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Application of Neural Network in Risk Management

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Abstract

In recent years, with the intensification of project competition and the rapid increase of various risks, all the major companies are facing unprecedented challenges. The emergence of this phenomenon makes people pay more attention to the engineering risk management, so the project risk management system comes into being under this background. The key of risk management is to analyze various risk factors that may occur in the project. Firstly, quantify each risk factor and adopt different quantitative methods for different risk factors; Then, using the risk information in the historical project, the neural network is trained to establish a complete network model; Finally, BP algorithm is used to train the weight of the neural network. Through the verification of the proposed neural network, the effectiveness of project risk management using neural network is verified. On the basis of risk management, according to the improved risk identification method of risk identification, risk identification results input to neural network project risk analysis, then use the optimal neural network algorithm solution, finally the risk level and countermeasures displayed on the system page, to reduce the project risk, improve the success rate of the project, make risk management more accurate, standardized, scientific and convenient.

Keywords

Neural network, Risk, Administration

Introduction

With the expansion of enterprise scale and the increase of engineering projects, the engineering risk management becomes more and more difficult. At present, there are two main problems facing the risk management only by manpower. First, a lot of manpower was wasted. Second, the response to risk is slow; This is because most engineering projects not only have the requirements of project risk assessment indicators, but also have the problem of milestones in project progress control, that is, the problem of project progress. In order to solve the above problems, this paper focuses on the judgment of the current situation of the project. First of all, judging whether a project is dangerous depends on personal experience. Everyone's understanding of the project is different, and as the scale and time of the project go by, more and more factors will affect it. The judgment will become more difficult and the accuracy will decline. Therefore, judging the risk of the project through neural network can not only save manpower, but also quickly respond to the risk. The key is that in the decision-making process, we should not rely solely on the experience of the evaluator, but also rely on the experience of the historical projects and personnel acquired by the trained neural network, so as to reduce the judgment of the project risk and effectively improve the accuracy of decision-making.

1. Quantification of risk factor selection

1.1 Risk factor selection

There are many kinds of risk factors in China, and their values are mostly specific languages. For example, the risk factors of progress evaluation are mainly advanced, normal, slow, and seriously overdue. In addition, there are some quantitative risk factors, most of which are specific values. For example, the risk coefficient of personnel input mainly refers to the manpower input in a specific project. In addition, the quantitative risk factors can be further refined according to the degree of impact of the project. For example, according to the degree of impact of different employees on the project, the investment of personnel can be divided into the investment of important personnel, ordinary investment, etc.

The neural network data composed of which risk factors is not only related to the personal experience of the project risk manager, but also related to the actual conditions of the project.

1.2 Quantification of risk factors

There are different types of risk factors, including qualitative risk factors and specific language descriptions. In the training and application of neural network, it is necessary to quantify it. Two different quantitative methods are proposed, namely qualitative and quantitative risk factors.

For qualitative risk factors, specific description language is used to quantify, and the principle of better completion effect and more quantity is followed when quantifying [1].

2. Neural network

2.1 Dataset

The quantity and quality of samples directly affect the learning and use of neural networks. Compared with traditional image classification methods, the quantity and quality of samples are very important in the risk management of engineering projects. In this way, the trained neural network can not only draw lessons from the experience of risk managers, but also find more fuzzy rules from previous data.

2.2 Neural network structure

To explore the application of neural network in project risk management, we can use fully connected neural network, which includes an input layer Two full connection layers (the number of nodes in the first full connection layer is 10, and the number of nodes in the second full connection layer depends on the number of project risk determination result types, even if A and C are used as neural network data set time points 2, data set B, data set D, neural network data set time points of 3, softmax (standardization) layer, and output layer.

2.3 Reverse transfer algorithm

The reverse transfer algorithm modifies the network weight based on the difference between the expected risk judgment and the actual risk judgment result of the neural network to ensure that the actual risk judgment result of the network is equal to the expected risk judgment result.

3. Neural network risk analysis method

(1) BP neural network algorithm analysis

First, the neuronal model. The neuron is the most basic organizational unit in the artificial neural network, and the neuron is the unit of its information processing, which is usually called the "processing unit" or "node". Neuronal models are cells used to simulate neurons, and their structure depends on the neurons and how they are connected. Use x1,... xi,... xn to represent the input of the neuron, each input has a weight, the positive and negative two modes of this weight represent the neuron's excitation and repression, respectively, while the quantity of the number represents the signal intensity, whose output is Oj. To determine the final result of a multiple input, all inputs need to be combined and Σ utilized to express the integration of the input signal.

Second, learn about neural networks. Generally speaking, neural networks gradually realize certain performance by adjusting weights according to certain indicators.

Third, the derivation of the BP algorithm. The idea of BP algorithm includes two aspects: one is the forward di-

rection of information and the backward error. BP neural network consists of three layers: input layer, hidden layer and output layer. The middle layer of BP neural network is fully connected rather than internal layer connection, while the input layer, as the storage function of buffer layer, bears the function of receiving and transmitting to the connected neurons; the hidden layer refers to the internal processing unit for finding rules in the data and converting, and the output end is responsible for the output results. All the inputs of a neuron are weighted by the entire output data of the previous layer, and then transmitted from the output signals of the previous layer to the next layer to handle and solve the complex problems.

(2) Improvement of the BP algorithm

In order to solve the problem of slow convergence speed and low accuracy of BP algorithm, this paper improves the startup function of BP neural network, including the S type startup function of BP algorithm.

First, the shortcomings of the BP algorithm. BP neural network is a class of BP neural network with three levels that can approximate any continuous function. The neuron activation function of traditional BP algorithm mostly adopts unipolar S or bipolar S form function, but the mapping range and localization of S form function cannot change, resulting in decreased flexibility [5], cannot meet the generalization function of neural network, and cannot improve its defects. To solve this problem, the BP algorithm by introduced the displacement coefficients into the S shape function.

Second, the activation function. In neural networks, the activation function is the most important one, which is the conversion function. Different patterns differ in their activation function, while different functions have different ability to process information. The start function is mainly used to functionalize the input and output functions, and to control the start of the input and output, to convert the input and output input into a limited output.

Third, to improve the activation function. At present, the BP algorithm in engineering project evaluation, risk analysis, progress prediction, investment control and other fields have certain application value, but in practice, BP algorithm encountered many difficulties in practical application, such as: the number of nodes more complex selection is implied layer, usually by the experience of experts and a large number of experiments. On the other hand, when the usual number of hidden layer nodes increases, the neural network has better approximation performance, but the generalization performance of the network also decreases. In order to achieve the above two conditions, the number of hidden layer nodes can be solved by the "golden section method", which has low cost, high efficiency and high practical value [4].

4. Establish BP neural network model for risk assessment

Through the preliminary risk management platform, we can build an information warehouse that includes customs clearance, supervision, trade control, tax, processing trade, inspection and other businesses. The data warehouse standardizes the data in terms of data format, index definition, etc., realizes data consistency, facilitates comprehensive business analysis of various departments, and solves the problems of data dispersion, format inconsistency, and inability to share in the past; Using data warehouse technology, massive risk measurement methods and multi-dimensional data analysis tools, risk management can be carried out at the macro and micro levels, providing strong support for enterprise risk management [2].

The risk management platform divides the enterprise data into three levels: basic data, comprehensive data and multi-dimensional data. On this basis, it builds various applications and analyzes the data to support the enterprise operation data. Through the analysis of the risk management platform, a series of comprehensive indicators can be easily extracted from the risk management data warehouse.

4.1 Input design of BP neural network

Enterprise risk evaluation is a comprehensive evaluation system, and its evaluation indicators are very complex. When BP neural network carries out risk assessment, it is first necessary to solve the corresponding relationship between the evaluation index and the output neuron of the neural network, as well as the standardization of the index data. On the one hand, in some non-quantitative classification attributes (for example, "system soundness" attribute includes "good" and "general"), values of [0, 1] are used for quantification, for example, "good" means 0.8, "general" means 0.4, and "poor" means 0. On the other hand, for quantized digital data (such as "annual export volume"), the original data is converted into [0, 1] intervals by using the min-max standardization 8.

4.2 Design of output layer unit

In a classification network, the number of units of output layer is m, and m is the number of categories to be divided. Because enterprises are divided into four types of risk monitoring: A, B, C and D, the number of units in the output layer is 4.

4.3 Hidden layer design of BP neural network

In the structural design of neural network, the selection of hidden layers and hidden nodes is the key. The function of implicit nodes is to discover internal rules from sample data and use them as link weights of hidden nodes. If the number of hidden nodes is too small, the learning ability of the network to the samples is weak, and it cannot fully reflect the sample rules of the training set; On the contrary, the network may also learn and memorize the noise data in the sample, resulting in "over-fitting".

The existing optimal hidden node estimation method is based on an attempt to the existing empirical formula: first use a small number of hidden nodes to train the network, gradually increase the number of nodes, use the same sample set, and then determine the optimal number of hidden nodes by comparing the results of network training [3].

5. Experimental results

Compared with the experiment, it can be seen that in the case of small risk factors, the accuracy of decision-making is reduced due to the lack of sufficient information in the decision-making process of neural network. Therefore, when using neural network for project risk assessment, it is necessary to provide the factors that affect the project risk as much as possible, so as to improve the prediction accuracy of the risk and carry out fine classification.

It is feasible to use neural network to replace or assist the risk management personnel to carry out the risk degree of the current situation of the project, and this method has good accuracy under the condition of reasonable selection and quantification of the project risk factors.

6. Conclusion

To sum up, by quantifying the risk factors of engineering projects, a method of using neural network to determine project risk is proposed, and its effectiveness is verified by experiments. Neural network can be used not only for enterprise classification, but also for daily risk assessment and special commodity risk assessment. Among them, the establishment of risk management data warehouse provides a very perfect data source for further in-depth data mining work, and lays a good foundation for the promotion of neural network algorithm and the establishment of risk assessment model.

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