

중국의 딥러닝 기술 동향에 관한 연구

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A Study of the Trend of Deep Learning Technology of China

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ABSTRACT

In recent years, China has faced unprecedented intelligent reforms. Artificial intelligence has become a hot topic in society. The deep learning framework is the core of artificial intelligence industrialization, and it has also attracted the attention of all parties. Among them, deep learning has been applied in the fields of computer vision, speech recognition, and language technology processing. This paper will introduce China's development status and future challenges in technology, talent, and market applications.

키워드

Artificial Intelligence, Deep Learning, Application Scenario, Neural Network, Talent Development

I. Introduction

In recent years, thanks to the joint efforts of Chinese research institutions, universities, and enterprises, the number of papers in the field of artificial intelligence surpassed that of the United States in 2006. Since 2011, the number of papers is still increasing rapidly, which has pulled open the distance between China and the United States and has been the world's first for many years [1], which has aroused the attention of the world on China's artificial intelligence. At the same time, Chinese technology is moving out of the laboratory and into various field applications, promoting the leapfrog upgrading of traditional Chinese industries and increasing the number of patents in the field of artificial intelligence in China. Among them, the neural network has achieved good results in papers, patents, and related market applications, so it has been widely concerned and then regarded as the main power of the rise of artificial intelligence.

In recent years, in China, neural network-based deep learning technology has been applied in more and more industries. With the increase of data feedback in various fields, data support is more

accurate, and the processing speed of certain functions is on the machine. It is not uncommon to see things that transcend humanity. This has also led companies to participate in technical research seeking to reduce labor costs. Injudicious investment in the research is not advisable.

In this paper, We hope to make statistics on China's existing technological innovation, talent cultivation, and industry application status, sort out the problems encountered so far and provide some reference for deep learning and future research.

II. The present condition in Deep Learning Technology

The deep neural network presents a trend of deeper layers and more complex structures. In order to continuously improve the performance of deep neural networks, researchers continue to explore and improve and iterate deep learning models, making the functions of neural networks more and more abundant, and their learning effects are getting better and better. From the first generation of feed-forward neural networks to convolutional neural

networks to the field of personnel are very concerned about Generative Adversarial network, a transfer learning network, and capsule network, etc. China has many research results in this field, but there are few new innovative learning results in the design of new deep learning models. But recently, Professor of Nanjing University put forward the "deep forest" model, which is a breakthrough and innovative scientific research result rarely seen in China[2].

China's impression of the rest of the world is more about manufacturing capabilities than advanced technological innovation capabilities. In the past, China's achievements in chip development were rare. The study of chip also is different from the past. It is a major change in china today.

The Chinese government strongly supports and encourages enterprises and universities to develop chips, promotes the vigorous development of the market in this field, promotes the operational capability of computer systems, and accelerates the introduction of "deep learning" in various fields. Among them, the world's first "deep learning" "neural network" processor chip, known as "Cambrian" [3], released by China Institute of Computing Technology, the pioneering progress of China's processor instruction set, the ecological intelligence industry Provide technical support. In addition, China also has a number of independently developed chip capabilities and ambitious companies. For example, Baidu officially launched the self-developed super AI computing platform x-man 3.0, which is designed for deep learning scenarios and can execute 2000 trillion deep neural network operations per second [4]. Technology giant Alibaba is not to be outdone, but also announced that it is developing neural network chips ali-npu[5] and so on.

Another important factor in deep learning is the open source framework. The performance of Chinese companies is particularly prominent in this regard. Baidu was the first company to establish a deep learning institute in 2013, and in 2016 released the open source framework Paddle. It enables CPU/GPU independent and distributed mode and supports massive data training and hundreds of machine parallel operations for large-scale data training. Through high-quality GPU code, it provides five tasks such as neuro machine translation, recommendation, image classification, sentiment analysis, and semantic role tagging. Each task can be launched quickly, and most tasks can be applied directly. After that, Tencent's first open

source which is a deep learning framework, released ncnn[6] and PocketFlow [7]. Alibaba also launched X-Deep Learning [8]. In addition to the above-mentioned companies, there are many deep learning frameworks that China's technology companies are developing independently. Some companies even surpass Baidu, Tencent, and Alibaba in terms of deep learning framework.

III. Talent Development

In the context of current big data, supercomputers and deep learning integration, companies, research institutes and universities work closely together to develop and advance the advancement of deep learning and promote multidisciplinary talent participation in the field of deep learning. As an important base for talent training - Chinese Academy of Sciences, Tsinghua University, Xi'an University of Electronic Science and Technology, Nanjing University, Hunan University of Technology, etc., in-depth study "incorporating artificial intelligence into complex image perception, brain intelligence, video perception, photoelectric intelligent system, Hybrid enhanced intelligence, intelligent control, robotic systems, high-performance intelligent computing, etc., cultivate talents in related fields, and scientific research results are very good. In addition, the National Deep Learning Technology and Application National Engineering Laboratory and Baidu jointly launched Huangpu College - Deep Learning Architecture Teacher training program [9]. Second, in order to stimulate people's enthusiasm for learning, Baidu and Alibaba have held competitions.

IV. Application in Deep Learning Technology

The emergence of startups in the field of artificial intelligence in China is concentrated in 2012-2016. In 2015, there were 228 start-up companies. By 2018, China (excluding Hong Kong and Macau) has a total of 1,011 artificial intelligence companies, ranking second in the world[10]. These Chinese businesses value chain layouts focus on the technology and application layers, the technology layer (computer vision, natural semantic understanding, speech recognition, machine learning) and the application layer (vertical industry / precise scene). Among them, the image

classification technology based on deep convolution network has exceeded the accuracy of the human eye. Speech recognition technology based on a deep neural network has achieved 95% accuracy. Machine translation technology based on deep neural network is close to the average translation level of human beings[11].

Taking Baidu, Tencent, and Alibaba as examples, in order to promote the innovation and development of China's scientific and technological research results, the three companies set up research laboratories in the United States to improve their research capabilities. They have achieved important scientific research in open source frameworks, neurochips, academic papers and smart market patents (smart urban smart commerce, smart transportation, home community security), smart healthcare and smart driving. The research and development of the transportation system has been adopted by the Chinese government, and has achieved good scientific research results in the fields of medical care, autonomous driving, and agriculture, and has achieved breakthrough research results. China includes Baidu's deep learning algorithm FROC, which is used to identify breast cancer metastasis. In the initial test, the accuracy exceeded the accuracy of human pathologists [12]. Tencent and a laboratory at the University of California jointly published the results of this study, using deep learning to segment the head and neck tissue regions to help with targeted therapy, an achievement published in the international authoritative journal "Medical Physics" [13]. With the help of deep learning and neural network technology, Alibaba developed the "AI rumor shredder" with an accuracy rate of 81% [14]. The three companies are building an industry ecosystem based on cloud computing, big data and artificial intelligence technologies, which is the main direction of the industry's layout and promotes deep learning technology to integrate with all walks of life.

In addition, research institutions, universities, and enterprises are becoming more and more important in the field of artificial intelligence, and competition is becoming more and more fierce. Sogou, Tencent and Alibaba are all working with universities to establish relevant research institutions to promote the development of "deep learning". In order to achieve scientific research results, for example, in 2018, Gaode Map Technology Co., Ltd. and Tsinghua University launched a traffic prediction system [15]. At the same time, in

addition to participating in various deep learning competitions, the research results of college students are also worthy of attention. For example, Students at Wuhan University use deep learning to develop robots that play Tai Chi, dance[16], etc.

V. Existing Problems In The Application and Future Directions

At present, China uses "big data + deep learning" to promote the development of artificial intelligence in China, but deep learning has not yet reached the level of the United States in many fields such as algorithms and chips. As the company applies more in-depth learning to more and more scenarios, deep learning exposes more and more problems. From the perspective of current enterprise applications, deep learning still cannot accurately understand natural language, emotions and emotions. Secondly, the current deep learning does not have the ability of memory and recall, multi-step reasoning and creativity, and the application scenarios in deep learning are too single, facing the inability to meet different needs in various fields and industries. Second, as Chinese users become more aware of data privacy, how to protect user privacy data becomes an important challenge.

But with 5G in the future, cloud computing, chain blocks, VR (AR), joint learning technology and the development and improvement of new hardware equipment, as well as the algorithm and model under the heavy investment in manpower and material resources to update iteration, deep learning technology will bring great impact to Chinese enterprises and reform, and promote deep learning from memory to multi-step reasoning, memory, innovative thinking direction. On the basis of gradually forming a perfect industrial chain covering computing chips, open source platforms, product safety and other links, China has gradually promoted new industries such as "unmanned coffee shop", "unmanned gymnasium" and "unmanned economy", and developed towards solving the individualized needs of enterprises.

VI. Conclusion

This paper was summarized the current status of deep learning in China's technology application, talent, and market, and describes the problems and future prospects of deep learning in various fields

from the perspective of the market application. First of all, China's current scientific research results mainly come from universities, enterprises, scientific research institutions and so on. People in related fields pay more attention to deep learning, Generative Adversarial Networks, Transfer Learning, and capsule networks. China has few scientific research achievements in this area. There is fierce competition in the field of deep learning frameworks and chips, and many products are developed by technology companies and universities. Secondly, in terms of deep learning talent cultivation, in addition to relevant majors and colleges set up by colleges and universities, enterprises not only set up colleges but also enter colleges and universities to cultivate talents together with colleges and universities. Thirdly, China's in-depth study has been integrated into all walks of life, And stimulate the development of new industries. Since China's deep learning technology is still in its infancy, there are many problems in the application process, such as the inability to meet the individual needs of the enterprise, the protection of user privacy data and the inability to truly understand language and emotions. Therefore, in the future, deep learning will combine blockchain, VR (AR) and joint learning technologies with new hardware devices to jointly address the different individual needs of enterprises and governments.

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