

Application Research of Artificial Neural Network in Intelligent Diagnosis of Traditional Chinese Medicine

Yuan Zhou, Yaofeng Miao*

School of Engineering, Xi'an International University, Xi'an, 710077, China

*Corresponding Author: Yaofeng Miao

Email: myfzhy@163.com

Keywords: Artificial neural network, Traditional Chinese medicine, Intelligent

Abstract: Traditional Chinese medicine has a unique view of physiology, pathology and disease prevention. It has a very important position in Chinese medicine and has made outstanding contributions to the healthy development of the world. This paper analyzes the theoretical and technical basis of artificial neural network to promote the development of TCM intelligentization. It introduces the application of artificial neural network to promote the intelligentization of TCM under different conditions. It is hoped that it has certain reference value for academic and practical research.

1. Introduction

Traditional Chinese medicine has a very important position in Chinese medicine and has made outstanding contributions to the healthy development of the world. Traditional Chinese medicine has a history of thousands of years in China, and it has a long history as China's excellent traditional culture. In particular, Tu Yu won the Nobel Prize for the use of Chinese traditional Chinese medicine research, which further enhanced the status of Chinese medicine in the world. With the rapid development of China's science and technology, many technologies and traditional Chinese medicine have achieved organic integration. As an emerging interdisciplinary subject, artificial neural network is of great significance to the development of traditional Chinese medicine. Based on this background, this paper introduces the development of artificial neural network and traditional Chinese medicine, introduces the technical means of intelligent Chinese medicine, and analyzes the application of artificial neural network in the intelligentization of traditional Chinese medicine.

2. Artificial neural network and intelligent Chinese medicine

The artificial neural network is an algorithmic mathematical model in which humans use artificial devices such as electrons to mimic the structure or function of animal neural networks and perform distributed information processing. Artificial neural network belongs to the interdisciplinary subject of information science, medicine, biology, and other disciplines. The discipline began to develop rapidly in the mid-to-late 1980s. It is a new intelligent information processing system that simulates the principle of biological nervous system. Human artificial neural networks can generate unpredictable system emerges through the connection of a large number of nodes and their nonlinear complex relationships, resulting in new ideas, new theories or new algorithms. With in-depth development, artificial neural networks have been widely used in information processing, fault diagnosis and prediction because of self-learning, self-organization and good fault tolerance.

Traditional Chinese medicine has a unique physiological view, pathological view, and disease prevention concept, and has unique health value in medical theory. From the perspective of protecting and improving human health, traditional Chinese medicine also has the advantages of focusing on preventive health care, clinical curative effect, relatively safe medication, and broad

development space. Traditional Chinese medicine has a systematic and complete theory. It established a certain medical system as early as two or three thousand years ago and has always played an important role in the Chinese medicine medical care system. The development of Chinese medicine in China has always been strongly supported by the state's policies. Chairman Mao Zedong proposed the establishment of the College of Traditional Chinese Medicine in 1956. President Xi Jinping also attached great importance to the development of Chinese medicine. It is precisely in the context that Chinese medicine is becoming more and more important, and the country attaches great importance to it. In the scientific field, there is a growing trend of interdisciplinary and TCM integration development. For example, artificial neural networks have been successfully used in TCM diagnosis, disease prediction, and pulse identification analysis. , medical image processing and other aspects, and achieved significant results.



Figure 1. Contribution and significance of Chinese medicine development

3. Machine learning: the technical means of intelligent Chinese medicine

Western medicine obtains relevant data through controlled experiments, and then summarizes them into theory, and then uses theory to guide practice. That is to say, controlled experiments, structural theory, and practical application are typical Western medical knowledge production methods. Because the data obtained by Chinese medicine is extremely personalized, it is difficult to summarize it into a general theory, that is, clinical practice is a typical Chinese medicine knowledge production method. Therefore, Western medicine is easier to learn and teach, while Chinese medicine is more difficult to learn and teach.

However, with the advent of the era of big data and artificial intelligence, the fragmentation and experience of TCM knowledge is no longer a scientific problem, and can be solved through machine algorithm learning. The key issue is nothing more than an algorithmic conversion problem. Big data converts TCM classics and clinical diagnosis and treatment experience into data, and forms a huge amount of TCM big data. This personalized and fragmented TCM clinical experience has a scientific expression, and personal experience can be transmitted and exchanged through data. . All in all, Western medicine summarizes and refines the theoretical algorithms of causality through controlled experimental data, while TCM constructs relevant empirical algorithms through personalized clinical data.

Deep learning imitates the way of thinking of human beings, stratifies and classifies massive and complex data, and promotes them step by step, step by step, and extracts general calculation methods from the cluttered raw data. TCM intelligence can also be learned more and more intelligently from TCM big data by deep learning and neural network algorithms. Through artificial neural networks, intelligent machines can simulate the thinking mode of Chinese medicine practitioners, emerge on the basis of TCM big data, generate new knowledge, and make breakthrough innovations to traditional Chinese medicine, so that not only the fragmented TCM big

data can be formed. Useful knowledge, you can also learn traditional Chinese medicine experience and contribute to the modernization and innovation of Chinese medicine.

4. The practical significance and practical significance of intelligent Chinese medicine

4.1. Promote clinical study of Chinese medicine

At present, the quality of Chinese medicine team is uneven, but the number of employees reaches more than 400,000. The intelligentization of Chinese medicine has professional operating standards, effectively solving the problem of lack of standardized and systematic diagnosis and treatment standards to improve the safety of Chinese medicine health care. At the same time, the intelligentization of TCM can also promote the diagnosis and treatment of TCM diseases, standardization of sub-health conditioning, standardization and proceduralization, and completely change the practical problems of unclear diagnosis and incomplete treatment in the process of TCM treatment.

4.2. Solve the employment problem of graduates of Chinese medicine schools

The students of Modern Chinese Medicine University are faced with the situation of unemployment, and the TCM auxiliary treatment system is easy to operate, with accurate, unique and safe diagnosis and treatment ideas, which can effectively assist Chinese medicine treatment. At the same time, it is of practical significance to improve the problem of the difficulty of seeing a doctor and the problem of expensive medical treatment that are currently faced by Chinese citizens. In addition, the hybrid artificial intelligence technology based on KDD method can scientifically describe and quantify traditional Chinese medicine theory, and explore and form new Chinese medicine theory to guide Chinese medicine research and development research.

4.3. Improve the database of Chinese medicine and improve the utilization value of the existing Chinese medicine database

The establishment of standardized TCM data standards and the integration of database architecture is the key to improving the sharing and utilization of TCM data. It is a big problem to find new rules and extract hidden information from a large number of Chinese medicine data. China's existing Chinese medicine database can only provide general services such as search and statistics. Accelerating the development of China's traditional Chinese medicine artificial intelligence information system can not only improve the utilization value of China's existing Chinese medicine database, but also avoid the cheap loss of Chinese medicine information resources. To this end, it is necessary to identify the development of heterogeneous multi-database fusion information processing technology, reduce the communication relationship between multiple database systems and find an appropriate method to coordinate the work of each database.

5. Application of artificial neural network in intelligent diagnosis of traditional Chinese medicine

5.1. General methods of artificial neural network diagnosis of traditional Chinese medicine

Artificial neural networks can be applied to medical diagnosis. The basic idea of this method is that the process of medical diagnosis is an imaging process, which is the process of finding the corresponding diagnosis results through symptoms. Artificial neural networks have a strong nonlinear mapping function and can therefore be applied to medical diagnosis. Artificial neural network construction diagnostic systems do not require prior knowledge rules and knowledge frameworks, but only a large amount of instance data. The artificial neural network is trained according to the sample. The whole training process will be iterated many times. The final weight will be adjusted to the appropriate value. Finally, these symptoms and diagnosis results will be quantified into symptom values and diagnostic result values.

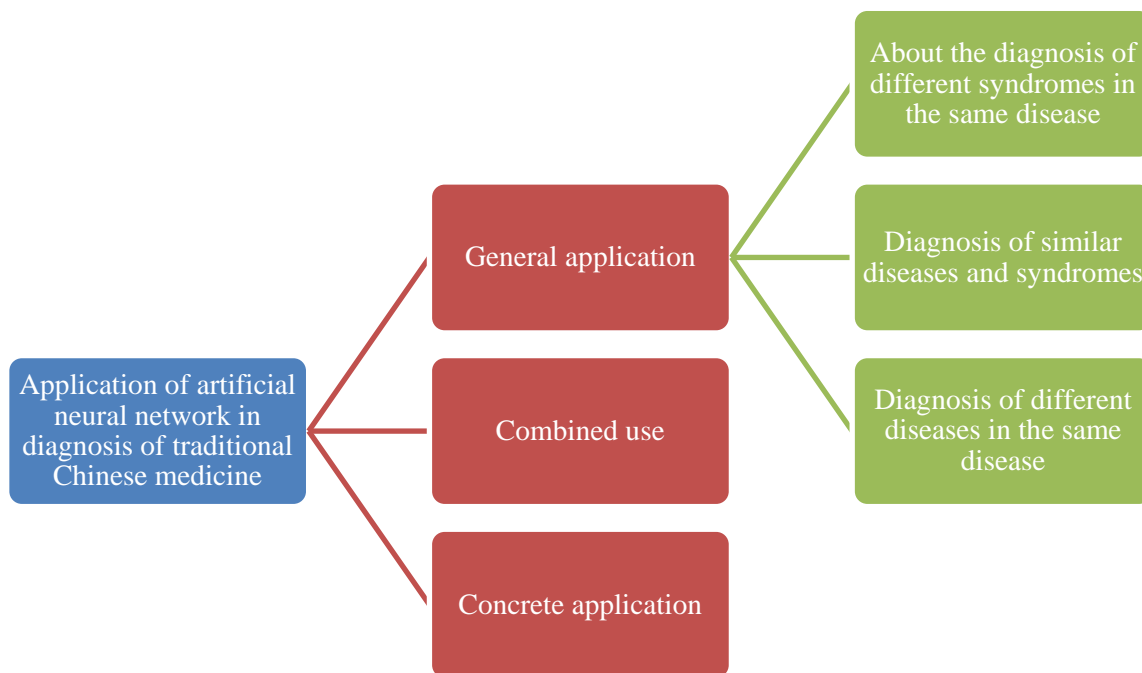


Figure 2. Application of Artificial Neural Network in Intelligent Diagnosis of Traditional Chinese Medicine

5.2. Application of Artificial Neural Network in Diagnosis of Traditional Chinese Medicine

Diagnosis of different diseases in the same disease. In 1996, Chinese experts used artificial neural network to realize the differential diagnosis of three kinds of liver diseases (chronic hepatitis, cirrhosis, liver cancer). The method collects sample data, and then quantifies the symptoms of the sample. When the output value of the output belongs to the interval $(-0.5, 0.5)$, it is judged as chronic hepatitis; when the output value belongs to the interval $(0.5, 1.5)$, it is determined as Liver cirrhosis; when the output value belongs to the interval $(1.5, 2.5)$, it is judged as liver cancer. The results showed that the test results of the six test samples were all correct.

About the diagnosis of different syndromes in the same disease. Depression is an emotional disorder syndrome characterized by significant and persistent low mood. Artificial neural networks have also achieved good results through training and sample collection. Experts use artificial neural network to diagnose four types of syndromes of hepatitis B. The structure of artificial neural network is: 106 nodes in the input layer, 10 nodes in the middle layer, and 4 nodes in the output layer. A total of 363 patients with hepatitis B virus hepatitis were extracted from the four syndromes as training samples, which directly affected the learning results and the accuracy of the discrimination.

Diagnosis of similar diseases and syndromes. In the diagnosis and treatment system, if deductive rules are used, there will be a large number of rules input work, and it may not be able to clearly analyze the condition or even cause misjudgment. Yeh explored the use of artificial neural networks to automatically diagnose these four diseases and syndromes with similar symptoms. The symptom indicators used were 9 types, which were headache, cold, weight, pain, wind, string or pulse, floating pulse, fever, and sweating. The structure of the artificial neural network is: input node 9 nodes, middle layer 4 nodes, output layer 4 nodes. The output target mode of the artificial neural network is $(1,0,0,0)$, $(0,1,0,0)$, $(0,0,1,0)$, $(0,0,0,1)$, respectively Wet temperature disease, summer temperature disease, sun typhoid syndrome and solar stroke syndrome. The method of judging the output of artificial neural network adopts the principle of maximum value. The results show that many knowledge in the diagnosis system that is difficult to obtain as a rule by manual acquisition can be solved from the actual example by establishing the corresponding artificial neural network.

5.3. Application of artificial neural network combined with other techniques in diagnosis of traditional Chinese medicine

At present, the combination of artificial neural network and other information processing technologies has gradually become the development direction and research hotspot of artificial neural network application research. These new techniques and methods are also used in the automatic diagnosis process of Chinese medicine. Bai et al. explored the feasibility of using artificial neural network method in syndrome research, and pointed out that artificial neural network can be combined with fuzzy control technology to be more suitable for TCM syndrome research. Wang et al. explored the method of combining symbolic reasoning technology with artificial neural network. It uses a combination of process and artificial neural network methods to apply to the ECG classification system. The experimental results show that this method can improve ECG analysis efficiency. Zhao et al. conducted a more in-depth study on the application of artificial neural network and case-based reasoning techniques to medical diagnosis. The artificial neural network was preprocessed by rough set theory and applied to the diagnostic modeling of TCM rheumatoid disease. The results show that the artificial neural network is assisted by rough set theory, which improves the learning ability of artificial neural network and achieves satisfactory results in practice.

6. Conclusion

Studies have shown that artificial neural networks can be widely used in all aspects of TCM diagnosis. Artificial neural network has strong nonlinear mapping function and ability to obtain data laws well. It is a new research and development trend to combine artificial neural network with other technologies for TCM diagnosis. However, there are still problems in that the sample size used is small, the method of sample quantification is too simple, and the BP learning algorithm is easy to fall into local optimum and the convergence speed is slow. Combining artificial neural networks with other technologies can improve the performance of diagnostic systems. To promote the intelligentization of TCM diagnosis, we must first improve the construction of TCM traditional Chinese medicine scientific research system and educational information system, establish a TCM scientific research information system, and improve and promote the scientific and technological management informationization and networking of the Chinese medicine industry. Secondly, it is necessary to establish a continuing education information system for Chinese medicine, and establish and improve the national continuing education information network for Chinese medicine, improve the management level of continuing education of Chinese medicine, make full use of information technology, realize the dissemination and renewal of Chinese medicine knowledge, and accelerate Chinese medicine. Informatization construction will promote the development of Chinese medicine.

Acknowledgements

The study is supported by the Key research and development program (general program) of Shaanxi Provincial science and technology Department (Program No.2018SF-333) and the Fund for innovative research team Program of Xi'an International University (grant No.XAIU-KT201801).

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