligence (AI) is also being used in the field of ophthalmology [27]. AI algorithms can examine patient symptoms, clinical data, and ocular imaging to aid in the spotting and identifying of a number of eye conditions. Here is some ways AI can help with eye disease diagnosis:

- *Analysis of Retinal Imaging* [28]: Using methods like fundus photography or optical coherence tomography (OCT), AI systems may examine retinal images. These algorithms can recognize and categorize several eye disorders, including glaucoma, age-related macular degeneration, diabetic retinopathy, and retinal detachment. AI can highlight anomalies or offer numerical data to help in disease diagnosis and tracking the evolution of the condition.
- *Assessment of the Optic Nerve* [29]: AI can examine clinical and imaging data about the optic nerve to help in the diagnosis of diseases like glaucoma. AI algorithms can offer insights and help with the early detection and management of glaucoma by examining several features such as the appearance of the optic nerve head, the thickness of the retinal nerve fibre layer, and the cup-to-disc ratio.
- *Corneal Disorders* [30]: AI algorithms can examine data from topography or tomography scans of the cornea to help in the identification of conditions like keratoconus, corneal dystrophies, or corneal infections.
- *Refractive Error Assessments* [31]: Using data from autorefractors and retinoscopes as well as other clinical data, AI algorithms can analyse refractive faults including myopia, hyperopia, and astigmatism to produce more precise readings. The prescription for eyeglasses or contact lenses may benefit from this.
- *Symptom Analysis* [32]: Chatbots or virtual assistants powered by AI can gather and examine symptoms and risk factors reported by patients to make early diagnoses of potential eye disorders. These virtual assistants can aid in patient triage and recommend suitable next steps for obtaining a diagnosis and therapy.

4. DIAGNOSIS OF NEUROLOGICAL DISEASES

It is a challenging undertaking to diagnose neurological disorders, and it frequently necessitates the expertise of competent neurologists as well as the synthesis of multiple diagnostic tests and clinical data. Artificial intelligence (AI) has attracted interest as a potential tool to assist healthcare professionals in more swiftly and accurately diagnosing neurological diseases. AI algorithms that can analyse various data sources can be used to diagnose neurological diseases. Clinical notes, electroencephalography (EEG) recordings, magnetic resonance imaging (MRI), computed tomography (CT), and positron emission tomography (PET) scans are among these sources [15]. One of the primary applications of AI in diagnosing neurological illnesses is the interpretation of medical imaging data. By identifying patterns and features in imaging data, AI systems can detect abnormalities connected to specific neurological conditions, such as stroke, brain tumours, multiple sclerosis, and Alzheimer's disease [16]. These techniques can aid radiologists in locating lesions, enhancing diagnostic accuracy, and reducing interpretation variability. AI can be used to interpret EEG data, which is frequently used to monitor and diagnose conditions, including epilepsy and sleep issues [17]. By analysing waveforms, spike patterns, and other EEG characteristics, AI systems can help neurologists diagnose neurological problems by detecting specific practices associated with certain neurological conditions. Another emerging area is the application of AI algorithms to genetic data analysis to identify particular neurological conditions with a hereditary component, such as Huntington's disease or specific varieties of muscular dystrophy [18][19]. AI can help create more precise and individualised diagnoses by identifying relevant genetic variants and assessing their significance [20][21].

5. DIAGNOSIS OF CARDIOVASCULAR ILLNESS

Artificial intelligence is being used more and more in the healthcare industry, particularly for the diagnosis of cardiovascular diseases [22]. AI systems can analyse large data sets and find patterns that can be difficult to see in human examination. AI algorithms can evaluate patient data from sources including medical records, test results, and imaging examinations to determine a person's risk of developing cardiovascular diseases [23]. Finding high-risk patients who may require additional evaluation and treatment can be made easier with the help of this. AI algorithms can analyse medical imaging studies like echocardiograms, CT scans, and MRIs to ascertain the structure and physiology of the heart [24][25]. This may aid in the early detection of anomalies such as weakened heart muscle, valve problems, or coronary artery plaque accumulation. Electrocardiogram (ECG) data can be analysed by AI algorithms to look for abnormal heart rhythms, ischemia abnormalities that indicate decreased heart blood flow, or other cardiac problems [26]. AI can be used for building prediction models that estimate the likelihood that a patient will encounter a specific cardiovascular condition, or a negative cardiac event based on patient data. These models can aid in directing preventive measures and specialized treatment regimens. By analysing patient data and offering suggestions or differential diagnoses based on accepted practices and prior cases, AI-powered decision support systems can help healthcare providers make precise diagnoses. By enhancing the skills of medical practitioners, enabling early detection, and guiding individualized treatment decisions, AI has the potential to significantly enhance the diagnosis of cardiovascular disorders.

6. DIAGNOSIS OF DIGESTIVE SYSTEM DISEASES

The area of gastroenterology is undergoing a revolution thanks to artificial intelligence (AI), which is improving how digestive system disorders are diagnosed [33]. AI algorithms can make it easier to identify, categorize, and treat a variety of gastrointestinal diseases through the study of patient data, medical imaging, and clinical records. Outline of how AI enables the diagnosis of gastrointestinal diseases:

- *Image analysis by AI* [34]: AI systems are excellent at analysing radiographic and endoscopic images used in medicine. AI systems can recognize anomalies like polyps, ulcers, tumours, or indications of inflammation in the digestive tract by utilizing machine learning techniques. This helps doctors establish precise diagnoses and proper treatment regimens.
- *Pattern Recognition* [35]: AI is capable of identifying patterns in patient data, including symptoms, medical history, test findings, and genetic data. AI algorithms can offer insightful information into disorders like inflammatory bowel disease, celiac disease, pancreatitis, or liver diseases by analysing connections within this data, assisting in diagnostic and therapy choices.
- Gastroenterologists receive intelligent advice from AI-powered decision support systems based on acknowledged norms and prior situations [36]. To create differential diagnoses or suggest additional diagnostic procedures, these systems analyse patient data, symptoms, and test results, improving diagnostic speed and accuracy.
- *Risk Stratification* [37]: AI algorithms may analyse patient information, such as genetic markers and medical history, to determine an individual's risk of acquiring particular gastrointestinal disorders. Through early interventions or preventative measures, this risk stratification helps identify those who are at high risk for illnesses like colorectal cancer, stomach ulcers, or gallstones.
- *Predictive Analytics* [38]: Using massive datasets, AI algorithms forecast the course of disease and the effectiveness of treatment. AI can predict patient responses to particular drugs, surgical procedures, or dietary changes by looking for patterns in patient data. This makes it easier to arrange individualized treatments and enhances patient results.

It is crucial to remember that the application of AI in gastroenterology is an area that is still developing, and different healthcare settings may use the technology differently [39-41]. To evaluate data generated by AI, apply their clinical knowledge, and guarantee comprehensive patient care, gastroenterologists and other healthcare professionals play a critical role. AI should be viewed as a supplement to clinical evaluations rather than as a substitute, even though it has enormous potential to increase diagnostic accuracy and treatment outcomes.

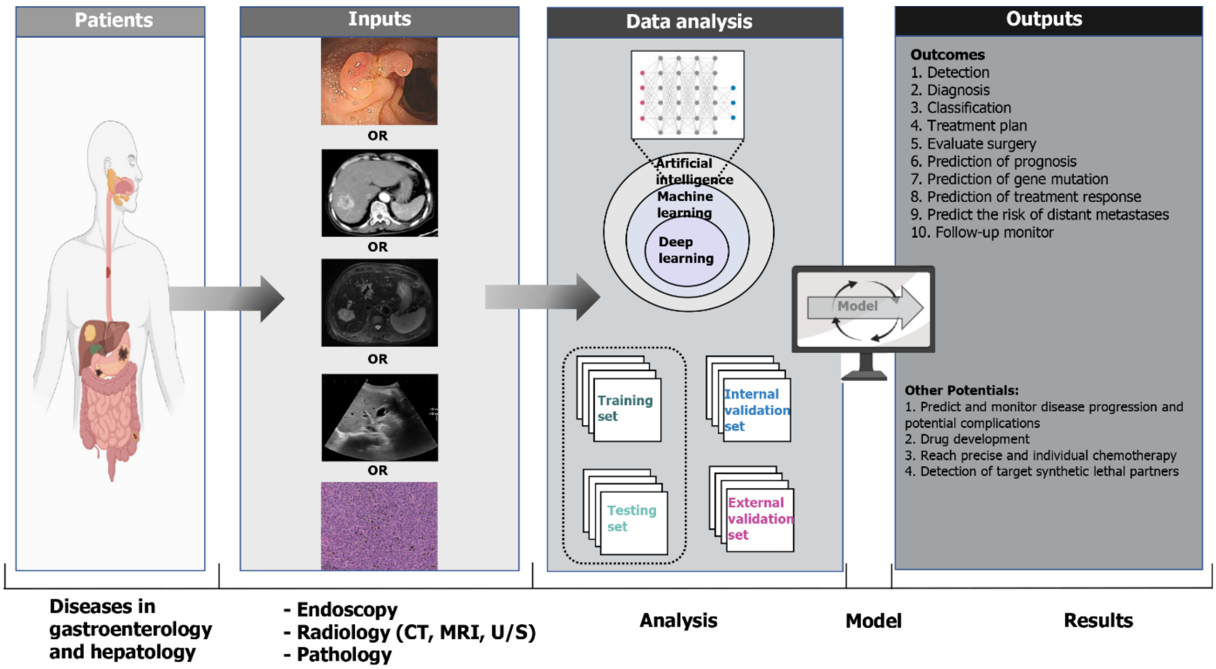

Fig. 1. AI in the fields of gastroenterology and hepatology [42].

7. CONCLUSIONS

If artificial intelligence is applied to enhance medical imaging detection of numerous diseases, there could be a revolution and significant development in healthcare. Thanks to artificial intelligence algorithms' ability to analyse, interpret, and diagnose medical images, medical professionals and hospitals can now diagnose patients more quickly. The use of artificial intelligence to diagnose medical imaging has various benefits. It can improve the speed, accuracy, and efficacy of diagnosis, allowing for more rapid and precise treatment decisions and shorter patient wait times. AI algorithms can also assist in the detection of uncommon and anomalous situations and evaluate characteristics in medical imaging, increasing the precision and dependability of diagnosis. Even though it is still in its early phases, artificial intelligence's usage in diagnosing medical images has great potential. Further research, validation, and cooperation amongst AI programmers, developers, healthcare professionals, and supervisors are necessary for this technology to be deployed safely and efficiently in clinical settings. There is a lot of promise to improve patient care and accuracy by utilising artificial intelligence to enhance medical imaging diagnostics. As technology advances, incorporating artificial intelligence into hospital and healthcare systems will pave the way for better, more precise, more efficient healthcare services.

Funding

The authors had no institutional or sponsor backing.

Conflicts Of Interest

The author's disclosure statement confirms the absence of any conflicts of interest.

Acknowledgment

The authors extend appreciation to the institution for their unwavering support and encouragement during the course of this research.

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