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Application of Medical Image Artificial Intelligence in Medical Diagnosis and Treatment

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ABSTRACT

With the progress of science and technology, artificial intelligence has made remarkable progress in various fields. Among them, the application of medical imaging is an important branch of AI technology. The purpose of this paper is to enhance the precision, efficiency and accuracy of medical image analysis. The research methods chiefly include deep learning, machine vision and natural language understanding. Through reading this article, we can know that the application of artificial intelligence in medical screenage diagnosis has a wide range of application prospects, but also faces some challenges. With continued research and development, we can expect to see more AI playing a role in medical imaging and bringing more benefits to human health.

KEYWORDS

Deficiency in tradition; Important role; Purpose and method; Application; Challenges faced

1. INTRODUCTION TO MEDICAL IMAGING DIAGNOSIS AND ARTIFICIAL INTELLIGENCE DIAGNOSIS

Medical imaging diagnosis refers to the process of confirming the type of disease, determining the location of the lesion and the severity of the lesion by analysing and judging medical images. In traditional medical imaging diagnosis, doctors need to make diagnostic results by observing and analysing the images with their rich clinical experience and professional knowledge. However, due to the complexity and subjectivity of medical imaging diagnosis, the doctor's judgement may be affected by subjective awareness and cognitive bias, resulting in certain limitations in the accuracy and consistency of the diagnosis.

Artificial Intelligence is a cutting-edge technology that analyzes complex data using computer algorithms. In diagnostic imaging, one of the most potential clinical uses of AI, there is increasing interest in determining and optimizing its performance to enable the identification and measurement of different clinical problems. There is a lot of research being done on the application of AI in diagnostic medical imaging. It is anticipated that artificial intelligence would improve tissue-based detection and characterization. Artificial intelligence has shown remarkable sensitivity and accuracy in detecting imaging abnormalities. But this improved sensitivity has a significant downside as well, which is the inability to identify minute changes of unclear significance. Artificial neural networks, for instance, are not any more accurate than radiologists in identifying cancer, according to evaluations of screening mammography. However, they are invariably more sensitive to abnormal symptoms, especially small lesions. As the revolution in diagnostic imaging powered by AI gets underway, the medical community needs to prepare for any unknowns in order to ensure a safe and successful integration of this technology into clinical practice. Given its distinctive qualities,

evaluating AI's possible risks carefully is essential to determining its place in clinical practice. It will not be simple to strike a balance between overdiagnosis and improved detection. This grade is based on the consistent application of well-defined cohorts and out-of-sample external validation to enhance the caliber and comprehensibility of AI research [1].

Nowadays, sensitivity and specificity are often used in AI imaging investigations to determine diagnostic accuracy; other research use this information to determine clinically significant outcomes. However, as AI frequently picks up on subtle changes to images, more significant outcome variables include newly discovered advanced illnesses, illnesses that need medical attention, or ailments that could have an impact on long-term survival. AI-based research should concentrate on the incidence of clinically significant events, such as symptoms, the requirement for disease-modifying therapies, and mortality, as these factors have a significant impact on quality of life. While numerous studies have demonstrated that AIs outperform traditional readings in terms of specificity and recall rates, the type and biological aggressiveness of the lesion are typically not considered in the estimation of accuracy and sensitivity. While non-patient-centered endpoint selection may lead to higher sensitivity, it also raises the risk of false positives and overdiagnosis by spotting minute changes that could indicate unfavorable or subclinical disease [2].

Artificial intelligence technology is starting to become more significant in the diagnosis of medical imaging as it develops. An increasing number of studies conducted in recent years have demonstrated that the application of AI-assisted medical imaging diagnosis can enhance physicians' accuracy and productivity while also improving patient care. For example, novel coronavirus pneumonia is a Class B infectious disease with mainly inflammatory lesions in the lungs, and the disease is transmitted in various ways, respiratory droplets and contact transmission may cause patients to fall ill, and all populations may be infected with the disease. Within a short period of time, a large number of patients flocked to the emergency and fever clinics waiting for diagnosis and treatment, and the load on healthcare institutions increased abruptly. As an important method of COVID-19 diagnosis, CT imaging was severely inadequate in the early stages of the epidemic. Due to the lack of judgement on the patient's disease trend, it is also difficult to prepare and intervene in advance for the acute complications of COVID-19. In the process of epidemic diagnosis and treatment, AI can efficiently assist healthcare institutions and healthcare workers, playing an important role in alleviating doctors' resource constraints, reducing human errors, improving diagnostic quality, and predicting disease trends.

2. RESEARCH PURPOSE AND RESEARCH METHOD

The research purpose of the application of artificial intelligence in medical image diagnosis is to improve the accuracy, efficiency and accuracy of medical image analysis. There are five main purposes, which are to improve diagnostic accuracy, optimize image segmentation, rapid analysis and diagnosis, data mining and prediction, and cross-domain application. (1) Improve diagnostic accuracy: Through machine learning technology, a large number of medical imaging data can be deeply learned to find potential lesions and abnormal areas. (2) Optimized image segmentation: Through computer vision algorithms, the required areas, such as tumors and blood vessels, can be automatically identified and segmented in complex medical images. (3) Quick analysis and diagnosis: Artificial intelligence technology can process a large amount of image data in a short time and quickly find suspicious results from it. (4) Data mining and prediction: Through the mining and analysis of a large number of medical records and other related data, the risk and development trend of the disease can be predicted and provide decision-making support for doctors. (5) Cross-domain application: In addition to clinical application, artificial intelligence can also be used in preventive medicine, bioinformatics and other fields to provide more new perspectives and possibilities for medical research.

Deep learning, computer vision, and natural language processing are some of the primary technologies used in artificial intelligence research approaches for medical picture detection. (1) Deep learning: Deep learning is a machine learning technique that trains models using multiple layers of neural networks. By training a large amount of medical image data, the deep learning model can automatically extract image features and predict on unmarked data. (2) Computer vision: Computer vision refers to enabling machines to "see" the world to identify, understand and interpret objects. This technology is widely used in medical imaging diagnosis, such as automatic detection of lesions, analysis of lesion areas and texture characteristics. (3) Natural language processing: Natural language processing refers to making computers understand human language in order to better communicate with people. In medical imaging diagnosis, natural language processing can help doctors understand and interpret medical reports and professional literature, thus providing more accurate diagnostic information.

3. THE WAY OF APPLICATION AND FUTURE

The main applications of AI technology in medical imaging diagnosis include the following: medical image information processing and analysis, medical image quality control, automated disease diagnosis and prediction, and evaluation of disease treatment plans and effects. Among them, automated disease diagnosis and prediction is one of the most important applications. By analysing medical image data and patients' clinical information, AI can help doctors make early diagnosis and prediction of diseases. For example, for chest CT scan images, in lung cancer screening, the use of AI technology can automatically identify the location and morphology of tumour lesions, calculate volume size and density, and provide information such as assessment of the benignity and malignancy of tumour lesions. This information can help doctors quickly determine whether a patient has lung cancer and carry out further treatment [3]. Artificial intelligence has two main roles in medical imaging diagnosis: the first is to enhance the diagnostic ability of doctors. The application of AI technology will be helpful for doctors' diagnostic ability. At the same time, for the annotation of medical images, artificial intelligence technology can further improve the medical image database, making the medical image database more complete. As a result, when doctors make diagnoses, they can further improve the accuracy of diagnosis with diseases based on the query results of the database. The second is to avoid the risk of medical misdiagnosis. Artificial intelligence technology has higher accuracy and fewer misdiagnoses when diagnosing medical images. In contrast, human doctors have the risk of diagnostic omission and misdiagnosis. AI technology can avoid this risk and reduce the loss of patients' health due to human error by doctors.

AI also provides three interesting directions. First, AI can broaden the range of potential datasets that can be used for medical insights and drug discovery by learning from non-image data sources like text and genetic sequences. The results of medical signal data, including electroencephalograms (EEGs), electrocardiograms, and auditory data, are already predicted using AI techniques. For instance, brain activity, a crucial indicator of long-term recovery, has recently been detected using artificial intelligence (AI) on the EEG signals of patients with brain injuries who are clinically unresponsive. AI can also combine data from several medical sources to enhance diagnosis. For instance, recordings of patients coughing and their symptom reports were utilized as inputs to improve the diagnosis of respiratory disorders in a study. Artificial intelligence (AI) models have also been used with more complicated inputs, such electronic health records, and with a range of data, like test results, medications, and vital signs. Second, AI is capable of unsupervised learning, or learning from data in the absence of labels or annotations. Typically, obtaining tagged data is costly and time-consuming. The range of medical applications for AI advancements that can leverage poorly tagged data can be expanded. Clustering algorithms, for instance, have been used to identify clinically meaningful patient subgroups in a variety of conditions, including sepsis, breast cancer, and endometriosis. They do this by organizing unlabeled data points by grouping together comparable data points.

Although artificial intelligence has great potential in medical imaging, it also faces some challenges. First of all, due to the complex details in medical imaging, highly accurate data processing and algorithm optimization are required. Secondly, the explanatory nature of the AI model is also an important issue, and how to make doctors understand and accept the results of AI is an important research direction. Finally, the application of AI technology also needs to consider ethical and legal issues. How to ensure the fairness and fairness of AI is a question worthy of in-depth study.

4. CONCLUSION

All things considered, the use of artificial intelligence technology in the diagnosis of medical imaging has produced some positive outcomes and has enormous development potential. It gives doctors a lot of help and support to increase the precision, effectiveness, and workflow of their diagnoses. Artificial intelligence technology will be used in more and more medical picture diagnostics in the future as a result of ongoing research and advancement. Artificial intelligence will become the right hand of doctors to provide patients with more accurate and personalized medical services. At the same time, we should also pay attention to solving relevant technical and ethical issues to ensure that the application of artificial intelligence in medical imaging diagnosis can better benefit human health. However, we still need to face some challenges and problems, and we need to further deepen research and exploration. It is believed that with the continuous progress and innovation of technology, artificial intelligence technology will bring more accurate and reliable results to medical imaging diagnosis, and provide better protection for the health of patients.

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