Chapter 4
Enterprise Accounting Decision Support System Based on Deep Learning Algorithm

Jiangyan Cheng

Abstract In the traditional financial decision analysis system, these unstructured data cannot be obtained and processed, and the data cannot be closely related and continuously improved. This article proposes a financial data mining (DM) algorithm based on deep learning (DL), which provides technical support for the construction of the enterprise accounting decision support system (DSS). Today, with the wide popularization of network informatization, the supervision and management functions of financial and auditing departments are becoming more and more important. Only seamless inspection by the financial department can ensure the accurate performance of the management process, only non-isolated statistics can generate a true description of the financial operation of each unit, and only the implementation without time difference can produce the efficiency significance of control in the matter.

4.1 Introduction

With the informationization and economic marketization of enterprises, enterprises are facing huge market competition, which inevitably increases the pressure of enterprise operation and survival [1]. Enterprises want to grow and develop without the participation of financial management, and the specific contents of financial management work by management mainly include analyzing enterprise financial indicators, monitoring and reducing enterprise financial risks, and making financial decisions [2]. To construct the technical principle of the intelligent financial application scenario, we can discuss it from two dimensions: commercial application principle and data technology principle [3, 4]. Because enterprises are facing increasingly fierce competition, the traditional decision-making methods can no longer meet

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the requirements, and leaders demand to develop high-level computer application systems, and it is imperative to develop a decision-supporting financial software [5].

In the field of financial management, due to the form of information provided, the timeliness of information provided and the support of information provided for decision-making, the usual accounting treatment methods and financial analysis methods can not well support the analysis and decision-making of complex problems [6, 7]. At present, the increasingly fierce market competition and the rapid growth of information technology, internet and e-business constitute the macro environment for the survival and growth of enterprises, which makes the traditional financial management face new challenges, so it is urgent to improve the decision-making level of enterprise financial management as soon as possible [8, 9]. This article puts forward a financial DM algorithm based on DL, which provides technical support for the construction of enterprise accounting DSS.

4.2 Methodology

4.2.1 Intelligent Financial Decision Support System (IFDSS) and Data Mining

The function of an intelligent financial decision support system should be based on the function of a traditional financial decision support system, and deeply analyze and mine historical, realistic, clear, fuzzy, internal, customer and other multi-level and multi-angle information by applying data mining technology. The overall design of the system is based on the analysis of the system function, dividing the system theme according to the system objectives, functions and environmental conditions, building the model, and then determining the overall functional module structure of the system, and defining the sub-objectives and sub-functions of each subsystem. Accounting behavior itself is a kind of data behavior, and its essence is the process of transforming an accounting phenomenon into a quantifiable form. The traditional double-entry bookkeeping method directly reflects the profit and loss of the business entity through data, which lays the foundation for recording with standard data [10]. Different levels of dataization have different emphases. The front-end intelligent financial robot and the middle-level intelligent financial assistant emphasize full and complete data collection, and continuously pass it back, while achieving a certain degree of analysis. The process of decision-making using the theory of management and advanced management ideas is through computer technology. Because the documents received by the finance department do not all have a unified format and reporting standards, the data collection cannot be based on the predefined logic of specific locations, but also needs to play the role of artificial intelligence (AI) cognitive technology to extract specific data independently [11]. Only in this way can the source of data collection be extended to unstructured or semi-structured documents, providing resources for higher-level machine learning, analysis and application.

The theme of financial analysis is to diagnose the financial situation of the enterprise according to the data of the enterprise, so as to grasp the lifeline of the economic operation of the enterprise, and it is an important basis for the relevant stakeholders, countries, investors, creditors and enterprises themselves to make relevant decisions. The function of DSS is to evaluate and analyse the business data according to the historical data accumulated by the daily basic business processing of enterprises, and to estimate and predict the development trend of the future business situation of enterprises by using mathematical, statistical or other intelligent technologies and methods [12]. The system needs to start with the business environment and business conditions of the enterprise, analyze the business and financial benchmark indicators and investment opportunities, find out the key factors that affect the investment efficiency of the enterprise, and then search for key projects and related methods to improve the investment efficiency of the enterprise according to the key factors, and finally realize the preparation and management of the investment business plan of the enterprise.

4.2.2 DL-Based Financial DM Algorithm

IFDSS is a concrete application of DSS in the financial field, and it is an inevitable trend of financial informatization after the rapid growth of market environment and computer information technology. Under the framework of enterprise data strategy and management policy, finance needs to conduct governance consultation on data architecture, data standards and master data, and conduct data demand management, data warehouse platform construction and application process establishment and assessment. The questions raised by users can be transformed into information language, forming data information that can be interpreted by computers [13]. Everyone who logs into the system will have a unique account number and password, as well as their own authority, and the artificial falsification of information can be curbed. IFDSS is a special intelligent DSS based on modern management theory and computer technology. It uses statistics, quantitative economics, data warehouse technology, AI and fuzzy mathematics and model technology to provide decision support through human–computer interaction. For investment decision support system, it is necessary to sort out and summarize the information systems related to investment decision, including personnel composition information, technical level information and performance information of the human resources information system, cost information and profit information of financial system, fixed assets and depreciation information of fixed assets system, production information, logistics information and personnel performance information.

As an assistant application for business personnel and individual financial personnel, intelligent financial assistant emphasizes rapidity and flexibility, which cannot be achieved by previous data processing [14]. This is the embodiment of the advantages of the data center, and it is also the fundamental reason why the establishment of intelligent finance must start from the digital transformation of financial

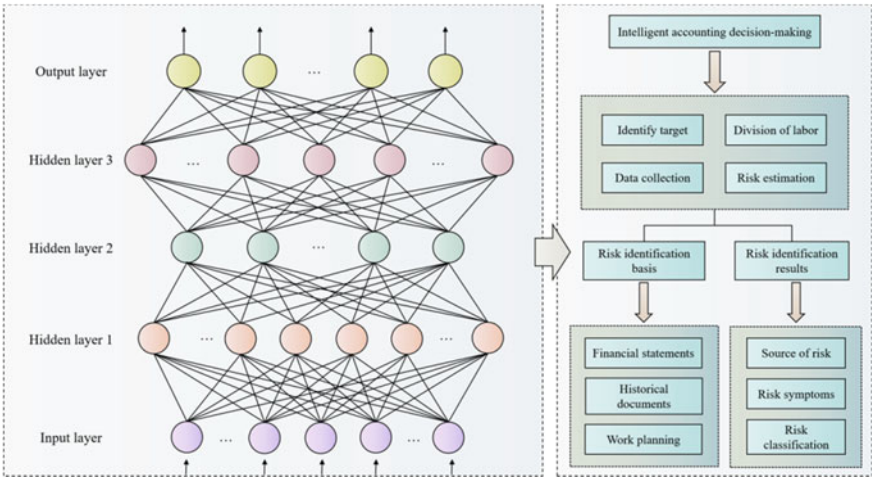

Fig. 4.1 DL model of enterprise accounting DSS

sharing services and the establishment of the data center. With the growth of business activities, financial data has been in the process of dynamic changes, so how to collect data efficiently when the management makes financial decisions is an urgent problem to be solved. The DL model of enterprise accounting DSS is shown in Fig. 4.1.

Enterprise investment decision-making is to use the raise funds to determine better or best investment projects in order to obtain investment income. When making investment decisions, enterprises need to analyze and evaluate the feasibility of investment schemes with specific indicators, including financial evaluation indicators, environmental evaluation indicators, risk evaluation indicators and the knowledge and experience of evaluation experts. The selection of models in the enterprise accounting decision-making system is to select from many models according to the characteristics of financial decision-making problems, and then link them as needed to form a composite model, so as to solve complex decision-making problems. Let the time series be $x_1, x_2, \ldots$, the moving average method can be expressed as:

$$F_{t+1} = (x_t + x_{t-1} + \cdots x_{t-N+1})/N \tag{4.1}$$

It is further derived as:

$$F_{t+1} = \frac{1}{N} \sum_{t-N+1}^{t} x_i \tag{4.2}$$

In the formula: x_t is the latest observed value, F_{t+1} is the predicted value of the next period. In order to calculate a moving average, it is needed to have N past values. After finishing, the calculation formula of the moving average method can be simplified as:

$$F_{t+1} = \frac{x_t}{N} - \frac{x_{t-N}}{N} + F_t \tag{4.3}$$

In order to make the system serve decision-making more effectively, enterprises should make use of some related emerging technologies in the computer field, such as DSS, neural network, data warehouse technology, DM, reasoning, etc., and further study and design functional financial DSS that meets the actual needs of enterprises to assist managers in making financial strategic decisions. Through data marts, users' behavior can be combined with the value created by finance through data, which is convenient for the financial department to clarify which services can be converted into benefits, thus providing more accurate performance assessment and feedback. Determine the data source by analyzing the decision-making requirements. Select the required data from the operable database, summarize and sort it out, and store it in different information layers of the data warehouse.

The amount of information in accounting decision-making is inversely proportional to the frequency of information, and the amount of information contained in different information can be accumulated. The Set sample set is written as:

$$S = \{s_1, s_2, \ldots, s_m\} \tag{4.4}$$

The sample categories are:

$$C = \{c_1, c_2, \ldots, c_k\} \tag{4.5}$$

Then the calculation formula of the sample information entropy is as follows:

$$\begin{aligned} H(S) &= \sum_{j=1}^{k} \sum_{i=1}^{m} p\left(s_{ij}\right) \log \frac{1}{p\left(s_{ij}\right)} \\ &= -\sum_{j=1}^{k} \sum_{i=1}^{m} p\left(s_{ij}\right) \log p\left(s_{ij}\right) \end{aligned} \tag{4.6}$$

where $p\left(s_{ij}\right)$ represents the probability that the sample point in the sample set belongs to the category c_j. Let the sample attribute set:

$$A = \{a_1, a_2, \ldots, a_t\}^T \tag{4.7}$$

Which has t different values. The sample set is divided into t sample subsets according to the attribute A, and the information entropy of the sample set is as follows:

$$H(S|A) = -\sum_{j=1}^{k} \sum_{i=1}^{t} p\left(a_{ij}\right) \log p\left(a_{ij}\right) \tag{4.8}$$

Among them, $p(a_{ij})$ represents the probability that the sample point belongs to the category c_i when the attribute A is a_i.

The establishment of the system completes the optimization and transformation of the traditional financial process, which makes the financial management mode more centralized, improves the efficiency of enterprise financial management and makes the decision more scientific and reasonable.

4.3 Result Analysis and Discussion

In the actual operation process, people find that it is not as easy as imagined to obtain useful information in the data ocean. Users of information use the data warehouse in a predictable and repetitive way. Information users instruct them what they want to know before using the data warehouse. They often visit the data warehouse regularly every day. In the process of visiting, they often only visit a small part of the data, and the results can often be obtained by visiting the data. The simulation operating system is Windows 11, the processor is Core i5 12400F, the graphics card is RTX 3060, the memory is 16 GB, and the hard disk capacity is 1 TB. After the data is stored in the data warehouse according to the unified format and different themes, the data can be expressed and accessed. According to the specific needs of enterprises for investment decision information, users can express and access the results in different ways through the purchased products and their supporting components. Analysts can directly calculate the investment payback period of the project in the non-discounted cash flow indicators, the net present value, the profitability index and the internal rate of return in the discounted cash flow indicators according to the needs of data analysis of specific different projects. The data outlier removal process is shown in Fig. 4.2.

The training samples are used to train the network and learn the weights after training. Then, the trained network is used to input the test network to verify the learning effect of the network. In the financial big data environment, the input sample is a full sample space, that is, all the data accumulated in production, circulation, consumption and management during the construction of financial big data. By training the whole sample space, the training results can be more accurate. Compare the output data of this model with the real accounting decision data, as shown in Fig. 4.3.

It is not difficult to see that the result of financial data forecast is convergent, which can approximate the original data well and has the basis for making decisions on accounting behavior. Different levels of applications have different algorithms for improving their capabilities and selecting them, which need to be selected and designed based on specific financial work scenarios. Knowledge diggers then use the data warehouse to explore why this effect occurs, and dig out the internal knowledge that produces these phenomena from the data warehouse. Intelligent financial applications need to learn and improve their performance by observing and adapting to their own environment, just like human beings in the process of dealing with

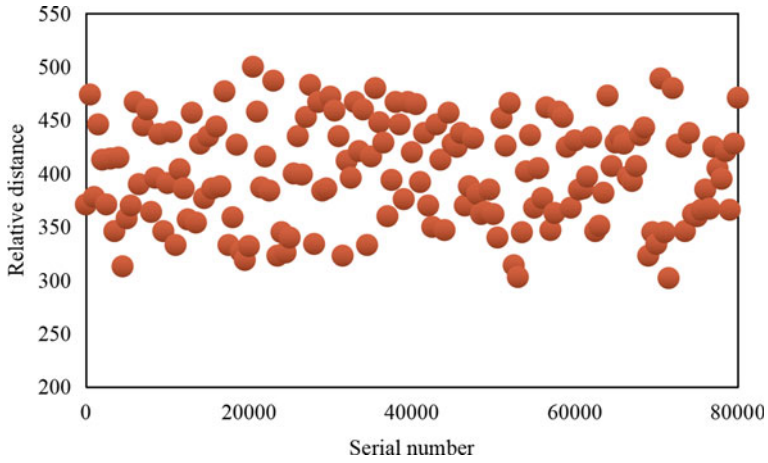

Fig. 4.2 Financial data processing to remove outliers

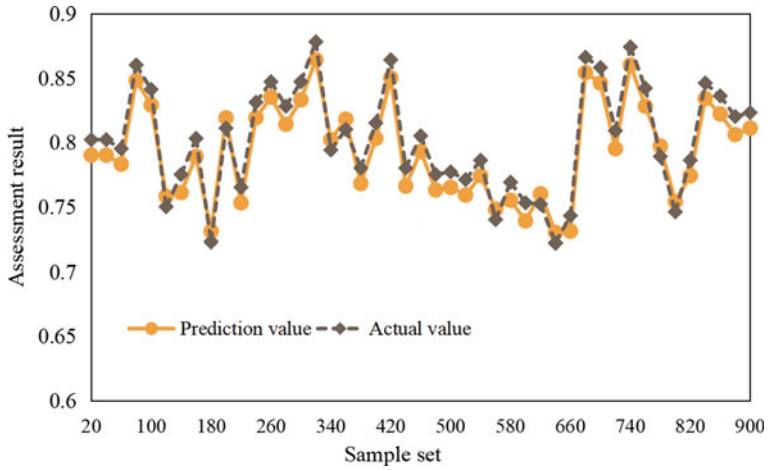

Fig. 4.3 Learning results of this model

repeated business and collecting data. Its data can be obtained from heterogeneous external data sources, online practical processing systems and other offline business data to support decision support and online analysis applications. Information users usually observe some general data or aggregate data, and seldom use some metadata or detailed data. From the nature of information users' work, they are often salesmen, who use some predefined queries to operate on general data and perform some simple processing. Compare the recall and accuracy of the algorithm in enterprise accounting decision, as shown in Figs. 4.4 and 4.5.

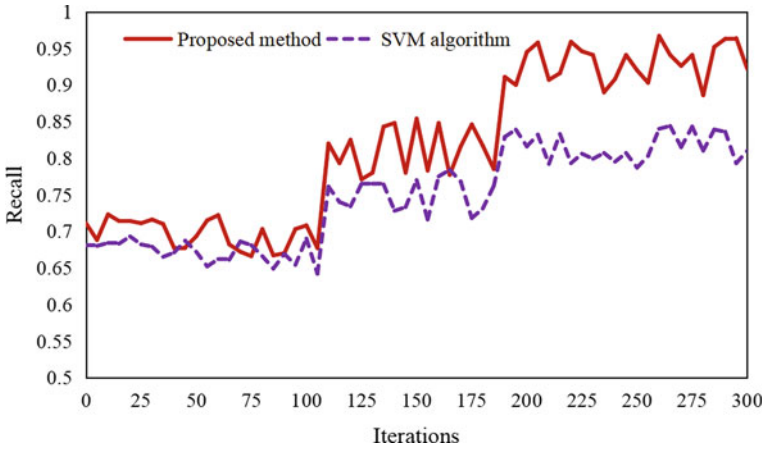

Fig. 4.4 Comparison of recall of enterprise accounting decision-making

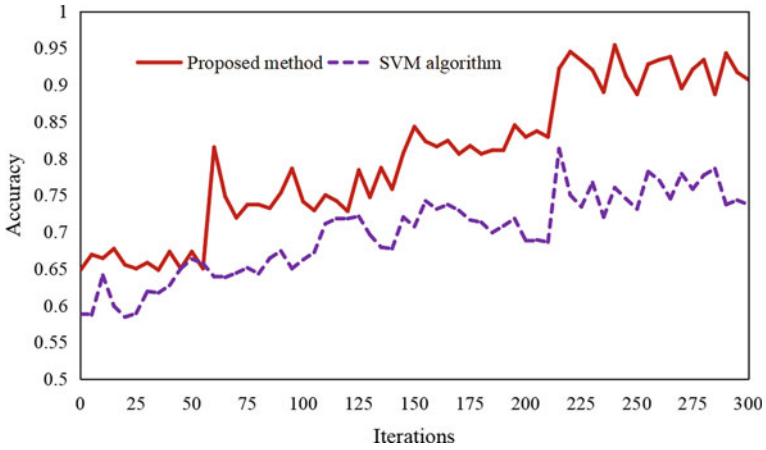

Fig. 4.5 Comparison of forecasting accuracy of enterprise accounting decision-making

When using data warehouse, information users often only involve the operation field of data warehouse. After submitting the query request, they often hope to get a response in a short time. Most of the queries submitted by these users are predefined queries. In order to complete these predefined queries, the designer of data warehouse must know the requirements, data structure and data content of these predefined queries during the design of data warehouse. From the test results, it can be seen that this algorithm is more accurate in enterprise accounting decision-making, which is 23.85% higher than the traditional SVM algorithm. Compared with the traditional data analysis methods, the enterprise financial DM algorithm in this article has higher decision-making accuracy and efficiency, and is more intelligent.

The IFDSS proposed in this article uses relational data storage format to store massive business data, and uses data warehouse and DM to greatly enhance the ability of data management expansion of the system. For the complex query request service, the parallel processing technology is adopted to optimize the decision support query, and at the same time, the query mode of multi-dimensional analysis can be realized.

4.4 Conclusion

Because enterprises are facing increasingly fierce competition, the traditional decision-making methods can no longer meet the requirements. Leaders demand the growth of high-level computer application systems, and it is imperative to develop the decision-supporting financial software. With the increasingly fierce market competition, applying DM to the field of financial management and promoting its intelligence can facilitate managers to grasp more valuable information and make effective decisions. This article puts forward a financial DM algorithm based on DL, which provides technical support for the construction of enterprise accounting DSS. From the test results, it can be seen that this algorithm is more accurate in enterprise accounting decision-making, which is 23.85% higher than the traditional SVM algorithm. Compared with the traditional data analysis methods, the enterprise financial DM algorithm in this article has higher decision-making accuracy and efficiency, and is more intelligent.

In this article, the structure and characteristics of the financial intelligent decision support system are studied, the basic concepts and characteristics of the decision support system are clarified, the problems existing in the current decision support system are discussed, and the architecture of the intelligent decision support system based on data mining technology is given. Although this article tries to introduce the knowledge base technology into the intelligent decision support system, the knowledge base is still at the conceptual level at present, and the future research field will focus on how to effectively explore, evaluate and analyze tasks and use AI technology for in-depth development.

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