Neural Network in Internet Financial Services

Zhaoyang Wu[*]

Qinghai Normal University, Qinghai, China

75666145@qq.com

[*]*corresponding author*

Abstract: The rapid growth of Internet finance has brought a huge impact on traditional financial institutions, as well as commercial banks. This paper analyzes and discusses the problems in the application of network in financial services and solutions. First, it describes the overview of neural network technology, artificial intelligence and other related theories. Then, it illustrates the relationship between neural network pattern recognition ability and model parameters based on different classification methods through examples. It introduces the use of Matlab software to establish neural network mathematical model and carry out data collection and processing. Finally, through a questionnaire survey, the application of neural network algorithms in Internet financial services was investigated. The survey results showed that online banking was the most widely used neural network algorithms in the Internet financial services industry, accounting for 47%, followed by online lending, accounting for 31%, and third-party payment, accounting for 22%.

1. Introduction

With the popularity of the Internet, people have a new understanding of the Internet. It has become a trend to use computers, smartphones and other devices for entertainment in daily life [1-2]. However, we are now facing a very big, complex and difficult problem - information security. At present, in many fields in China, there are a lot of potential risks such as virus attacks and hacker attacks. At the same time, due to the immature growth of computer technology and the lack of effective management measures, network vulnerabilities are increasing, which also pose a great threat and challenge to Internet financial services [3-4].

The application of neural networks in financial services has become more and more extensive, and scholars at home and abroad have conducted a lot of research in this area. Foreign scholars put more emphasis on putting forward new ideas from the perspective of computers and mobile communication networks, and through the discussion and research of these theories, they have

come up with solutions suitable for the national conditions, etc. [5-6]. The academic circles in China mainly focus on the problems faced by the growth of the financial industry in the Internet era. Some domestic experts believe that modern information technology should be used to improve the combination of traditional financial industry and emerging technologies, such as how to improve customer satisfaction and reduce enterprise operating costs. Some scholars use artificial neurons to simulate human brain function system to predict financial market risk. Other scholars use wavelet theory to build models to solve practical problems. Some scholars have made a series of research results, such as the construction of neural network applications and the application of computers in financial services, which indicate that China still has a lot of room for growth in the Internet field [7-8]. Some scholars put forward countermeasures and suggestions for the growth status and existing problems of China's commercial banks. Some scholars believe that the establishment of Internet technology based micro loan company network model innovation model. Therefore, based on neural network algorithm, this paper studies its application in Internet financial services.

Internet finance refers to a new business model based on the network and through information technology, which combines traditional financial institutions with modern emerging technologies. Compared with traditional banks, securities companies and other industries, it has obvious advantages. First, it breaks the time limit. Second, it has low cost and high efficiency. Third, information processing is convenient and accurate. In the age of BD, people tend to use the network for analysis and research when obtaining a large number of transaction records and related financial reports, and draw conclusions, which provides a new way and method to use neural network technology in financial services.

2. Discussion on Neural Network in Internet Financial Services

2.1. Internet Financial Services

Internet finance refers to that traditional financial institutions and emerging Internet companies use modern communication technology and information technology to provide credit evaluation, financial consulting and other services, realizing direct or indirect financing between capital suppliers and demanders, and financial financing, payment, information intermediary and other business transactions and related activities are generated and finally integrated [9-10]. For example, mobile communication, search engine, etc., through the analysis and processing of BD, realize the direct transaction between the capital supply and demand sides and the integration of payment and clearing to complete the financing. At present, China has formed an online lending platform represented by Alipay, a supply chain network and a P2P model as the main forms, and a third-party intermediary agency carries out investment and financial management operations for investors. People gradually realize the huge benefits brought by the emerging industry of "going to the bank". Under the "win-win" strategy, it has accelerated the process of economic globalization, changed the way of social production and life, and optimized the industrial structure, thus promoting the progress and innovative growth of the whole world [11-12].

2.2. Types of Internet Finance

The types of Internet finance can be divided from different perspectives. According to the technical characteristics of the Internet, it can be divided into three categories: online lending, online banking and third-party payment, as shown in Figure 1.
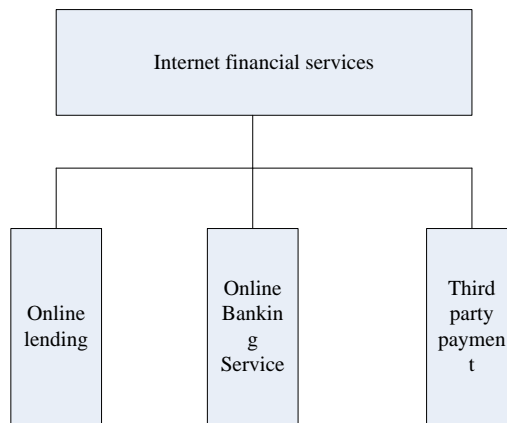
Figure 1. Type of Internet financial services

(1) Network lending refers to a new form of financing, also known as "e-commerce", which is a new way to solve the problem of capital and finance communication under the condition of information asymmetry by means of modern electronic information technology. It includes taking credit intermediary, capital supply and demand as the main purpose and relying on Internet technology as the basis. Under this mode, banks and financial institutions can directly realize information exchange between capital suppliers and demanders through the network platform. For consumers, they need a third party to complete the loan application and repayment. The second is the P2P online loan business developed through the cooperation between online financing service websites and financial supermarkets. This is a new business operation model that uses the Internet as a medium for trading activities [13-14].

(2) Online banking refers to digital electronic services provided through the Internet. In the transaction process, both parties can complete various businesses without face-to-face. Now people use computers, mobile phones, telephones and other electronic devices to transmit information without spending too much money to buy these products. Therefore, online shopping is becoming more and more popular and has become one of the trendy consumption methods. However, it only changes the impact of traditional payment methods on e-commerce to some extent, but it is realized through electronic services. Therefore, electronic payment is of great significance in today's society [15-16].

(3) Third party payment refers to the agreement signed by an enterprise with certain strength and reputation guarantee after both parties reach a consensus. At present, electronic cash and mobile banking are the most commonly used methods to settle funds in China; In addition, the popular "Bitcoin" and "Future Online Banking" are common and diversified Internet financial products. By signing with the bank and using the e-commerce platform, both parties reach an online payment and fund transfer settlement service agreement. Third party payment is a new financial model jointly established by several e-wallet suppliers. It has the characteristics of low cost and high convenience.

2.3. Neural Network Algorithm

There are many kinds of neural network algorithms, the simplest of which is BP layer direct training and error prediction. BP artificial neurons get the weights one by one from the input layer and adjust them continuously. A new phenomenon has been formed through continuous learning and training. When the input signal strength is large, multi-point decision algorithm can be used [17-18]. A hidden layer (also called weight criterion) is introduced into the application layer to solve the nonlinear problem. If the output result is correct when compared with the actual value, the network is called an error system. In the whole data processing process, the output results can be

judged or estimated without any external signal interference or human intervention. For a large number of complex problems, the calculation ability and learning ability need to be realized through the method of multi-layer neural network, so as to obtain more accurate and reliable information. The most important method in information theory is to select a suitable sample as the input parameter for training, and in data processing, the weight value between any two neurons can also be used to determine the impact of each factor in the optimal combination scheme on the final result and the optimal decision coefficient. This method can fully reflect the internal characteristics and external environment of the system, so it is widely used in data mining, algorithm optimization, machine learning and other fields. Figure 2 shows the principle of neuron composition.
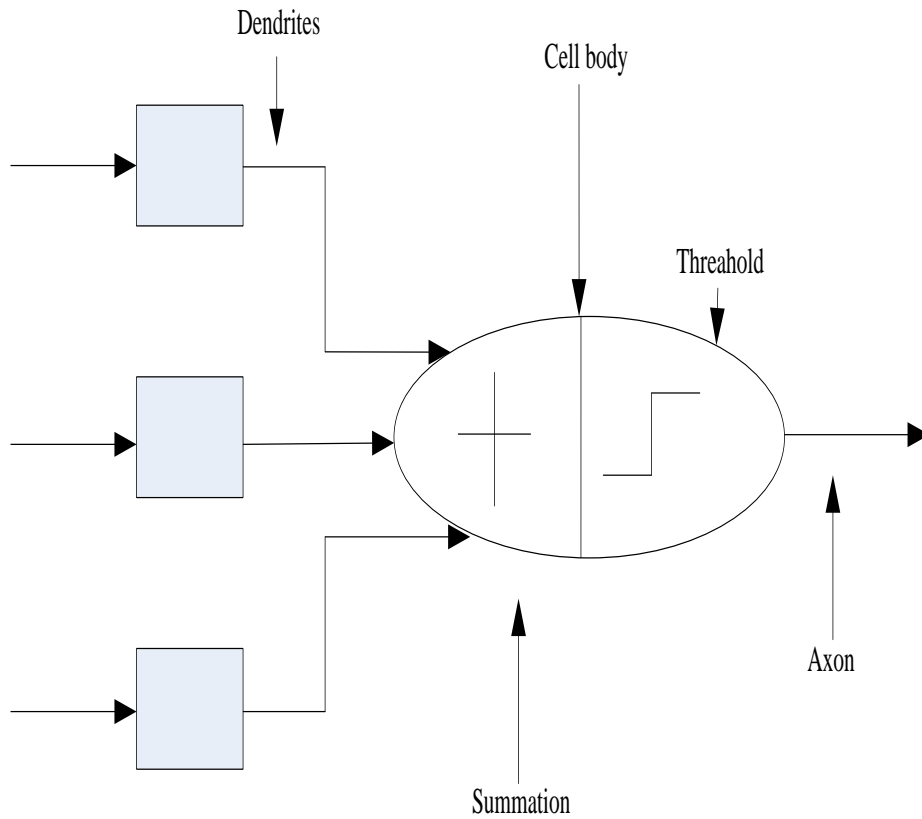

Figure 2. Neuronal composition principle

Input vector of artificial neuron:

$$P = [P_1, P_2, P_3, \ldots, P_r]^2 \tag{1}$$

Weight vector of neuron:

$$W = [W_{1,1}, W_{1,2}, W_{1,3}, \ldots, W_{1,R}]^2 \tag{2}$$

The neuron has an offset value b, which is accumulated with the weighted sum of all inputs to form a net input n:

$$N = W_{1,1}P_1 + W_{1,2}P_2 + W_{1,3}P_3 + \ldots + W_{1,RPR} + B \tag{3}$$
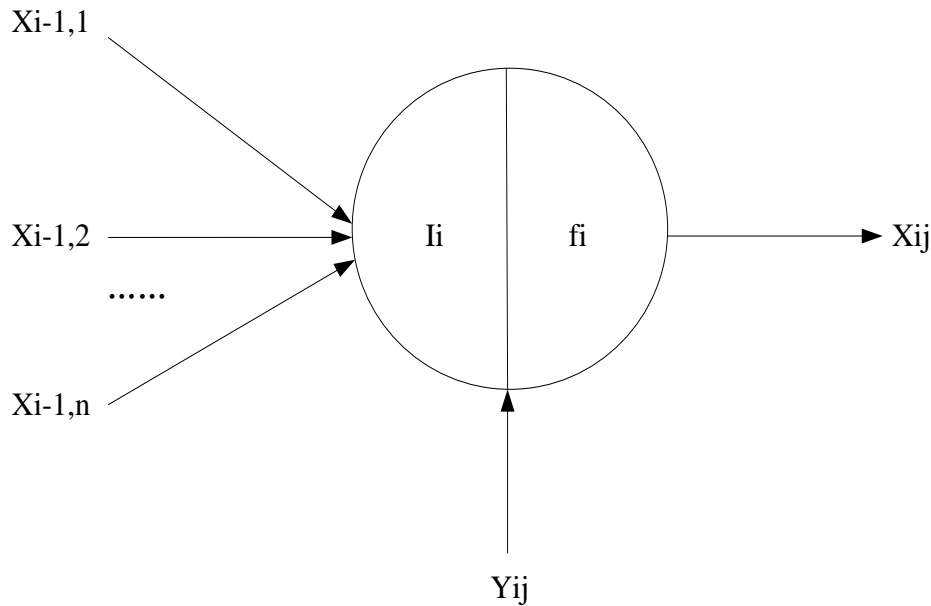
Figure 3. Neuronal mathematical models

The essence of neural network is to imitate the information processing process of human brain, and use these perceptions to learn and understand. The application of neural algorithms in Internet financial services can realize the classification, identification and prediction of data. Select different types of sample points to divide them into several groups, calculate the number of neuron nodes in each training set corresponding to the sample set according to the characteristic parameters, and then obtain a representative network model (as shown in Figure 3). According to the training process, a group of weight vectors and output weights can be automatically determined for decision analysis.

3. Investigation process of Neural Network Application in Internet Financial Services

3.1. Investigation Purpose

Neural network has been widely used in our life, including intelligence, information processing technology and so on. The neural network can effectively meet these needs is one of the best means to solve this problem. Therefore, this paper mainly puts forward relevant suggestions for the traditional financial service field to apply modern science and technology to achieve personalized customized products for customer groups and improve service quality, it can provide theoretical support and technical assistance for China's commercial banks to better complete their business on the basis of making good use of modern information technology.

3.2. Investigation Content

In view of the problems and deficiencies in Internet financial services, we conducted a questionnaire survey to understand the application of neural network algorithms in Internet financial services. However, individual users and corporate customers may have different characteristics, such as high dependence and stable use habits when using Internet platforms. The second problem is data processing and analysis. Because the growth of neural network is not perfect, the number of

samples needs to be adjusted.

3.3. Investigation Methods

The survey method of this paper is to collect relevant information through questionnaire survey and research through reading network resources, consulting experts and scholars. First of all, the neural network theory and the application technology of hierarchical classification model are introduced. It includes conceptual framework and neural tree structure based on neural algorithm. The system uses support vector machine as a tool to achieve different types of problems in the process of classification ability training. Through learning and combining with a large number of data analyses, it draws conclusions. Finally, it is applied to network pattern recognition, feature extraction and decision support services.
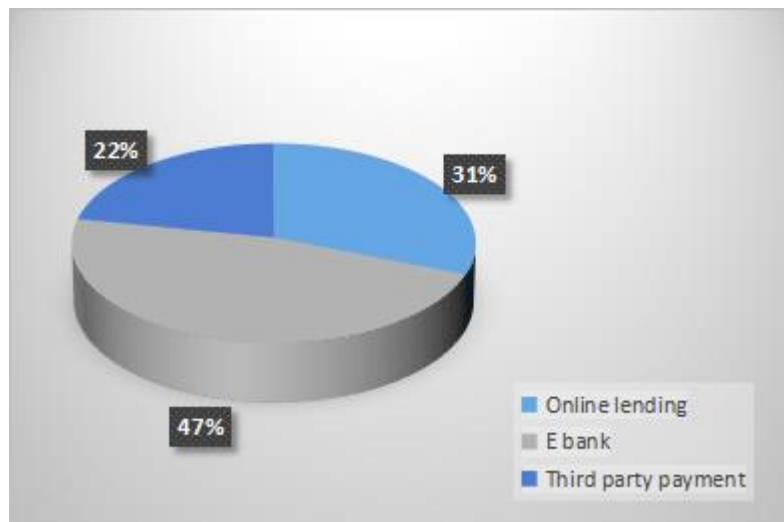
4. Investigation and Analysis on Neural Network Application in Internet Financial Services

4.1. Application of Neural Network in Internet Financial Services

Table 1 shows the application data of neural networks in Internet financial services.

Table 1. Application scenario of neural network in Internet financial services

Internet finance application field	Online lending	E bank	Third party payment
The proportion of situation	31%	47%	22%

Figure 4. The use of neural network algorithm in the Internet finance industry

At present, the application of neural network in Internet financial services mainly focuses on the following aspects. First, use artificial neurons to process and analyze data. Through the use of neural network technology, information collection, storage and classification can be achieved. The second is to establish a model to simulate the construction process and process of human brain functional structure and computer simulation capability. Finally, the neural network system is used to simulate the building results of human brain thinking mode and the operation level of computer simulation, so as to achieve the purpose of intelligent application in artificial intelligence research. It can be seen from Figure 4 that online banking accounts for 47%, online lending accounts for 31%,

and third-party payment accounts for 22%, with the most neural network algorithms used in the Internet financial service industry.

5. Conclusion

With the rapid growth of the Internet, more and more people have access to the Internet, which has become a new way of financial services. However, due to many problems and imperfections in the practical application of neural network, there are many deficiencies in its service that need to be improved. This paper introduces the advantages and characteristics between neural network and traditional finance, analyzes the use of Matlab to simulate the data processing of financial services and establish a model to draw conclusions, and finally puts forward suggestions to improve the problems and defects in the application of network technology for the online store to solve the challenges faced by Internet enterprises by using modern scientific and technological means.

Funding

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Quan H, Srinivasan D, Khosravi A. Short-Term Load and Wind Power Forecasting Using Neural Network-Based Prediction Intervals. IEEE Transactions on Neural Networks & Learning Systems, 2017, 25(2):303-315. https://doi.org/10.1109/TNNLS.2013.2276053

[2] Feng X, Qin B, Liu T. A language-independent neural network for event detection. Sciece China. Information Sciences, 2018, 61(09):81-92. https://doi.org/10.1007/s11432-017-9359-x

[3] Kruthiventi S, Ayush K, Babu R V. DeepFix: A Fully Convolutional Neural Network for Predicting Human Eye Fixations. IEEE Transactions on Image Processing, 2017, 26(9):4446-4456. https://doi.org/10.1109/TIP.2017.2710620

[4] Kahng M, Andrews P Y, Kalro A, et al. ActiVis: Visual Exploration of Industry-Scale Deep Neural Network Models. IEEE Transactions on Visualization & Computer Graphics, 2018, PP(99):1-1. https://doi.org/10.1109/TVCG.2017.2744718

[5] Ao R, Zhe L, Ding C, et al. SC-DCNN: Highly-Scalable Deep Convolutional Neural Network using Stochastic Computing. ACM SIGARCH Computer Architecture News, 2017, 45(1):405-418. https://doi.org/10.1145/3093337.3037746

[6] Yan C, Xie H, Yang D, et al. Supervised Hash Coding With Deep Neural Network for Environment Perception of Intelligent Vehicles. IEEE Transactions on Intelligent Transportation Systems, 2017, 19(99):284-295. https://doi.org/10.1109/TITS.2017.2749965

[7] Kang D, Emmons J, Abuzaid F, et al. NoScope: optimizing neural network queries over video at scale. Proceedings of the VLDB Endowment, 2017, 10(11):1586-1597. https://doi.org/10.14778/3137628.3137664

[8] *Chatterjee S, Sarkar S, Hore S, et al. Particle swarm optimization trained neural network for structural failure prediction of multistoried RC buildings. Neural Computing & Applications, 2017, 28(8):2005-2016. https://doi.org/10.1007/s00521-016-2190-2*

[9] *Acharya U R, Fujita H, Lih O S, et al. Automated detection of coronary artery disease using different durations of ECG segments with convolutional neural network. Knowledge-Based Systems, 2017, 132(sep.15):62-71. https://doi.org/10.1016/j.knosys.2017.06.003*

[10] *Bangalore P, Tjernberg L B. An Artificial Neural Network Approach for Early Fault Detection of Gearbox Bearings. IEEE Transactions on Smart Grid, 2017, 6(2):980-987. https://doi.org/10.1109/TSG.2014.2386305*

[11] *Hodo E, Bellekens X, Hamilton A, et al. Threat analysis of IoT networks Using Artificial Neural Network Intrusion Detection System. tetrahedron letters, 2017, 42(39):6865-6867.*

[12] *Meng H, Bianchi-Berthouze N, Deng Y, et al. Time-Delay Neural Network for Continuous Emotional Dimension Prediction From Facial Expression Sequences. IEEE Transactions on Cybernetics, 2017, 46(4):916-929. https://doi.org/10.1109/TCYB.2015.2418092*

[13] *Afram A, Janabi-Sharifi F, Fung A S, et al. Artificial neural network (ANN) based model predictive control (MPC) and optimization of HVAC systems: A state of the art review and case study of a residential HVAC system. Energy & Buildings, 2017, 141(APR.):96-113. https://doi.org/10.1016/j.enbuild.2017.02.012*

[14] *Paoletti M E, Haut J M, Plaza J, et al. A new deep convolutional neural network for fast hyperspectral image classification. Isprs Journal of Photogrammetry & Remote Sensing, 2017, 145PA(NOV.):120-147. https://doi.org/10.1016/j.isprsjprs.2017.11.021*

[15] *Evo I, Avramovi A. Convolutional Neural Network Based Automatic Object Detection on Aerial Images. IEEE Geoscience & Remote Sensing Letters, 2017, 13(5):740-744. https://doi.org/10.1109/LGRS.2016.2542358*

[16] *Haenssle H A, Fink C, Schneiderbauer R, et al. Man against machine: diagnostic performance of a deep learning convolutional neural network for dermoscopic melanoma recognition in comparison to 58 dermatologists. Annals of Oncology, 2018, 29(8):1836-1842.*

[17] *Sujata Joshi, Sanjay Bhatia, Kiran Raikar, Harmanpreet Pall:Customer experience and associated customer behaviour in end user devices and technologies (smartphones, mobile internet, mobile financial services). Int. High Perform. Comput. Netw. 2017, 10(1/2): 118-126. https://doi.org/10.1504/IJHPCN.2017.083209*

[18] *Anastasia Iskhakova, Daniyar Volf, Roman V. Meshcheryakov:Method for Reducing the Feature Space Dimension in Speech Emotion Recognition Using Convolutional Neural Networks. Autom. Remote. Control. 2022, 83(6): 857-868. https://doi.org/10.1134/S0005117922060042*