



Application and Development Model of Image Recognition Technology in Medical Field

Zhao Feng

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

September 18, 2019

Application and Development Model of Image Recognition Technology in Medical Field

ZHAO Feng^{1,2}

1. Key laboratory of Evidence-Identifying in Universities of Shandong,
Shandong University of Political Science and Law, Jinan 250014, China;

2. Judicial identification center of Shandong University of Political Science and
Law, Jinan 250014, China.

E-mail: zhaof0531@126.com

Abstract. With the progress of computer technology and the improvement of consumer demand, artificial intelligence has gradually become the hot topic of discussion and research in recent years. As an important research field of artificial intelligence, image recognition technology of in-depth learning has attracted extensive attention of many scholars. Starting from the development background of artificial intelligence, this paper sorts out the application of image recognition technology in medical field, probes into its business model, and puts forward reasonable countermeasures and methods to promote the landing and application of artificial intelligence technology in medical field.

1. Introduction

In recent years, China has made remarkable achievements in the field of artificial intelligence. More and more attention has been paid to the development of artificial intelligence. In this context, this paper tries to discuss the application and business model of image recognition in medical field from the perspective of artificial intelligence, and analyze the problems and countermeasures of image recognition in medical field commercialization[1-2].

2. Application Status of Image Recognition Technology in Medical Field

2.1 Technical introduction

Image recognition refers to the technology of using computer to process, analyze and understand images to identify the targets and objects of different modes. It is generally

divided into five steps: input image to be processed, image preprocessing, extraction of image features, construction of classifier and output of classification results [3]. In the process of recognition, image segmentation and classifier construction are the two most critical steps. How to minimize the loss of the image after segmentation compared with the original information and help the classifier to judge its pattern more accurately is very important to improve the accuracy of image recognition.

At present, there are four most common image segmentation methods: threshold-based segmentation algorithm, edge detection-based segmentation method, region-based segmentation method, and neural network-based image segmentation method [4-6]. Among them, image segmentation based on neural network technology is currently the most noticeable. Many scholars devote themselves to the research in this field, and then introduce in-depth learning into the field of image recognition. At the same time, good results have been achieved. At present, the record of image recognition is created by the champion 360 of the 2017 ImageNet Large-scale Visual Recognition Challenge and the NUS team. The "DPN Dual Channel Network + Basic Aggregation" in-depth learning model proposed by them has achieved the lowest positioning error rate

2.2 Application status

While the image recognition technology tends to be mature, the application of this technology is also gradually strengthened. Especially in the medical field, the use of machines to assist in identifying medical images can greatly reduce the workload of doctors, improve the efficiency and accuracy of image recognition, save medical resources, reduce medical costs, and solve the problem of expensive and difficult medical treatment. In the case of the heart, lung nodes, diabetic retinas, brain and other images, the artificial intelligence has performed well.

2.2.1 Cardiac image recognition

Human heart organs are very complex, and there are differences among individuals, so doctors need to accumulate experience for a long time in order to carry out pathological analysis of heart images in a relatively short time. However, due to the deviation of naked eye observation and the subjectivity of human brain judgment, it is not only time-consuming but also possible for doctors to make large errors in the study of heart images. The heart image recognition by artificial intelligence greatly improves the recognition efficiency and has reliable accuracy

2.2.2 Identification of pulmonary nodules

According to the survey, the incidence and mortality of lung cancer rank first among malignant tumors, while the early imaging manifestations of lung cancer are pulmonary nodules. Early detection and accurate judgment of pulmonary nodules is the most critical link to reduce the mortality rate of lung cancer and improve the quality of life of patients. At present, the diagnosis of pulmonary nodules in China relies on chest CT scanning, and then the imaging physician gets the diagnosis results by analyzing the CT images. However, the accuracy of manual film reading is not high, and it usually takes 2-3 days to report. And through AI reader, not only the report is fast, but also the accuracy is high. Therefore, compared with other diseases, the use of artificial intelligence technology to identify

pulmonary nodules is a more mature application.

2.2.3 Diabetic retinal image recognition

The retinal fundus image of diabetic patients carries a lot of information about diseases. By observing the fundus image, we can judge whether the patients have diabetic retinopathy and its pathological stage. However, retinopathy is often overlooked by patients, or is not found due to poor medical conditions, resulting in untimely treatment. So many scholars use the method of deep learning to recognize retinal images, and use artificial intelligence to assist doctors in diagnosis. For example, Ding Pengli[7] proposed a complete retinal image classification system based on deep neural network, which realized the recognition of retinal images in different situations

2.2.4 Brain image recognition

The human brain has a relatively complex structure, which dominates all the processes of activities in the body. Any slight pathological changes may seriously affect people's normal life. In recent years, the increasing incidence of brain diseases makes people pay more and more attention to the study of brain images in order to diagnose related diseases as soon as possible.

At present, many types of feature information can be extracted from brain medical images for later recognition and analysis, such as intensity features, morphological features and texture features [8]. Compared with artificial judgment, artificial intelligence also shows the advantages of fast processing speed and high analysis efficiency. However, even though many medical units have abundant brain image data and mature technical support, there is still a lack of relevant intelligent devices or platforms.

3. Problems of image recognition technology in medical field

Although image recognition technology has achieved good results in recognition of heart and lung nodules, there are still several problems.

3.1 Privacy factors of image data

At present, the traditional film images produced by X-ray, CT and nuclear magnetic resonance belong to patients' privacy. On the one hand, the training set of image recognition is not comprehensive enough, which limits the recognition accuracy to a certain extent. On the other hand, in order to realize the application of image recognition in computer-aided therapy, it is necessary to obtain the application license of patient image. This is the biggest obstacle to the commercialization of image recognition technology in the medical field.

3.2 Factors between doctors and equipment or platforms

At the hospital level, although the use of intelligent devices or platforms can reduce costs and improve the efficiency of doctors, how to choose between them, how to configure them reasonably, and how to deal with the relationship between them need to be carefully considered. For experienced doctors or experts, the accuracy of image recognition seems to be more credible; however, the authoritative doctors have difficulties in registering and booking, and the cost of diagnosis and treatment is relatively high. Therefore, hospitals need to choose and coordinate the resources of doctors and intelligent platforms according to the actual

situation, so as to achieve a reasonable collocation [9-11].

3.3 Psychological factors of patients

For patients themselves, trust in image recognition technology is the key to whether they will use intelligent platform to read pictures. Although AI is relatively objective and accurate, there will be some mistakes. Moreover, people have long been in the habit of seeing a doctor. For the unfamiliar thing of artificial intelligence, it will naturally lead to rejection. Therefore, in order to promote the use of image recognition in the medical field, it is necessary to overcome the doubts about artificial intelligence in patients' minds.

4. Countermeasure and suggestion on realizing commercial model of image recognition technology in medical field

4.1 Locate in the auxiliary function

For the recognition of medical images, doctors should still be the main method, while artificial intelligence should be used as auxiliary reading. When patients are inconvenient to register in the hospital, need to spend a lot of time and cost, or have doubts about the doctor's diagnosis, they can choose to use artificial intelligence to read maps. This not only enables patients to quickly obtain the diagnosis results, but also relieves the pressure of doctors, and verifies the doctor's diagnosis [12-13].

4.2 Build the public praise effect from top to bottom

On the basis of high recognition efficiency and accuracy, first obtain the approval of authoritative hospitals and authoritative doctors, and take this as a breakthrough point to spread artificial intelligence image recognition to people. Today, with the Internet so developed, it's especially important to use the network platforms and the press, to enhance the awareness of image recognition technology, to reduce the confusion, and to make the use of image recognition technology in the medical field to be recognized by society.

4.3 Cooperative promotion from bottom to top

Intelligent map reading can't be promoted without hospitals, so it is better to adopt a business model of cooperation with hospitals. Especially for hospitals with relatively insufficient resources of doctors, the addition of intelligent map reading will inevitably solve the problem that some patients cannot seek medical treatment, which can also be used as the first batch of target customers for image recognition promotion. For authoritative hospitals, although doctors have abundant resources, there are still difficulties in seeking medical treatment, such as registration difficulties, which can be promoted from this perspective. At the same time, image doctors and related disease doctors in cooperative hospitals can recommend to patients in the process of diagnosis, and ultimately realize the circulation of image recognition among large hospitals, small hospitals, doctors and patients, and further strengthen the word-of-mouth effect [14].

4.4 Take reasonable price strategy

Make use of the modes of small profits and more sales to enter the market, and then gradually adjust the price. Through low-cost access, patients can ignore the question of image

recognition technology. As a low-cost diagnostic tool, patients' willingness to use artificial intelligence to read maps will increase. When most patients develop the habit of using artificial intelligence to read maps, they can adjust the price according to the market situation .

5.Summary

In this paper, the current application status and influencing factors of image recognition technology in medical field are expounded. The combination of the two, the countermeasures and suggestions for commercialization of image recognition technology in medical field are put forward. Faced with the current factors such as image data confidentiality, trade off between doctors and intelligent devices, and patients' questioning psychology, this paper proposes that various methods should be adopted to realize the commercial application of image recognition technology in the medical field.

The advantages of AI are far beyond what has been seen. In the future, AI based on image recognition will inevitably be widely used in the medical field.

6.References

- [1] Jiao Jingzhu. Human rights and ethical issue in the development of artificial intelligence technology application research [D]. Yanbian University,2017.
- [2] Yang fan. Study on the ethical problems of the application of artificial intelligence techniques [D]. Yunnan normal university,2017.
- [3] Geng Qingtian. Research on Key Technologies of Intelligent Transportation System Based on Image Recognition Theory [D]. Jilin University,2016.
- [4] Zhang Mingyue. Image Segmentation Based on Deep Learning [D]. Jilin University, 2017
- [5] Qayyum, A., Anwar, S. M., Awais, M., & Majid, M. Medical image retrieval using deep convolutional neural network. Neurocomputing. Volume. 266, pp.8-20 (2017).
- [6] Wang Yuanyuan, Zhou Tao, Wu Cuiying. Depth learning and applied research in medical imaging analysis [J]. Television technology, 2016,40 (10): 118-126
- [7] Ding Pengli. Research on diabetic retinal image analysis algorithm based on in-depth learning [D]. Beijing Jiaotong University,2017.
- [8] Zhang Cong. Brain medical image recognition based on multi-feature fusion [D]. University of Electronic Science and Technology, 2016.
- [9] Duchi J, Hazan E, Singer Y. Adaptive Subgradient Methods for Online Learning and Stochastic Optimization[J]. Journal of Machine Learning Research, 2011, 12(7):257-269.
- [10] Hinton G E, Srivastava N, Krizhevsky A, et al. Improving neural networks by preventing co-adaptation of feature detectors[J]. Computer Science, 2012, 3(4):págs. 212-223.
- [11] Poljak B T. Some methods of speeding up the convergence of iterative methods.[J]. Ussr Computational Mathematics & Mathematical Physics, 1964, 4(5):791–803.
- [12] Kingma D P, Ba J. Adam: A Method for Stochastic Optimization[J]. Computer Science,2014.

- [13] R. Panchal, B. Verma. Neural classification of mass abnormalities with different types of features in digital mammography[J]. International Journal of Computational Intelligence& Applications, 2006, 6(01):61-75.
- [14] Mavroforakis M E, Georgiou H V, et al. Mammographic masses characterization based on localized texture and dataset fractal analysis using linear, neural and support vector machine classifiers[J].Artificial Intelligence in Medicine, 2006,37(2):145-162.

Fund projects:Supported by Program for Young Innovative Research Team in Shan Dong University of Political Science and Law (2018FTKX) ;Teaching research and teaching reform project of shandong university of political science and law (2018JGB009) .Scientific Research Project of Shandong University of political Science and Law (2019Z10B)