

Research Status of Applied Artificial Intelligence Technology in the Field of Traditional Chinese Medicine

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Abstract

Today's artificial intelligence has begun to take shape and is applied in various fields, and the interdisciplinary research work is increasing day by day. This article collects and organizes recent articles on interdisciplinary research in the fields of artificial intelligence and traditional Chinese medicine, and sorts out and explores the current status and future development trends of related research in this field are analyzed from the application of artificial intelligence technology in the current situation of TCM industry, technology application and other related fields of scientific research, and some related issues are put forward in an attempt to provide new ideas or methods for the development of TCM industry.

Keywords

Traditional Chinese Medicine; Artificial Intelligence; Technology Application.

1. Introduction

Table 1. The approximate statistical data of CNKI related literature from 2007 to 2017

Crucial technology of Artificial Intelligence	Artificial intelligence medical	Artificial intelligence traditional Chinese	Key words
4	6	3	★★★★★
2	3	3	★★★★
14	7	2	★★★
35	29	11	★★
1386	748	38	★
1441	793	57	Number of articles

It is undeniable that traditional Chinese medicine is an inseparable part of the Chinese national culture and has made a key development contribution to the revitalization of China. Today, Traditional Chinese medicine and Western medicine have developed together in China. But now traditional Chinese medicine has attracted worldwide attention because of its unique treatment methods, systematic diagnostic methods and a large number of classic materials. In addition, the international

recognition of traditional Chinese medicine has gradually increased to a certain extent, and a new era of informatization of the traditional Chinese medicine industry is coming.

From Table 1, although artificial intelligence technology has been applied in the medical field and has a certain development, but the application of this technology in traditional Chinese medicine is still very small.

Combined with the analysis in Figure 1, the number of papers published on artificial intelligence and traditional Chinese medicine in China has only been on the rise since 2016, which proves that the application of this technology in the traditional Chinese medicine industry has just started, and it has broader research and development prospects in the traditional Chinese medicine industry.

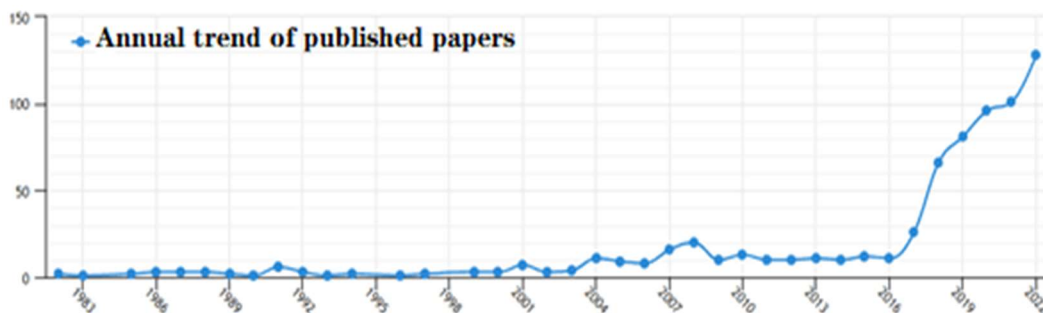


Figure 1. Statistics of TCM informatization literature on CNKI

The term "artificial intelligence" first appeared at the Dartmouth College Summer Symposium in 1956, and then went through several important stages such as logical reasoning, expert systems, neural networks, and deep learning [1]. In 2012, Alex Net defeated the traditional human feature image recognition for the first time, and the development of artificial intelligence has entered a new era of three-wheel drive of algorithm, data and computing power. With the support of a large amount of data and effective computing power, artificial intelligence has begun to be used in life in combination with various fields [2]. In 2016, Alpha Go developed by Google applied the "Deep Convolutional Neural Network" model and "MCTS, Monte Carlo Search Tree" algorithm. In March 2016, it competed with the world Go champion Lee Sedol and won the game. This historic case symbolizes the rapid development of a new generation of AI replaced by big data and deep learning algorithms. Compared with the past, the attributes of the latest generation of AI based on big data are undoubtedly more suitable for the overall structure of traditional Chinese medicine, and the predictions brought by deep learning are also more suitable for the activities of traditional Chinese medicine. From this point of view, the application of the latest generation of AI technology to TCM diagnostics helps it break the current predicament in the development of TCM [3].

2. Artificial Intelligence Technology Promotes the Development of Chinese Medicine Industry

Artificial intelligence is a new computational science that studies, analyzes and develops theories, methods, technologies and application systems for simulating training, extending and expanding human intelligence [4]. The field of artificial intelligence mainly studies robotics, language recognition, image recognition, natural language processing and expert systems, which perfectly fits the four-step diagnostic model of traditional Chinese medicine: "look", "smell", "ask", and "feel the pulse".

2.1 Using Artificial Intelligence Technology to Mine Traditional Chinese Medicine Data

Informatization of various traditional Chinese medicine classics and clinical data, further mining of associated data and analysis, to generate experience and assist clinical diagnosis.

For example, Hu Y Z and et al put forward the steps of data preprocessing in data mining, cleaning the clinical data of cases by ignoring tuples, combining computer and manual inspection and data transformation, so as to create concise and reliable data, and provide a reliable shortcut for the processing of case data of traditional Chinese medicine [5]. Lu L Z and et al proposed to build a data mining platform with Python programming language [6].

At present, TCM data mining has been widely used in the information retrieval of classic TCM literature and the mining and arrangement of the experience of famous and old TCM. At present, the widely used methods include frequency analysis, cluster analysis, complex network analysis, association analysis, etc.[6]. Through the method of data mining, we can obtain and analyze a large number of existing prescription data, which can accelerate the discovery of drug interactions, which has guiding significance for the discovery of new drugs and composition [8]. On this basis, the research on the modernization of traditional Chinese medicine has also accumulated a large amount of information on the prediction of the pharmacy research data of traditional Chinese medicine and Data of target, and established a standardized database to provide a solid foundation for the combined development of artificial intelligence and traditional Chinese medicine in the future.

2.2 Using Artificial Intelligence Technology to Assist in the Identification of Chinese Herbal Medicines

At present, the quality of Chinese medicinal materials is greatly affected by many human factors such as the geographical location of planting, climatic conditions, planting, processing, and factory storage and the quality will be various. We can use artificial intelligence technology to assist in the identification of traditional Chinese medicines, not just by looking, touching, smelling and tasting to identify the type and quality of traditional Chinese medicines, and also by implementing big data identification and analysis based on samples of traditional Chinese medicinal materials, we can spend less Time to screen out higher quality Chinese herbal medicines. For example, Tan Chaoqun proposed to use the "shape" and "color" of TCM decoction pieces as break throughs, and apply the deep learning of artificial intelligence to the research on the quality evaluation of TCM. Through the analysis of four parts: the construction of the decoction pieces database, the data preprocessing, and the detection of the decoction pieces, the identification and classification [8].proved that the application of artificial intelligence technology in the field of traditional Chinese medicine can effectively realize the auxiliary evaluation of medicinal materials.

2.3 Application of Artificial Intelligence Technology to Assist TCM Diagnosis

Nowadays, the rapid development of artificial intelligence technology has opened up a new path for traditional Chinese medical diagnosis methods. It has become a new method of Chinese medicine diagnosis and treatment. And "Pulse diagnostic instrument", "Tongue diagnostic instrument", "Color diagnostic instrument", "Smell diagnostic instrument", "Meridian instrument" and so on have become new methods of traditional Chinese medicine diagnosis and treatment.

For example, Zhu P C and et al proposed the secondary combination for the purpose of artificial intelligence input, and constructed the syndrome database and tongue image factors to improve the accuracy of tongue diagnosis [10]. Sun MJ and et al proposed a traditional Chinese medicine assisted diagnosis and treatment system for RA based on artificial intelligence by learning the patient's medical record text and joint image data, we can judge RA and RA syndrome types, and assist some new doctors with insufficient experience to diagnose cases [10].

Artificial intelligence has independent diagnosis and treatment capabilities, and through big data learning, it can achieve a treatment effect that is very similar to that of traditional Chinese medicine experts. With the support of modern Chinese medicine diagnosis and treatment technology and its current big data, according to the case-based reasoning model, using human body information collection equipment and artificial intelligence technology to virtually build a Chinese medicine diagnosis and treatment platform, which can provide doctors with the knowledge, skills and measures needed for diagnosis and treatment. Then it can enlighten the thinking of doctors effectively and assist

doctors in diagnosis, this can successfully complete the informatization, digitization and standardization of TCM diagnosis and treatment technology, and also break the bottleneck that the TCM diagnosis and treatment model is highly subjective and lacks objective relevant data.

2.4 Using Artificial Intelligence Technology to Assist Traditional Chinese Medicine in Healthy Managing

Use artificial intelligence technology to develop a big data platform for traditional Chinese medicine health management, using aerodynamics, spectrum analysis, etc. [3]AI acoustic diagnosis can not only identify pathological sounds such as coughing, hoarseness, low voice, etc. [12]Researchers also use algorithms such as sample entropy and approximate entropy of wavelet packet transform to obtain the disease location through sound, disease syndrome elements and other diagnostic information [13]. Efficient human-machine dialogue can be achieved through these techniques. And through the combination of "data mining" method and "data analysis" method and data warehouse to process and analyze related information, According to each person's different physical situation to make scientific and reasonable health prescriptions, and provide individuality to individuals with different physiques. To achieve precise individual medical care.

3. The Difficulties Faced by the Application of Artificial Intelligence Technology in the Chinese Medicine Industry

3.1 Uncertainty of TCM Data

The analysis of a large amount of clinical data accumulated in the field of TCM medical treatment is considered to be the key and data core of the rapid development of TCM AI technology. At present, some research work is also organized and carried out on the basis of relevant data, but the biggest problem is the lack of standardization, fragmentation, uncontrollable quality and genetic diversity of TCM diagnosis and treatment data at this time. Yu X M believes that the process of mining uncontrollable data such as frequent pattern mining will also bring a series of uncertainties. These uncertainties continue to spread and accumulate in the mining process, which may lead to a large gap or even meaningless between the mined knowledge and the real results [14]. Therefore, it is still difficult to break away from the traditional TCM diagnosis and treatment. The hard comprehension of traditional Chinese medicine data, conventional statistical analysis methods and simple data mining technology are now difficult to meet the needs of contemporary information technology construction of traditional Chinese medicine. From this, it seems that artificial intelligence deep learning is applied in the implementation analysis and processing of big data which is not deep.

3.2 People's Concept of Traditional Chinese Medicine

The traditional diagnostic methods of TCM, such as "looking", "smelling", "asking", and "feel the pulse", are difficult to be mastered by normal students or practitioners, and are considered to be "metaphysical" that only a few people can master [15]. In addition, the current interdisciplinary academic research between modern technology (Artificial Intelligence) and traditional Chinese medicine is not in-depth, which makes it difficult for them to feel informatization and rigor in the learning process, Producing negative emotions such as fear and withdrawal. And this concept will greatly affect the inheritance and learning of traditional Chinese medicine.

3.3 Insufficient Related Infrastructure and Technology

The foundation of TCM informatization is unstable, related basic equipment is in short supply, and research funding is insufficient. At present, the methods mainly used in TCM is syndrome differentiation include association rules, Bayesian networks, artificial neural networks, and decision tree algorithms. Among them, artificial neural network is the most commonly used, but the above methods only use shallow algorithms to associate simply [16]. Moreover, unlike Western medicine, Chinese medicine not has a very clear molecular structure like it to analysis, so the non-standardization of medical terms will cause difficulties in the application of artificial intelligence technology in the Chinese medicine industry. Yin Z L proposed that the development of the "Internet

+ traditional Chinese medicine" industry in the emerging stage is mainly reflected in four major sectors: cloud computing, traditional Chinese medicine big data analysis, Internet of things and mobile Internet, and traditional Chinese medicine artificial intelligence. However, the optimal allocation of information resources is not good, which also greatly affects the development of the traditional Chinese medicine industry [17].

3.4 Lack of Relevant Talents

In the 21st century, there has a little shortage of researchers in the interdisciplinary fields of traditional Chinese medicine and artificial intelligence. Nowadays, there is a shortage of interdisciplinary researchers of traditional Chinese medicine and artificial intelligence in the 21st century. The main reason is that in today's fast-paced era, traditional Chinese medicine knowledge is broad so that will be more time-consuming and labor-consuming than western medicine to comprehend it, which result in most people choosing western medicine.

4. Outlook for the Future

The fact that the Chinese medicine industry can exist for thousands of years is due to its real and reliable clinical efficacy, which plays an irreplaceable role in the health of the human body's metabolism [17]. The application of artificial intelligence technology in the medical field has become the focus of attention, and artificial intelligence algorithms relying on a large amount of data can provide medical technology with a convenient and integrated method to complete tasks. And also Liu Y H and et al proposed the talent management and training policy of the new era to cultivate innovative talents with strong traditional Chinese medicine data analysis ability, and use the plan to improve the teaching level of the school and promote the scientific development of innovative education [19]. The application of artificial intelligence in the medical field not only brings about technological innovation, but also changes in the mode of diagnosis and treatment. Therefore, in the new round of scientific and technological revolution and industrial transformation, As the core driving force, artificial intelligence cloud computing shows new main characteristics, such as deep learning, integration, innovation, man-machine collaboration, and human-machine collaboration, which is more conducive to promoting the production ecology of traditional Chinese medicine [19].

5. Conclusion

To sum up, science is at the forefront of technology. Only when science is developed can technology be improved. Artificial intelligence technology and the medical diagnosis and treatment model are a perfect fit, but due to the difficulties caused by the above-mentioned problems, this is a new challenge for researchers, which requires us to propose new ideas and conduct research from different research angles, and conduct in-depth research. The analysis of AI is based on algorithms and models, so we should pay more attention to this aspect to break through the difficulties. In addition, in order to make Chinese medicine develop better, it is necessary to encourage more research on Chinese medicine from a macro level, such as the national level, increase research funding and set up relevant incentive policies to retain relevant talents. Like western medicine now has many research institutions, and the state has invested a lot. We should also increase the research investment in traditional Chinese medicine too. Only when breakthrough scientific achievements are produced can they be transformed into technology and the status and role of traditional Chinese medicine can be improved.

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