ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

Application of Computer Technology in Legal Finance for Applied Economics Majors

Mingguang Yao[1,2,a,*]

[1]*School of Economics, Shanghai University, Shanghai, 200444, China*
[2]*School of Tourism & Leisure Management, Shanghai Institute of Tourism, Shanghai, 201418, China*
[a]*yaomingguang2023@163.com*
[*]*Corresponding author*

Abstract: *The application of computer technology in applied economics, law, finance and other majors has become a trend. This article aimed to study the application of computer technology in legal finance for applied economics majors. This article used neural network structure design to study and analyze the prediction of computer technology for economic and financial majors. The experimental results in this paper showed that when the error of the test sample set continued to decrease 5 times, the training of the network was stopped. At this time, the network training accuracy and generalization ability could be well balanced. The first and sixth predicted points had a significant deviation from the actual value, and the prediction of the actual value at other points was within the error range of 10%. Computer technology became increasingly accurate in predicting economic data.*

Keywords: *Legal Finance, Computer Technology, Applied Economics, Economic Management, Neural Networks*

1. Introduction

With the development of China's economy and society, people are increasingly paying attention to computer technology, and its application is also increasingly widespread. As a new technology, computer technology plays an important role in modern society. At the same time, with the rapid development of China's market economy, the stock market is also gradually improving, and more and more investors hope to make profits in the stock market. However, the stock market is a very complex market, which is influenced not only by the local economy, politics, psychology, and other aspects, but also by the world economy, politics, and other aspects. Moreover, they interact with each other in a very complex way. Therefore, through careful analysis of the stock market and the use of computer technology, a relatively stable and accurate stock market forecasting model can be established. For this reason, many scholars have conducted research on computer technology.

Based on existing research results, various scholars have conducted relevant research in legal finance. Qian Z. applied computer algorithms to suppliers of agricultural products, and introduced agricultural products, e-commerce, and precision mining algorithms. He established a characteristic information model of consumer preferences, and constructed a characteristic model of agricultural products, so as to provide recommendation algorithms. According to the characteristics of agricultural products, the traditional commodity recommendation process was optimized, which could effectively improve the accuracy of recommendation [1]. Ioannou Ilias believed that blockchain technology played a role in promoting innovation in supply chain finance solutions by reducing inefficiency and increasing visibility among parties, which was a major challenge in this field. On this basis, combined with relevant research results in the world, the financial, operational, legal, and other issues faced by supply chain finance were identified and discussed, and the feasibility of using blockchain technology to solve the above issues was discussed. In addition, he also discussed the challenges and benefits brought by the development of blockchain technology, and pointed out the necessary factors for realizing blockchain transactions and supply chain finance, such as establishing cooperation among supply chain participants, integrating with Internet of Things systems to improve data quality, and reforming regulatory and legal frameworks. Finally, promising research directions on the implementation process were identified, and further research was invited on the shift towards a more collaborative business model [2]. Mobile technology became a necessity for tourists in daily life and travel. Due to the increasing importance of mobile phone technology, Law Rob collected and analyzed

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

92 papers from hotel and tourism magazines to review the latest research findings in this field. The comprehensive review showed that most research focused on the context of tourism experience and the hotel industry. These studies tended to adopt quantitative research methods and were based on theories in the field of information systems. Some research topics were identified from the perspective of suppliers and consumers. Researchers gave disproportionate attention overall, with more research focused on consumers rather than suppliers. Through a review of relevant literature, a survey schedule was developed to provide reference for the future use of mobile technology in the hotel and tourism industries [3]. However, these scholars did not combine computer technology with legal finance, and they only conducted research at a superficial level.

This article drew the following conclusions through research and analysis of economic and financial majors based on computer technology: With the development of technology, computer technology became more accurate in predicting economic data, and the use of computer technology became more widespread.

2. Application Methods of Computer Technology in Finance

2.1 Development of Computer Technology

(1) Speech recognition technology

Although speech recognition technology is still in its infancy, it has become a major development trend in computer technology. This technology, which enables computers to "understand" human language and respond appropriately, has taken a significant step towards "personification" of computers. With the continuous progress of speech recognition technology, media English teaching is bound to enter a new era.

(2) Artificial intelligence

At present, artificial intelligence has become a hot research topic and a major development trend in computer science. If there is a major breakthrough in artificial intelligence technology, it is possible to create computers that are similar to or surpass humans in certain fields. Therefore, at the current stage, the research on artificial intelligence technology from all walks of life is constantly deepening, and the trend of computer technology towards artificial intelligence has become more obvious.

(3) Quantum computer

The computing power of quantum computers is strong enough to far surpass that of ordinary computers. Such data processing capabilities would greatly promote the development of the medical field, as well as the development of artificial intelligence. In addition, using quantum technology can well strengthen China's chip technology, which is also the most important link in computer technology at present.

2.2 Application of Computer Technology in Economic Management

(1) Using computer science and technology to establish a management system

Applying computer network systems to economic management and constructing a systematic and comprehensive internal management model would make the responsibilities of each department clearer and the organizational structure more perfect [4-5]. To explore and change traditional economic management methods, computer technology should be combined with economic management methods on the premise of meeting the needs of enterprise development based on the original marketing plan and strategy. Using computer network systems to conduct economic management of enterprises can improve the efficiency and quality of enterprise economic management, and reduce the workload and pressure of staff, so as to reduce the operating costs of enterprises. This can promote the development of enterprises themselves [6-7]. In addition, in economic management, computer technology can also play a risk prevention function, which can correct information distortion and prevent risks, so as to find vulnerabilities. With the strong support of computer technology, economic management has changed the outdated ideas and methods before, thus promoting the process of integrating economy and management using computer technology [8-9].

(2) Prediction of market by computer science and technology

Computer network systems can predict future markets. In the process of economic management, it

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

is necessary to use a large amount of information statistics to analyze the factors that would affect the changes in the market supply and demand relationship in the future [10-11]. Economic managers should use this information to explore the changing laws of the market, so as to better analyze future market conditions, such as the trend of stocks and changes in futures prices [12-13]. The use of computer technology to process and analyze information has brought enormous convenience to economic management, while computer technology also helps to avoid the phenomenon of blind decision-making caused by inaccurate analysis of information [14-15]. Applying computer technology to economic management can enable enterprises to make more accurate decisions in economic management, thereby improving their operational efficiency and promoting their development [16-17].

2.3 Neural Network Structure Design

Before conducting network training, the dimensions of input variables are different, so they cannot be directly used as input to the network. Instead, it is necessary to normalize the data and adjust it to a unified range, thereby achieving the effect of smoothing the data and eliminating noise. In addition, if an excessively large input is set to a neuron, its output is easily located in the saturated region of the neuron. That is to say, its output is either the maximum or the minimum of the activation function, thus resulting in a minimum differential of its output and a minimum correction of its weight, thereby resulting in low training efficiency and difficult convergence of the network. Therefore, during learning, it is necessary to standardize the data to avoid network paralysis due to the flatness of the incorrect surface during learning. Standardized data is typically between [0,1] or [-1,1].

This article uses the following formula to normalize the data:

$$a = \frac{t - t_{min}}{t_{max} - t_{min}} \tag{1}$$

Among them, t is the original data sample, and t_{min} and t_{max} are the minimum and maximum values of the sample. a is the normalized sample data. The value range of the processed data sample is [0,1].

After the completion of network training, the obtained sample data needs to be de normalized, and the formula is as follows:

$$x = x(x_{max} - x_{min}) + x_{min} \tag{2}$$

How to determine the number of hidden layer nodes has always been another major problem in neural networks, and there is still no accurate calculation method for the number of hidden layer nodes [18-19]. The learning performance of neural networks is closely related to the number of hidden layer nodes. When the number of nodes is insufficient, the learning performance of the network would be affected, and internal mapping relationships between data cannot be fully mined, thus resulting in a decrease in network strength. Therefore, by increasing the number of hidden layer nodes, the learning performance of the neural network can be improved, thus making it easier to converge.

Currently, a commonly used method to determine hidden nodes is tentative. Generally, a small node is set for the hidden layer first, and then the number of nodes is gradually increased according to network training methods until the training results meet the desired goal. For the number of nodes in the initial hidden layer, when setting the number of initial nodes, researchers generally use the following empirical formula:

$$a = b * \sqrt{b * c} \tag{3}$$

Among them, a represents the number of hidden nodes; b represents the number of input nodes; c is the number of output nodes.

Computer technology is to make full use of neural network design to analyze and study relevant data, and then make predictions [20]. Due to the development of technology, the deviation of prediction is becoming smaller and smaller, and can be controlled within a reasonable range.

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

3. Prediction and Evaluation Investigation Experiment for Economics and Finance Majors Based on Computer Technology

3.1 Evaluation of Experimental Data

The stock market is a dynamic and unstable system, and its operation is influenced by politics, economy, macro and micro factors. In a mature and open market, the trend of stocks is closely related to macroeconomic trends. With the continuous deepening of China's securities market, China's securities market is gradually becoming mature, and the securities market has gradually become a "barometer" and gradually accepted by people. Therefore, in the process of forecasting the Shanghai Stock Exchange Composite Index, this article mainly selected the main macroeconomic indicators reflecting China's macroeconomic performance as input variables and alternative indicators based on computer technology. A brief analysis of the alternative indicators was conducted, and the input variables for the model were selected, with the closing price of the Shanghai Composite Index as the output variable.

The correlation coefficient matrix between macro variables is shown in Table 1. As can be seen from Table 1, there is a high correlation between the leading index and the Purchasing Manager Index (PMI); there are many macro variables that are highly correlated with the consistency index and the lag index. The corresponding indicators are included in the compilation components of the consistency index and lag index, so the correlation is high. Although there is a high correlation between some variables, it is not necessary to take the correlation between variables into account when making computer technology predictions. In the process of network training, the network can learn the relationship between input variables and output variables without eliminating the collinearity between variables. This is the advantage of computer technology [21].

Table 1: Correlation coefficient matrix between macro variables

	Antecedent index	Consensus index	Hysteresis index	PMI
Antecedent index	1	0.4	-0.12	0.65
Consensus index	0.4	1	0.73	0.90
Hysteresis index	-0.12	0.73	1	0.57
PMI	0.65	0.90	0.57	1

3.2 Prediction of Relevant Indicators

(1) Correlation analysis

Using computer technology to predict is to find a complex connection between input and output. If there is originally no connection between input and output, but computer technology is used to fit it, it is difficult to obtain a perfect model, and let alone predict it. Therefore, this article conducted a simple analysis of the correlation between macro variables and the Shanghai Stock Exchange Composite Index. As shown in Figure 1, it is a linear correlation coefficient between macroeconomic indicators and the Shanghai Stock Exchange Composite Index. The lag index, early warning index, manufacturing purchasing manager index, Consumer Price Index (CPI), and the Shanghai Stock Exchange Composite Index have significant correlations, while the leading index, consistent index, import and export volume year-on-year growth, and the Shanghai Stock Exchange Composite Index do not have strong correlations. The traditional linear correlation coefficient can only measure the strength of the linear correlation between two variables, but cannot measure the nonlinear correlation between two variables. In this case, the rank correlation coefficient could also be used to replace the linear correlation coefficient, as shown in Figure 2, which was the rank correlation coefficient of macroeconomic indicators and the Shanghai Composite Index. When two variables exhibit a monotonic functional relationship, the two variables are rank dependent.

(2) Model prediction

Computer technology is used to continuously train the network for prediction, thereby gradually reducing the prediction error of the Shanghai Stock Exchange Composite Index. During the training process, the error of the training sample would continue to decrease, but the error of the verification sample set would rapidly decrease at the beginning of the network training. However, when the error of the test sample set continues to decrease 5 times, the sample error would no longer decrease. On the contrary, as the training continues, its error may increase. Therefore, when the error value starts to increase, the training of the network can be stopped. In this way, a balance point can be obtained that

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

can ensure both the accuracy of training and the promotion performance of the network. However, in practice, the error rate may fluctuate, so it should also be confirmed. When the error rate continues to rise several times, the exercise would be stopped [22].

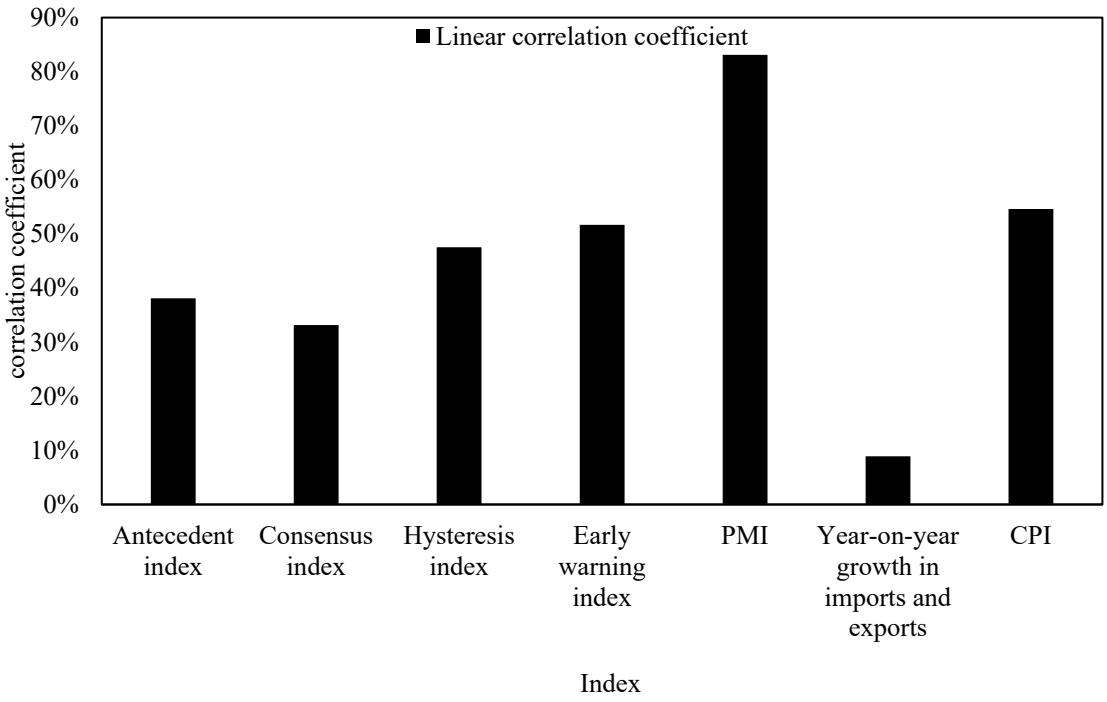

Figure 1: Linear correlation coefficient between macroeconomic indicators and Shanghai Stock Exchange Composite Index

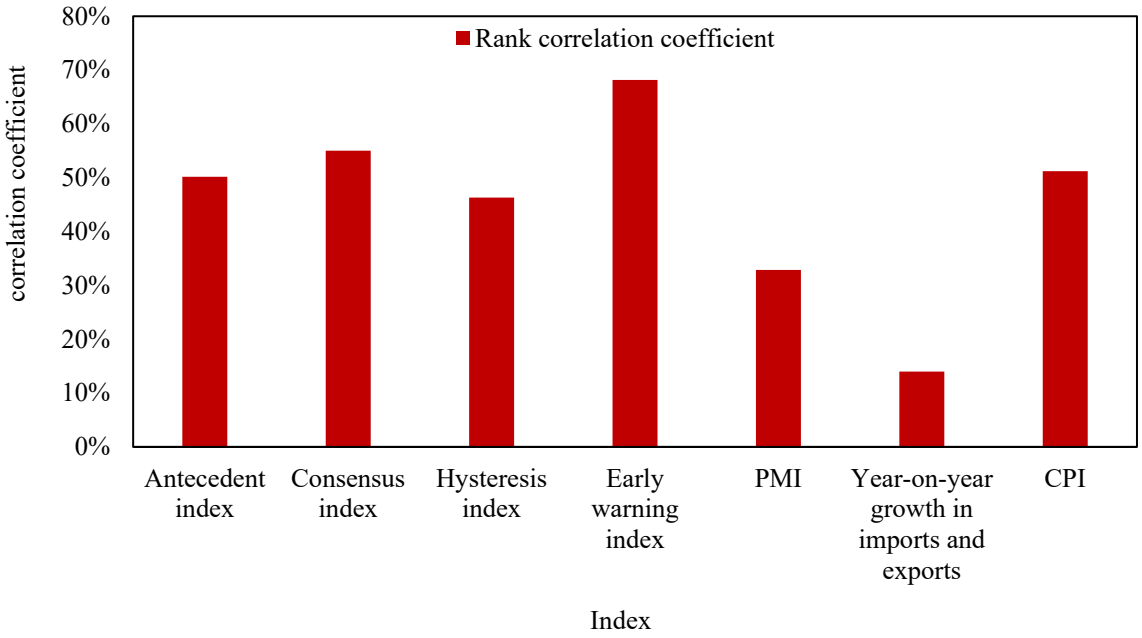

Figure 2: Rank correlation coefficient between macroeconomic indicators and Shanghai Stock Exchange Composite Index

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

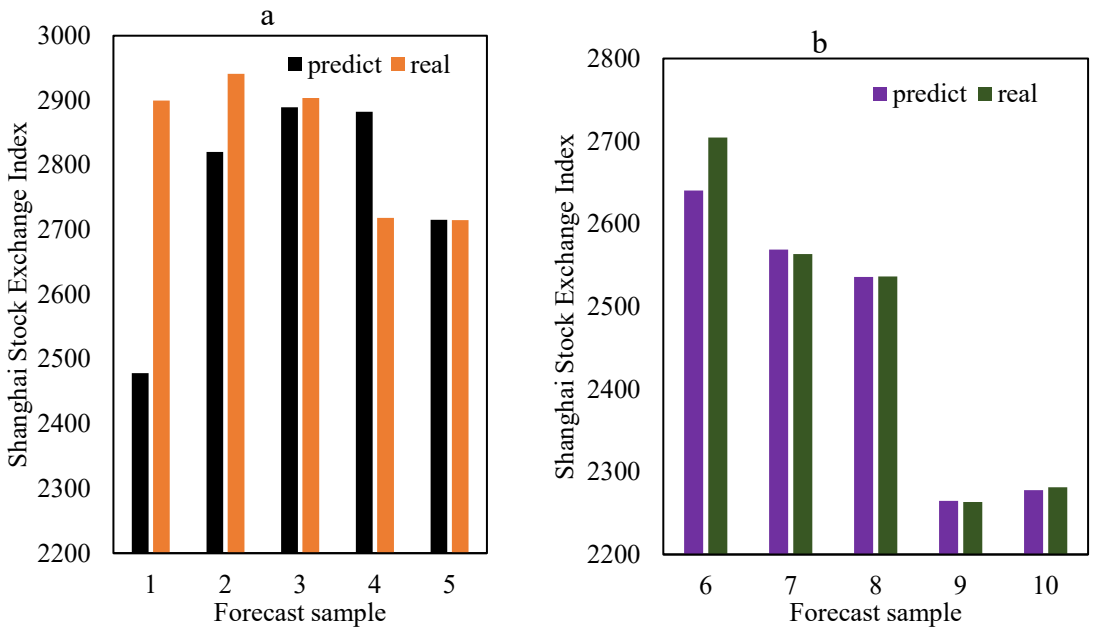

Figure 3: Comparison between predicted and true values of Shanghai Stock Exchange Index in computer technology samples

The trained network was used to predict 10 validation samples, as shown in Figure 3. Figure 3 (a) showed the comparison between the predicted and true values of the Shanghai Stock Exchange Composite Index for samples 1-5, and Figure 3 (b) showed the comparison between the predicted and true values of the Shanghai Stock Exchange Composite Index for samples 6-10. Based on the prediction of the test sample, this article found that except for the prediction at points 1 and 6, which had a significant deviation from the actual situation, other predictions were within 10%. This could well demonstrate the application of computer technology in economic data prediction, with strong applicability.

3.3 Application of Computer Technology in Economic Finance

Through computer technology, economists, financiers, and legal professionals can collect, analyze, and interpret massive amounts of data to more accurately predict and make decisions. They can also help investors effectively trade in stocks, futures, foreign exchange, and other fields, as well as conduct algorithmic and high-frequency trading. Computer technology and machine learning technology can be applied to economics, law, and finance, such as predicting market trends, identifying investment opportunities, and controlling risks. In computer technology, blockchain technology and cloud computing are also included. They have applications in digital authentication, contract management, transaction settlement, and payment, as well as in financial and legal fields. This article studied and analyzed the prediction and analysis of economic data by computer technology. After verification and analysis, it was found that the prediction of computer technology could be controlled within a certain error. In summary, computer technology became an indispensable and important tool in applied economics, law, and finance.

4. Conclusions

With the development of the times and technological progress, computer technology has already had a certain theoretical foundation. However, scholars are still actively exploring the application of computer technology in the securities market. Although this paper conducted some discussions on using computer technology to predict the stock market, these discussions were still in the preliminary stage. In some specific technical details, there was still room for in-depth discussion, so as to further improve the stability and accuracy of stock market prediction using computer technology. At the same time, it was also necessary to explore other applications and developments of computer technology in the field of economics.

ISSN 2522-6398 Vol. 6, Issue 18: 82-88, DOI: 10.25236/FER.2023.061815

References

[1] Qian Z., Y Li. "Agricultural research recommendation algorithm based on consumer preference model of e-commerce." Future Generation Computer Systems 88.NOV.(2018):151-155.
[2] Ioannou Ilias, Guven Demirel. "Blockchain and supply chain finance: a critical literature review at the intersection of operations, finance and law." Journal of Banking and Financial Technology 6.1 (2022): 83-107.
[3] Li Cheng, Chu Chan, Liang Wang. "A comprehensive review of mobile technology use in hospitality and tourism." Journal of Hospitality Marketing & Management 27.6 (2018): 626-648.
[4] Howard Philip N., Samuel Woolley, Ryan Calo. "Algorithms, bots, and political communication in the US 2016 election: The challenge of automated political communication for election law and administration." Journal of information technology & politics 15.2 (2018): 81-93.
[5] Werbach Kevin. "Trust, but verify: Why the blockchain needs the law." Berkeley Technology Law Journal 33.2 (2018): 487-550.
[6] Keith H Coble, Ashok K Mishra, Shannon Ferrell, Terry Griffin "Big data in agriculture: A challenge for the future." Applied Economic Perspectives and Policy 40.1 (2018): 79-96.
[7] Feyrer James. "Trade and income—exploiting time series in geography." American Economic Journal: Applied Economics 11.4 (2019): 1-35.
[8] Nguyen Hoai-Luu Q. "Are credit markets still local? Evidence from bank branch closings." American Economic Journal: Applied Economics 11.1 (2019): 1-32.
[9] Zheng Xiaolin, Mengying Zhu, Qibing Li, Chaochao Chen, Yanchao Tan. "FinBrain: when finance meets AI 2.0." Frontiers of Information Technology & Electronic Engineering 20.7 (2019): 914-924.
[10] Purcell Thomas F., Alex Loftus, Hug March. "Value–rent–finance." Progress in human geography 44.3 (2020): 437-456.
[11] Zetzsche Dirk A., Douglas W. Arner, Ross P. Buckley. "Decentralized finance." Journal of Financial Regulation 6.2 (2020): 172-203.
[12] Lai John, Nicole O. Widmar. "Revisiting the digital divide in the COVID-19 era." Applied economic perspectives and policy 43.1 (2021): 458-464.
[13] Aziz Hassan Mahmood, Sarhang Sorguli, Pshdar Abdalla Hamza, Bawan Yassin Sabir, Khowanas Saeed Qader, Bayar Ali Ismeal, et al. "Factors affecting International Finance Corporation." International Journal of Humanities and Education Development (IJHED) 3.3 (2021): 148-157.
[14] Chege Samwel Macharia, Daoping Wang, and Shaldon Leparan Suntu. "Impact of information technology innovation on firm performance in Kenya." Information Technology for Development 26.2 (2020): 316-345.
[15] McNown Robert, Chung Yan Sam, Soo Khoon Goh. "Bootstrapping the autoregressive distributed lag test for cointegration." Applied Economics 50.13 (2018): 1509-1521.
[16] Wright F. D., T. M. Conte. "Standards: Roadmapping Computer Technology Trends Enlightens Industry." Computer 51.6(2018):100-103.
[17] Hua R., M. Kasli, W. G. Secada. "A Meta-Analysis on Computer Technology Intervention Effects on Mathematics Achievement for Low-Performing Students in K-12 Classrooms" Journal of Educational Computing Research 59.1(2021):119-153.
[18] Chunsen Liu, Huawei Chen, Shuiyuan Wang, Qi Liu, Yugang Jiang, Wei Zhang et al. "Two-dimensional materials for next-generation computing technologies." Nature Nanotechnology 15.7 (2020): 545-557.
[19] Ai Yuan, Mugen Peng, Kecheng Zhang. "Edge computing technologies for Internet of Things: a primer." Digital Communications and Networks 4.2 (2018): 77-86.
[20] Raja R., P. C. Nagasubramani. "Impact of modern technology in education." Journal of Applied and Advanced Research 3.1 (2018): 33-35.
[21] Lv Zhihan, Alaa Halawani, Shengzhong Feng, Haibo Li, and Shafiq Ur Réhman. "Multimodal hand and foot gesture interaction for handheld devices." ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM) 11, no. 1s (2014): 1-19.
[22] Lv Z., Wang N., Ma X., Sun Y., Meng Y., & Tian Y. (2022). Evaluation Standards of Intelligent Technology based on Financial Alternative Data. Journal of Innovation & Knowledge, 7(4), 100229.