Design of Financial Early Warning System Based on Elman_Adaboost Algorithm

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Abstract: This article analyzes the relevance of the Elman_Adaboost algorithm and combines the design points of the financial early warning system. This article includes data integration platform design, operating system platform design, data warehouse platform design, system integration platform design, system logic structure design, system software function design, financial warning level division, financial risk warning situation division, etc. The author of this paper continuously improves the financial information system, the financial risk responsibility system, etc. The purpose of this article is to improve the practicality of the financial early warning system and lay the foundation for the stable development of the enterprise economy.

1. Introduction
In the process of enterprise economic development, financial management is one of the core contents, and its management level also directly affects the survivability of enterprises in the market. At this stage, with the increase in the complexity of business, the difficulty of financial management is also increasing. Many companies are using information technology and Internet technology to build a financial early warning system. As an advanced algorithm, the Elman_Adaboost algorithm has a positive significance for improving the application effect of the financial early warning system by applying it to the design process of the financial early warning system.

2. Elman_Adaboost Algorithm Overview
When analyzing the Elman_Adaboost algorithm, it can be disassembled into two parts: Elman neural network and Adaboost algorithm. As shown in Figure 1, the main structure of Elman neural network is feed-forward connection, including input layer, hidden layer, and output layer, and its connection weight can be learned and modified. The feedback connection is composed of a group of "structure" units, which are used to memorize the output value of the previous moment, and the connection weight is fixed. In this network, in addition to the ordinary hidden layer, there is also a special hidden layer, called the association layer (or contact unit layer). This layer receives feedback signals from the hidden layer, and each hidden layer node has a corresponding associated layer node connected to it. The function of the correlation layer is to use the state of the hidden layer at the previous moment together with the network input at the current moment as the input of the hidden layer through connection memory, which is equivalent to state feedback. The transfer function of the hidden layer is a non-linear function, generally a Sigmoid function, the output layer is a linear function, and the correlation layer is also a linear function.
Adaboost is an iterative algorithm whose core idea is to train different classifiers (weak classifiers) against the same training set, and then combine these weak classifiers to form a stronger final classifier (strong classifier). The algorithm itself is implemented by changing the data distribution. It determines the weight of each sample based on whether the classification of each sample in each training set is correct and the accuracy of the previous overall classification. The new data set with modified weights is sent to the lower classifier for training, and finally the classifier obtained by each training is finally fused as the final decision classifier. Using the adaboost classifier can eliminate some unnecessary training data features and place them on the key training data. The Elman_Adaboost algorithm is a comprehensive analysis method that combines the application characteristics of the two types of methods and applies it to the financial early warning system, which can refine the application content of the analysis required and improve the accuracy and reliability of the output results.

3. Main Points of Designing Financial Early Warning System Based on Elman_Adaboost Algorithm

3.1 Data Integration Platform Design
Figure 2 Schematic Diagram of the Data Integration Platform

As shown in Figure 2, when designing the data integration platform of the financial early warning system, it is necessary to standardize the original design interface on the basis of the original design to make it more standardized, and can be used for multiple types of data (pictures, audio, data packets etc.) for compatibility. At the same time, in the design stage of the platform, IFIX Web Server configuration will also be used to publish the financial data generated by each subsystem to the internal LAN of the enterprise. Afterwards, it is unified and sorted, and the data information from different sources is smoothly converted into a unified type of data to be processed, and then stored in the database classification. Before storage, keyword tags are also added to the data information, so that users can quickly retrieve the required information when using the information, providing more convenient services.

3.2 Operating System Platform Design
When designing the operating system platform, you should pay attention to the following two parts of the application content: (1) Choose the service operating system. The main function of the server operating system is to achieve direct control of computer hardware and software, and to manage and coordinate. Mainly classified into Web servers, application servers and database servers, it is the basic architecture platform for enterprises to build financial early warning systems. At this stage, more than 60% of enterprise platform servers use the Windows 2017 Server operating system. The result is that its efficient structure helps the network to become a strategic asset of the unit, and its platform service efficiency increases by 30%-35%. (2) Select the operating system of the working platform. In order to match the service operating system, the selected working platform is also the Windows series, and the minimum configuration is Windows 7 (64 or 32 bits) to meet the actual financial data statistics needs [1].

3.3 Data Warehouse Platform Design
One of the effective ways to achieve early warning management of corporate financial data is to establish a reasonable database structure. Otherwise, the financial data information of each department is stored in real time, and then processed and transmitted in a unified manner, in order to lay the foundation for the application of the Elman_Adaboost algorithm model. In the specific design stage, you also need to pay attention to the following: First, optimize and analyze the financial data
organization structure at this stage, and establish an information metadata structure. The basis of this structure is to rely on the financial data provided by various departments of the enterprise, and use the sharing of the local area network to build a financial risk assessment system [2]. Second, establish a financial data mining system to analyze the potential value of data information. Combining previous experience, 15-30% of the data collected will have the potential for mining, which is also one of the important references for improving the financial early warning system and optimizing production methods. There are two modes of mining that are frequently used at this stage: periodic mining and sequential mining.

3.4 System Integration Platform Design
In the design process of the previous financial early warning system, the independence of the subsystem information provided by it is relatively strong, which also reduces the timeliness and effectiveness of information communication. In this regard, with the help of the Elman_Adaboost algorithm, the sharing of data information can be appropriately improved, and the collected financial data information can be unified and integrated. Moreover, the neuron technology is applied to the design of the system integration platform, and it is classified into several "neurons". While maintaining its independent operation, it will also have certain relevance, thereby improving the reliability of information applications, and also providing sufficient data support for financial early warning systems [3].

3.5 System Logical Structure Design
Considering the richness of the daily work of the enterprise, when relying on the Elman_Adaboost algorithm to design the logical structure of the system, the enterprise should adopt a multi-layer distributed system to complete the construction of the logical structure of the system to improve the flexibility and scalability of the structure itself. In specific applications, the structure can be divided into four layers: the first layer is the data layer, the job is to collect various types of data, such as production data, safety data, financial data and so on. The second layer is the business logic layer, whose job is to classify, filter, and store data layer information to enhance the potential value of the data. The third layer is the business control layer. After the user submits the application or the main system issues instructions, the execution status of each subsystem. The fourth layer is the display layer, which is the interface for direct information interaction with users and the main interface for displaying query results [4].

3.6 System Software Function Design
For the sake of meeting the smooth application of financial early warning system, in the actual processing process, its functional design should include real-time monitoring function, mobile monitoring function, information interaction function, security warning function, etc. Taking the security early warning function as an example, during the normal operation of the enterprise, the early warning parameters of the management system need to be determined in conjunction with the Elman_Adaboost algorithm. At the same time, to monitor the financial data generated by the enterprise, after breaking through the safety red line, the enterprise needs to quickly dig deeper into the cause of the problem and suspend the continued operation of the project. Then determine the specific cause of the hidden danger problem and formulate a solution to it, and then resume normal operation activities, so as to improve the application value of the system and enhance the safety of the enterprise's operation process [5].

3.7 Classification of Financial Warning Levels
In order to better highlight the application value of the Elman_Adaboost algorithm, when building a financial early warning system, it is necessary to do a good job in dividing the financial early warning level. Under normal circumstances, we can quantitatively analyze the calculation results and display them in the form of a "percentage system" to assess the severity of current financial risks [6]. As
shown in Table 1, the corresponding value calculated according to the financial early warning system represents the corresponding financial risk. At the same time, corresponding treatment measures are formulated in advance in response to these risk situations, in order to improve the company's ability to respond and enhance the safety of the company's operating environment.

Table 1 Schematic Diagram of the Division of Financial Early Warning Levels

| Score | Warning Level   | Remarks                                                                 |
|-------|-----------------|-------------------------------------------------------------------------|
| x<60  | Very Dangerous  | Enterprises are prone to financial crisis, broken capital chain and other situations. |
| 60≤x<70 | Severe Danger  | Financial risk is relatively high, approaching the edge of financial crisis. |
| 70≤x<80 | Moderately Dangerous | There is a high financial risk.                                          |
| 80≤x<90 | Mildly Dangerous | Financial risk is relatively small.                                      |
| 90≤x  | Safe            | There is almost no financial risk, and the enterprise capital chain is stable. |

3.8 Division of Financial Risk Warning

The so-called financial risk alert refers to the category corresponding to financial risk, which is also an important guarantee for the formulation of countermeasures. According to the actual needs of the application of the Elman_Adaboost algorithm, in the specific analysis process, the warning situation can be divided into the following five categories: (1) Growth ability risk. The content of its sub-projects includes the scale of the company’s growth, its popularity, and its ability to obtain orders. (2) Risk of solvency. The contents of its sub-projects include the amount of fixed assets, debt ratio, current assets and so on. (3) Operating capacity risk. Its sub-projects include the turnover rate of accounts receivable, the utilization efficiency of current assets, the inventory turnover rate, etc. (4) Risk of cashability. The content of its sub-projects includes cash backflow, payment cycle, and payment amount. (5) Profitability risk. The contents of its sub-projects include cost increase and profit rate etc. [7].

4. Matters Needing Attention in the Application of Financial Early Warning System

4.1 Continuously Improve the Financial Information System

By continuously improving the financial information system, the integrity and accuracy of financial data information collection can be improved, thereby improving the reliability of the working state of the financial early warning system [8]. Besides, the algorithm content mentioned above, information technology and big data technology can also be integrated into the early warning system to enhance the application value of data information on the basis of ensuring the validity of collected data. Moreover, in the application phase, companies also need to update the software and hardware equipment of the early warning system from time to time, especially in the business development phase of the enterprise, the required evaluation indicators and evaluation weights also need to be adjusted. Only in this way can it be more in line with the current economic development status of the enterprise and play a guiding role in future development planning, thus laying a foundation for the stable development of the enterprise economy.

4.2 Improve the Financial Risk Responsibility System

By improving the financial risk responsibility system, companies can transfer financial risks to the heads of various departments, help the heads to clarify their responsibilities, and make them more
serious in their work, so as to reduce the probability of financial risks. In the operation of an enterprise, we can use the Elman_Adaboost algorithm to complete the classification of risk responsibilities. At the same time, it will be divided equally among the various departments of the enterprise to inform them of the risks and joint responsibilities they bear. In addition, it also points out ways for risk avoidance, so that it can restrict its own behavior in the work and improve the compliance of the operation process [9].

5. Conclusion
In summary, continuous improvement of the financial information system can improve the completeness and accuracy of the collection of financial data and improve the financial risk responsibility system. Moreover, this can also transfer financial risks to the heads of various departments, reducing the probability of financial risks. By applying the Elman_Adaboost algorithm to the design of financial early warning systems, this can not only improve the accuracy of the calculation structure, but also play a positive role in promoting the sustainable development of the industry economy.

Project
Key Project of Humanities and Social Science in Anhui Province:
Research on the return mechanism of social capital investment based on PPP model of pension service
Anhui Quality Engineering Project:
Demonstration project of basic teaching and research section—Accounting teaching and research section

References
[1] Zhao Nanan. Design of college financial early warning system based on improved C4.5 algorithm [J]. Journal of Shaoguan University, 2019, 40(09): 26-31.
[2] Yang Linwei. Research on the design of financial risk early warning system for startups[J]. Accountants, 2019(07):3-5.
[3] Yin Xianan, Bao Xinzhong. Design and Application of Enterprise Financial Risk Measurement and Early Warning System Software——Based on Industry Difference Perspective[J]. Finance and Accounting Newsletter, 2019(02):109-112.
[4] Cao Na. Design of enterprise financial risk early warning system based on support vector machine [J]. Microcomputer Application, 2018, 34(08): 73-77.
[5] Chen Xinrong. Research on the design and application of early warning indicators of financial risks in colleges and universities[J]. Higher Education Research on Finance and Economics, 2017,20(03):30-35+59.
[6] Zhu Guorong, Feng Hao, Xu Yang. Design of company financial early warning system based on Delphi method and efficiency coefficient method——Taking Zhejiang Electric Power as an example[J]. Contemporary Economy, 2017(26):122-123.
[7] Yang Jing. Design of early warning system for corporate financial crisis in Haixi Economic Zone [J]. Accounting and Communications, 2017 (17): 84-86.
[8] Xu Xu, Liu Hongjun. Research on Internet Enterprise Financial System Based on Neural Network and Orthogonal Design [J]. Journal of Jilin Institute of Technology, 2017, 31(06): 39-42.