

# Research and Practice on the Integration and Development of Artificial Intelligence and Medical Image

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**Abstract:** *The innovative development of medicine is synchronized with the innovative application of technology. Also, artificial intelligence technology brings new breakthroughs for medical research in the era of artificial intelligence. In particular, artificial intelligence technology has achieved conspicuous application expectations in medical image, realized the integration of intelligent technology and medical image research, and provided assistance for tumor diagnosis and cardiovascular disease diagnosis. As a computer technology operating in human thinking mode, artificial intelligence technology realized the imitation of human brain thinking process and overcame the subjective bias of human brain thinking, which is of great application value. The integration of artificial intelligence technology and medical image is an inevitable trend and the dawn of medical progress. In the new era, it is valuable to increase the research on the integration of artificial intelligence technology and medicine in order to realize the new development of medicine supported by artificial intelligence technology. In this context, this work mainly discussed the integration and development of artificial intelligence technology and medical image and analyzed the application of artificial intelligence technology in medical image on the basis of clarifying the current situation of medical application of artificial intelligence technology.*

**Keywords:** *Artificial intelligence, Medical image, Integration and development*

## 1. Introduction

The innovative development and application of artificial intelligence technology have promoted the reform of medical research. The combination of artificial intelligence technology and medical image has made a new breakthrough in medical research, brought about the change of traditional medical image diagnosis mode. The combination has also realized the participation of artificial intelligence technology in all aspects of medical image analysis, greatly improved the diagnosis level and diagnosis efficiency [1]. The deep learning algorithm in artificial intelligence technology has the greatest application achievements in the field of medical image, provides image analysis basis for tumor diagnosis, and gradually realizes early prevention, early detection, early diagnosis and early intervention of tumor. However, artificial intelligence technology is also facing new challenges in the integration with medical images, which needs enough attention.

## 2. Medical application status of artificial intelligence technology

Artificial Intelligence (AI) is a new technical science that studies and is used to simulate, extend and expand the theory, method, and technology and application system of human intelligence. With the development of AI technology, it has become an emerging frontier discipline involving the intersection of computer science, psychology, philosophy and linguistics. In recent years, with the emergence of deep learning algorithms, the increase of index level growth for computing power, rich big data resources and training based autonomous learning methods, as well as the development of complex artificial intelligence due to the brain like abilities of computers such as conditioned reflex, make the new generation of AI technology usher in explosive development and application. AI enabled medical industry has made amazing achievements in virtual physician assistant, medical record and literature analysis, drug research and development, gene sequencing and image-assisted diagnosis, precision medicine and so on. Among them, the combination of medical image and artificial intelligence is the most promising field. After 2012, with the rise and application of deep convolution neural network technology, AI has made a breakthrough in the field of computer vision. Based on image recognition,

computer vision can deeply analyze medical image data and obtain more valuable information. Through the training and learning of a large number of data, its analysis ability is continuously improved, which shows a broad application prospect in accurate diagnosis [2]. At present, there are many clinical applications and studies in tumor detection, automatic structural reporting, qualitative and quantitative diagnosis, tumor extraction and radiotherapy target organ mapping. When the artificial intelligence method is seamlessly integrated into the clinical workflow as a tool to assist doctors, by providing pre screened images and determined features, it can carry out imaging evaluation more accurately with high repeatability, significantly improve work efficiency, reduce misdiagnosis and missed diagnosis, and monitor the curative effect.

### **3. Application of artificial intelligence technology in tumor image analysis**

#### ***3.1. Detection of pulmonary nodules, early detection and diagnosis***

Early detection and diagnosis are always the key to the treatment of lung cancer. With the increase of lung cancer incidence rate, a sensitive and accurate diagnostic method is not only an important tool for clinicians, but also the key to improve survival rate. Artificial intelligence technology has been developed on the basis of computer science, information science and big data, which has led to the popularization of artificial intelligence system for pulmonary sub solid nodules. Pulmonary nodule detection is the most common application of artificial intelligence in cardiothoracic radiology. Artificial intelligence can judge whether the nodules are benign or malignant by detecting the characteristics of pulmonary nodules. Some studies believe that the nodules detected by pulmonary nodule image artificial intelligence technology are mostly nodules with diameter less than 5mm and 5mm ~ 10mm, solid and ground glass density nodules. For the screening of ground glass nodules above 5mm, calcified nodules and micro nodules of 0 - 3mm, as well as sub solid nodes and nodules at different positions, the detection rate of artificial intelligence is higher than that of imaging doctors. As a method of machine learning in artificial intelligence, image omics is the earliest, most extensive and fruitful research application in lung cancer. It can be used for many aspects such as tumor staging, pathological typing, lung cancer diagnosis, differential diagnosis, treatment scheme selection, and efficacy monitoring and prognosis evaluation [3].

#### ***3.2. For breast cancer diagnosis, clear pathological characteristics.***

The continuous development and diversification of new image techniques of breast cancer, provides radiologists with rich data and a variety of diagnostic tools. Artificial intelligence combined with image specificity to discover the genome, pathology and clinical characteristics of the disease is becoming more and more valuable in breast cancer. Artificial intelligence system based on deep learning algorithm mainly focuses on mammography X ray image analysis and research. It is widely used in X ray radiography for screening breast cancer. MRI, ultrasound and digital mammography are relatively few. X ray photography has a higher detection rate for microcalcifications, and the detection rate of tumor will be affected by gland density and cannot replace visual image evaluation. Li Xin and others have shown that the sensitivity of artificial intelligence detection system to mass, intramammary lymph nodes, circular calcification, circular calcification and rough calcification has reached 76.4%, 71.2%, 75.0%, 83.1% and 64.9% respectively, of which the detection effect of intramammary lymph nodes is the best.

#### ***3.3. Support the diagnosis of glioma and prostate cancer***

In the diagnosis of glioma, artificial intelligence is mostly used in brain MRI. With the supervised deep learning method, the computer forms a prediction model of the image after repeated trial and error and selection, and then forms a preliminary model that can predict the medical image after multiple verification and optimization. In the diagnosis of prostate cancer, artificial intelligence can diagnose prostate cancer faster by deep learning of normal and abnormal prostate images. In the image of prostate cancer, artificial intelligence has great practical value in performing three main clinical tasks, including prostate cancer detection, characterization (tumor and organ segmentation, diagnosis and staging, prognosis and result prediction, etc.) and monitoring.

### **4. Application of artificial intelligence technology in cardiovascular image analysis**

Cardiovascular disease is the number one killer of human beings. In recent years, the rapid development of cardiovascular image technology has produced a large number of image data. The

rational application of artificial intelligence cannot only greatly shorten the examination time, reduce the time of cardiac image reconstruction, accurately and quickly carry out image segmentation and calculation, and improve the accuracy of diagnosis, it can also play a greater role in disease prognosis judgment and risk stratification. Machine learning model has been used for feature extraction and annotation of cardiovascular images [4]. For example, machine learning can automatically identify lesions on coronary CT angiography. Support vector machine algorithm was used to improve the automatic localization of lesions, which combined with multiple quantitative geometric indexes and shape features (including stenosis, minimum lumen diameter, eccentricity index, etc.), higher sensitivity, specificity and accuracy were obtained, which were 93%, 95% and 94% respectively.

## **5. Application of artificial intelligence technology in other image analysis**

Artificial intelligence also shows a certain clinical value in the screening, diagnosis and differential diagnosis and prognosis evaluation of non-tumor diseases and non-cardiovascular diseases. Some scholars have designed a diagnostic model of Alzheimer's disease with regional abnormal representation. In addition, the study found that artificial intelligence technology can differentiate thinner cortical thickness and smaller hippocampal subregion [5]. Some scholars have also found that the deep learning algorithm can accurately identify the abnormal CT manifestations of the head requiring emergency intervention, including various types of intracranial hemorrhage, skull fracture and midline displacement, which makes it possible for automatic triage. Relevant scholars applied the deep learning network to realize the full-automatic detection system for emergency patients with brain injury, which helps radiologists and emergency doctors reduce diagnosis time and human errors. Cheng and other scholars can realize the detection and visualization of pelvic X-ray hip fracture by using deep learning algorithm, which may be helpful for emergency screening and evaluation. In addition, the accurate and automatic quantification of left ventricular function in multi center cine MR images based on deep learning method has been realized.

## **6. Reflections on the application of artificial intelligence technology in medical imaging**

### ***6.1. Data security and ethical issues***

Using patient data to train these AI systems may raise ethical issues in data security and privacy. A common feature of current AI tools is that they can perform a single task well and cannot handle multiple tasks. Radiologists are the key elements in the process of artificial intelligence training, contributing knowledge and supervising efficiency. Image physicians need to pay attention to artificial intelligence technology, abide by the ethical requirements for the safe use of data, and make full use of data value. Only in this way, can they not only supervise the results, but also use verification means to explain the reasons behind them, and find potential hidden information that may be ignored.

### ***6.2. Establishment of standardized data and database***

Data is still the core and key component of artificial intelligence system, including image archiving, communication system, medical digital image and communication. Only by establishing standardized data acquisition and storage standards, can image data be easy to access and retrieve. However, these data are rarely sorted out in terms of label, annotation, separation and quality assurance. The management of medical data requires trained professionals, but the time and cost are very expensive. It has become a major bottleneck in the development of artificial intelligence model for automated clinical solutions. Therefore, the establishment of standardized data and database is the key.

## **7. Conclusion**

The application of artificial intelligence technology in medical image analysis can help radiologists register through rapid analysis of images and data, train radiologists, and help residents and consultants complete clinical work. The integration of artificial intelligence technology and medical image will be more in-depth, but the large-scale popularization and application of artificial intelligence technology in medical image still needs further research and continuous exploration.

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