Block Chain Financial Transaction Using Artificial Neural Network Deep Learning

Bowen Zhao¹*, Runyu Wang², Yan Cai³, Enyu Zhao⁴

¹School of Computer Science and Engineering, University of New South Wales, Sydney, 2052, Australia
²Antai College of Economics & Management, Shanghai Jiao Tong University, Shanghai, 200000, China
³School of Economics, Fudan University, Shanghai, 200433, China
⁴School of Economics, Renmin university of China, Beijing, 100872, China

*Corresponding author: Bowen Zhao, e-mail: bowen.zhao@unswalumni.com

Abstract. In order to adapt to the rapid development of the trading market in the financial industry under the condition of artificial intelligence and solve the unstable problem of capital loss in the process of financial transactions, in this study, firstly, the concept and principle of block chain are summarized, and the problems that block chain can solve are analyzed in an all-round way. Secondly, the concepts and computational principles of artificial neural network and deep learning are analyzed, and they are integrated into block chains for artificial intelligence payment. Finally, the block chain, which integrates artificial neural network and deep learning, is applied to the financial market. The results show that block chains can make use of decentralized networks to simulate virtual consumer payments, and can be used in many financial fields. They can track and check information and prevent goods from being tampered with in the logistics process. Artificial neural network (ANN) can imitate the human brain to process and calculate the captured data by using neurons in both forward and reverse transmission modes. Deep learning can process and recognize graphics and language information by means of computer network. After updating the artificial neural network and the block chain of deep learning, all kinds of transaction needs can be met through appropriate calculation methods, so as to accurately grasp the trading situation of financial market and provide the standard data of artificial intelligence to customers. This shows that the block chain which integrates artificial neural network and deep learning plays a decisive role in financial transactions, can bring huge potential benefits to the financial industry, and make the financial transaction market develop steadily under huge competitive pressure.

1. Introduction
With the rapid development of science and technology, computer networks have been used in various industries. Block chain is a newly emerging network technology, which has the characteristics of common recognition mechanism and secret computing [1], and has been widely used in various industries. Since the reform and opening up, China has always emphasized the rejuvenation of the country by science and technology, and in 2015 launched a plan to use the Internet to reform traditional industries [2]. After the Davos Forum in 2016, China has already implemented the economic
transformation plan and made clear the consensus of using science and technology to promote economic development.

After years of development, artificial intelligence has been widely used all over the world, and artificial neural network and deep learning network technology [3] as the frontier technology of science has been used in various fields. Artificial neural networks and deep learning are also indispensable to the development of new financial transactions, and they have attracted great attention all over the world. By 2016, there are more than 7,000 financial trading enterprises based on deep learning, including block chains, financing transactions, large data analysis and network data security modules [4]. Current financial transactions have changed from passive resistance to active innovation.

In this study, the principle and application scope of block chain technology at the present stage are elaborated, and the concepts, principles and application fields of artificial neural network and deep learning are analyzed. The application of artificial neural network and deep learning to block chain technology in financial transactions provides a creative method for the development of the financial industry, which can enhance the competitiveness and core value of the financial industry, and has practical feasibility.

2. Block chain technology

2.1. Concept and principle of block chain technology

Firstly, the concept of block chain technology refers to the consumption payment model which uses decentralized network to simulate virtual consumption.

Decentralized network [5] refers to the integration of each scattered point in the same network, the sharing of data and information, and then the related calculation and statistics for the network. Each scattering point is relatively fair. It can input data information to the network and obtain data information transmitted from other scattering points at the same time. Therefore, decentralized networks are also called "mutual justice networks" [6]. The optimal feature of decentralized networks is that even if any decentralized point is destroyed, the integrity of the network will be maintained and the network will work normally without any influence. Only when all the scattered points of the network are destroyed can it be in danger. The decentralized network structure is shown in the following figure:

![Decentralized network architecture](image)

Figure 1. Decentralized network architecture

Secondly, the design of block chain technology is based on the fact that there are many information modules with time stamp in the chain. Each information module has time difference between before and after, and is constrained by Hash value [7]. Bitcoin is used as an incentive in the labor process, using algorithms given by customers to prove and describe payment to shared accounts. Bitcoin [8] realizes the conversion of payment function and no longer requires secondary payment. Before the block-chain
payment function appears, digital capital circulation needs supervision and management, so there must be a third supervision unit, namely secondary payment [9]. However, nowadays, block chain payment can share resources face to face, and the degree of confidentiality is very high. The combination of public key and personal key greatly enhances the security of block chain payment. The two-way encrypted fund holders are recorded in the block chain record book, which must be kept confidential and the users who have reached a common agreement can pass through. Each scattered point is connected through a special network, so users can check in the block browser.

Block chain is essentially a task checking reaction chain, that is, a sequential and indestructible accounting book. Without the central characteristics, block chains can be used not only for financial transactions, but also for recording all the content that customers need to record. The only requirement is that the contents to be recorded can be represented by symbols. The contents of these records are transaction records from one place to another, including transaction vouchers, which are appended to the notebook. Next, these credentials are evaluated by block chains. Only credentials included in the identified block links can be stored and cannot be broken or changed. The working steps of the block chain are as follows:

The workflow between the scattered points in the block chain is as follows. Firstly, when financial payment is generated, the content of the payment will be distributed to each network. Each decentralized point stores and integrates the accepted payment content. Secondly, each dispersed point can analyze the data at the same time and get the opportunity to build block chains. After the establishment of qualified block chains, the collected data are dispersed throughout the network. Finally, each block chain is connected at the end to obtain a complete block chain. In this whole process, there is no need to verify the steps, nor need third-party supervision. The only need is a complete reputation network and consensus.

2.2. The application field of block chain technology
At present, block chain technology is highly valued in various fields. Beijing, Shanghai, Shenzhen and other regions [10] include block chain technology in the scope of financial transactions, and highly integrate it with the offline economy. China also includes it in the 13th Five-Year Plan in 2016. The application fields of block chains in China are shown in the following table:

| Practical application | Bank |
|-----------------------|------|
| Combination of credit transaction and block chain technology | CITIC |
| Combination of credit reporting and block chain technology | Ping an insurance |
| Combination of foreign trade and block chain technology | China merchants bank |
| Combination of account arrangement and block chain technology | Weizhong |

At present, the application of block chain technology in China includes many industries. There are more than fifty A-share listed industries, and more than half of them are in the network field, which means that block chain technology itself has a deep connection with computer networks. Block chain technology is listed in A-share companies as follows:
2.3. Problems solved by block chain in financial transactions

The first is the innovation in tracking and checking information. Through the integration of regional chain technology, all data in handover and payment can be more effectively and publicly entered. At the same time, under the supervision of common participants, the security and stability of data can be ensured, thus ensuring the integrity of logistics data.

The second is to prevent goods from being tampered with in the process of logistics. Block chain technology is integrated into the whole flow process of cargo data, which can understand the output and input information of each link in the whole process in real time, and can effectively prevent cargo tampering on the basis of grasping the actual data. For example, in the process of mobile phone transportation, all the cargo code circulation data should be mastered and recorded, in order to prevent problems in the cargo need to recall, so as to be more flexible. Block chain technology can be used to grasp logistics information at any time to meet the various requirements of customers.

3. Application of artificial neural network and deep learning in block chain

3.1. Artificial neural network

First, the human brain can analyze the captured data and store the information it needs in the brain. Artificial Neural Network (ANN) is a computational model, which uses the information collected in the network as a basis and imitates the human brain for data processing. ANN consists of innumerable neurons. Its import layer receives data and then transmits it to the next level. The data is analyzed and calculated step by step. In the 1990s, scientists added BP algorithm to the artificial neural network, so that the problem of computing mode appeared in the calculation process of the network can be solved smoothly. After that, the ANN develops rapidly. Nowadays, ANN has created many mesh models, the most representative of which is BP neural network.

Secondly, the basic unit of ANN is neuron, which has many import windows, but only one export window. After a series of training and data analysis, the information is finally calculated to 0 or 1 of the exported data, so that the information can be summarized. The neurons are shown in the following figure:

![Figure 3. Number of A-share listed companies combined with blockchain](image_url)
Among them, N1, N2 and N3 represent imported values, m represents weights, a represent paranoid and computational functions, and b represent derived values.

Finally, the calculation of data between neurons is divided into forward transmission calculation and reverse transmission calculation, and finally the derived value is obtained.

3.2. Deep learning
Computer network is widely used in deep learning. Its tasks can be divided into graph recognition, purpose verification, language meaning analysis and so on.

Firstly, graphics recognition is mainly based on the meaning of graphics response to identify graphics, generally there is a series of stable coding. It is difficult to derive the encoding that corresponds to this figure by the way of calculation in computer. After years of research, scientists have successfully solved the problems encountered in graph classification in the field of deep learning and computing.

Secondly, the purpose of verification is to find the specified types of voice content in digital graphics and videos. The process covers both purpose identification and classification. The most representative method of purpose verification is RNCC method, which marks many small blocks on the alternative graph. Next, these blocks are marked and summarized, and finally the orientation of the figure that needs to be distinguished is obtained.

Finally, the analysis of linguistic meaning is to change the original imported graphics into representative blocks, and classify all the materials into different categories and mark them, that is, to identify the same type of blocks on the premise of linguistic meaning analysis.

3.3. Application of block chain combining artificial neural network and deep learning in financial transaction
With the development of financial industry and science and technology industry, the whole world is paying attention to the integration of academic achievements and actual financial transactions. Block chains and artificial intelligence have become the focus of current research. Artificial intelligence includes the use of artificial neural networks and deep learning.

Firstly, the block chains of artificial neural networks and deep learning are updated by choosing appropriate calculation methods to meet the needs of each transaction. In this study, the basic configuration of the computer is optimized by using conventional computing, deep learning to identify blocks, and self-updated neural network computing methods. Finally, the information bank is enriched by self-input and self-update.

The method of calculation and fusion under the condition of deep learning calculation and monitoring is used to remove some noise caused by monitoring, and finally a quantization network W with large influence for deep learning parameters is formed. The internal learning criteria are W1 and W2, respectively.

As far as the W1 learning rules are concerned, if the data imported and exported are:

\[ \{m_1, n_1\}, \{m_2, n_2\}, \ldots, \{m_N, n_N\} \] (1)

The above equation can be expressed as follows:
In the equation, QV1,1 denotes the weight matrix, l denotes the input data, and q denotes the number of weight matrices.

W2 learning rules are used after W1 to ensure the accuracy of calculation results. The calculation method is as follows:

\[
q \ast QV^{1,1}(l) = q \ast QV^{1,1}(l-1) - \varphi(a(l) - q \ast QV^{1,1}(l-1))
\]  

(2)

In conclusion, the principle of using artificial neural network and deep learning block chain computing model in financial transactions is horizontal reverse transmission method.

Finally, the ANN and deep learning block chain model are applied to financial transactions. For example, in the insurance industry, investment industry, etc., after the input of a pre-established calculation model, artificial nerve simulation calculation begins. Each error parameter can be identified by the model. Then noise elimination is adopted to assimilate and improve the accuracy of the differences between block chains. In view of the differences among the blocks in the network, cluster analysis can be used to verify the differences and connections between the blocks, and ultimately complete the accurate calculation. For the insurance industry, the trading situation of the financial market can be accurately grasped and the standard data of artificial intelligence can be provided to customers.

4. Conclusion

Block chain is a skill and a creative service. Block chains based on ANN and deep learning can not only provide intelligent contracts for financial transactions, intelligent management of property and funds, but also enhance the transparency of financial funds circulation, making financial transactions stable and safe.

In this study, the use of block chains in financial transactions is proposed, including tracking and checking information and preventing goods from being tampered with in the logistics process. At the same time, a block chain based on artificial neural network and deep learning is proposed, which can improve the stability and security of capital flow in financial transactions, and enable the financial industry to improve its own value and core competitiveness. The block chain, which integrates ANN and deep learning, has strong practicability in the future trading process of the financial industry.

References

[1] Yao Q H, Xiao X. White Paper on the Development of Insurance Science and Technology in China. China Insurance Science and Technology Laboratory, Fudan University, 2017, (14), pp. 87-99.

[2] Xiao X. Block Chain and Insurance Innovation: Mechanisms, Prospects and Challenges. Insurance Research, 2017, (05), pp. 43-52.

[3] Yao X D, Ke F. Innovation and Limitation of Block Chain Technology Application Sexual Thinking. Rural Financial Research, 2016, (12), pp. 12-17.

[4] Yong Y, Wang F Y. Development Status and Prospect of Block Chain Technology. Kinetic Chemistry, 2016, (4), pp. 482-493.

[5] Jian Z. Block Chain: Defining the New Financial and Economic Pattern in the Future. Beijing:
Machinery Industry Press, 2016, (08), pp. 15-28.

[6] Fu K L, Hui L, Xia Z. BP neural network prediction model and its application. Information and Computer (theoretical version), 2016, (11), pp. 47-48.

[7] Si W. Design and Application of Discount Rate in Enterprise Value Assessment Based on BP Neural Network. University, 2015, (09), pp. 110-120.

[8] HeD, Chen H M, Li Z S. Digital Recognition Based on Convolutional Neural Network. Journal of Guizhou Normal University (Nature)Science Edition, 2017, (05), pp. 100-105.

[9] Wang Y S, Yao H X, Sun X S, Xu Pengfei and Zhao Sicheng. Study on the expressive ability of self-encoder in deep learning. Computer Science, 2015, 42 (09), pp. 56-65.

[10] Qian L. Image Recognition Based on Deep Belief Network and Its Application. 2016, (09), pp. 101-109.