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Research Article

Intelligent Decision-Making Model of Enterprise Management Based on Random Forest Algorithm

Zhecheng Huang

Guangzhou College of Technology and Business, Guangzhou, Guangdong 510000, China

Correspondence should be addressed to Zhecheng Huang; huangzhecheng@gzgs.edu.cn

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With the sustained and rapid development of China's economy, the business environment of enterprises is becoming more and more complicated. Coupled with the increasing international competitive pressure of enterprises, the management of enterprises needs more attention. The emergence of DSS provides an opportunity for enterprise management intelligent decision-making. Based on the in-depth study of RF algorithm, this paper proposes a new intelligent decision-making model for enterprise management, aiming at the shortcomings of traditional decision-making systems. In this paper, the decision-making process of the system for decision support is given. Through the quantification and evaluation of various data by subsystems, the best decision-making scheme with strong operability is provided for enterprises. And this model can effectively solve the problem of heterogeneity, duplication and clutter of data in traditional database, and avoid the loss of historical data. Through simulation, the accuracy of this system can reach 96%, which is about 17% higher than other systems. It has certain practicability and feasibility. It is hoped that the research in this paper will play an important role and service support for enterprise intelligent decision-making and further promote the development of intelligent enterprise management decision-making system in China.

1. Introduction

In the era of lack of information, enterprise management relies more on personal experience and wisdom to manage and make decisions. However, the development of modern information technology has greatly promoted the development of economy and productivity, and mankind has stepped into an information explosion era [1]. With the development of Internet technology, professional information service websites and various business websites are springing up like mushrooms after rain, and the content and scale of economic information on the Internet are rapidly expanding, which provides favorable conditions for scientific management decision-making by using information on the Internet [2]. In the current tide of market economy, more and more enterprises realize that correct and timely decision-making is an important link for the survival and development of enterprises [3]. Therefore, how to help enterprise management make the fastest and most scientific response and processing in the shortest time to face the vast data, so as to improve enterprise decision-making level [4]. So as to gain new competitive advantages, it will be particularly urgent and important. At present, the external environment faced by enterprise management is changing rapidly [5]. Business and its own environment is more complicated than ever before, and this complexity is increasing day by day, so it is very important to put forward scientific decision-making schemes in time simply by relying on the subjective judgment of decision makers [6]. Intelligent decision support system is a system that comprehensively utilizes a large amount of data, organically combines many models, mathematical models and data processing models, and assists decision makers at all levels to make scientific decisions through human-computer interaction [7]. IDSS (Intelligent Decision Support System) is an intelligent man-machine interactive information system based on AI (Artificial intelligence) technology, aiming at semistructured and unstructured decision-making problems, providing background materials, listing possible schemes, analyzing and comparing, etc., to help managers make correct decisions [8]. It greatly expands the functions of database and model base, that is, the development of DSS makes MIS (Management Information Systems) rise to a new level of intelligent decision support system.

In such an information age, enterprises will face huge amounts of data and information, and "ignorance" will become the greatest threat to modern enterprise management and decision-making [9]. The emergence of DSS is to solve the problem that computers can automatically organize and coordinate the multimode operation, access and process data in a large number of databases, and achieve a higher level of auxiliary decision-making ability. The new feature of DSS is the addition of model base and model base management system [10]. It effectively organizes and stores numerous mathematical models, data processing models and broader models, and establishes the organic combination of model base and database. In the process of decision-making, the role of information also depends on the knowledge background and thinking style of decision makers, and it is necessary to comprehensively consider the relationship among data, information and knowledge and its influence on decision-making behavior [11]. Combining data-driven decision-making with knowledge-based system, and looking for decision-making basis from the operating environment and background of enterprises, can better realize enterprise decision-making objectives [12]. The traditional intelligent decision support system based on [13] is limited in its application range because of the system structure and numerical analysis method with model-driven as the core. At present, the traditional IDSS has the following shortcomings: scattered data, inconsistent data interfaces, and access problems of historical data. In order to improve the intelligent decision support system and make the traditional decision system support the intelligence of the system, this paper puts forward an intelligent decision model of enterprise management based on RF (Random forest) algorithm. This system can make up for the shortcomings of traditional database system, and it has certain advantages. The innovations of this paper are as follows:

(1) Aiming at the shortcomings of traditional models, this paper puts forward the application of RF algorithm in enterprise management intelligent decision-making model. Every object in this system corresponds to a macroanalysis field, which makes data analysis and processing modular. And the data entering the database is unified in structure and coding mode, which solves the problems of heterogeneity, repetition and jumble of data in traditional database

(2) In this paper, the tolerance of RF to noise and the treatment of imbalance classification are further studied, and the parameter selection of the model is experimentally analyzed, and some practical conclusions are drawn. And after verification, this system has certain stability. The data after integration will not be easily modified and deleted, thus avoiding the loss of historical data

The specific chapters of this paper are arranged as follows:

The first chapter of this paper discusses the background and significance of the topic selection and expounds the research contents and innovations of the article. The second chapter summarizes the related research results of the existing literature at home and abroad and gives the research ideas and methods of this paper. The third chapter is the method part. In this chapter, firstly, the basic concepts and structures of enterprise management and IDSS are deeply studied. Then, the related theory of RF method is introduced. This paper focuses on the application of RF in intelligent decision-making of enterprise management. Finally, the design and implementation of the enterprise management intelligent decision-making model based on RF are proposed. In chapter four, the model constructed in this paper has been tested for many times, and the performance of the model is analyzed. The fifth chapter is the conclusion part, which summarizes the empirical research results of "Intelligent Decision Model of Enterprise Management", and puts forward the shortcomings and future prospects.

2. Related Work

With the development of computers and networks, many enterprises have established their own information management systems. However, these systems have obvious limitations, especially in supporting decision-making and have gradually failed to meet the requirements of the coming information age. Under the modern environment, how to make the right decision in time is an important part of enterprise management and plays a decisive role in the good development of enterprises. Based on this, Perez-Luno et al. proposed the shortcomings of traditional IDSS and built an intelligent decision-making system based on database technology [14]. Shao expounded the importance of IDSS to modern enterprise management and its basic structure [15]. Gibbons and Hazy mainly used data warehouse technology to build an intelligent decision-making model [16]. Goldstein and Frank pointed out that the rapid development of information network has changed the way of information transmission from hierarchical to horizontal, not only leading units can make decisions but also executive units can make quick decisions based on real-time conditions. These all bring new challenges to the management decision-making of modern enterprises [17]. Douglas et al. believe that the architecture of business intelligence refers to the main framework for providing business intelligence system applications by identifying and understanding the flow process of data in the system and the application process of data in the enterprise [18]. On the basis of analyzing the impact of Internet development on EIDSS, Foss et al. studied the network model and system framework model of Internet-based EIDSS (Enterprise intelligence decision support systems) [19]. Vesyropoulos et al. gave a detailed introduction to decision tree and RF in big data environment. And these two methods are applied in the management decision analysis of the enterprise to realize the prediction of the information and then assist the managers of the enterprise to make decisions [20]. Saxton et al. made corresponding analysis and proposed solutions for the problems and difficulties often encountered in the implementation of intelligent decision-making and automatic control in the development of enterprise management systems [21]. Wu et al. conducted in-depth research on the design of intelligent financial intelligent decision support system and established the basic framework of intelligent financial intelligent decision support system. Taking the investment forecasting decision-making subsystem as an example, the application of the DM (Data mining) model in the intelligent decision-making support system is given [22]. Geary et al. pointed out that IDSS is based on management science, operations research, cybernetics, and behavioral science, using computer technology, simulation technology, and information technology as means, aiming at semistructured decision-making problems, supporting decision-making activities with intelligent functions man-machine system [23].

In this paper, the related literatures are deeply studied, and then, the enterprise management intelligent decision-making model based on RF algorithm is proposed. In this paper, we combine fuzzy mathematics to transform binary classification data into multiclassification data, then input it into RF model for training and prediction, and get a fuzzy RF model that can make multiclassification prediction. The contribution function is introduced to decompose the prediction process of the original RF model and quantify the contribution of each index in the prediction process. Through the data collection and analysis subsystem, the system puts forward several plans for decision makers to choose according to predetermined procedures and specifications, which can effectively reduce and avoid decision-making mistakes, shorten decision-making time, and improve decision-making effect. This research has practical guiding significance for the practice of enterprise management intelligent decision-making.

3. Methodology

3.1. Enterprise Intelligent Decision Management. Now, the functional scope of enterprise management system is no longer limited to the original information data recording and saving functions. With the increasing complexity, relevance, and timeliness of contemporary enterprise affairs, people's requirements for enterprise management system are getting higher and higher [24]. Information network has not passively adapted to the original management business process but actively promoted the rational reorganization of management business process and integrated various interrelated management functions. This makes modern enterprise management very different from traditional enterprise management. For modern enterprises, data can be regarded as an important asset. But only when data is used can it generate real value. The results show that the data processed by enterprises will double every five years. Excessive data duplication and inconsistency will be the problem that most enterprises will face. This makes it difficult for enterprises to use, manage effectively and use these data in the decision-making process [25]. Therefore, what the market needs is a system that can turn data into reliable and usable information. One of the key points to realize the intelligentization of enterprise management system is to convert data into information through certain technical methods and display it in a specific mode.

With the rapid development of computer technology and new demands from business circles, in recent years, computer computing has begun to expand in two different directions: breadth computing and depth computing. On the one hand, the application scope of computers should be expanded as much as possible, and extensive data exchange should be realized at the same time; on the other hand, people put forward higher requirements for simple data operation of computers in the past, hoping that computers can participate more in data analysis and decision-making and other fields. The so-called decision-making is a method of thinking analysis, which includes a series of processes of constantly knowing things, generating solutions and solving problems [26]. Enterprise decision-making is to analyze the current situation of enterprises based on some data and decide to take corresponding measures to promote the development of enterprises. But it may not be easy for decision makers to find these data in numerous enterprise information systems. The core of decision-making lies in analysis, comparison, and optimization, that is, after careful inference and analysis, choose an optimal or suboptimal scheme from multiple alternative decision-making schemes. Intelligent decision support system is a system that comprehensively utilizes a large amount of data, organically combines many models, mathematical models and data processing models, and assists decision makers at all levels to make scientific decisions through human-computer interaction.

Intelligence science and technology is the core of information science and technology, the frontier and commanding point of modern science and technology. The study of it makes human self-knowledge and self-control, and the application of it can raise the daily management work to a new height. Among them, IDSS is an intelligent man-machine interactive information system which aims at semi-structured and unstructured decision-making problems by providing background materials, helping to clarify problems, modifying and perfecting models, enumerating possible schemes, analyzing and comparing, etc., and helping managers to make correct decisions. DSS organically combines human-computer interaction system, model base system and database system. It greatly expands the functions of database and model base, that is, the development of DSS makes MIS rise to a new level of intelligent decision support system. DSS makes those problems that cannot be solved by computer gradually become ones that can be solved by computer. Implementing intelligent learning and assistant decision-making in enterprise management system is the process of collecting, managing, and analyzing the information involved in enterprise business. The purpose is to enable decision makers at all levels of enterprises to gain knowledge or insight and to make more favorable decisions for enterprises and businesses. The architecture of EIDSS based on RF in this paper is shown in Figure 1.

Decision-making process and decision-making model are dynamic, which are dynamically determined according to different levels of decision-making, surrounding environment, internal conditions of enterprises, user requirements, people's understanding of decision-making problems, and acquired knowledge at present. In addition to storing various

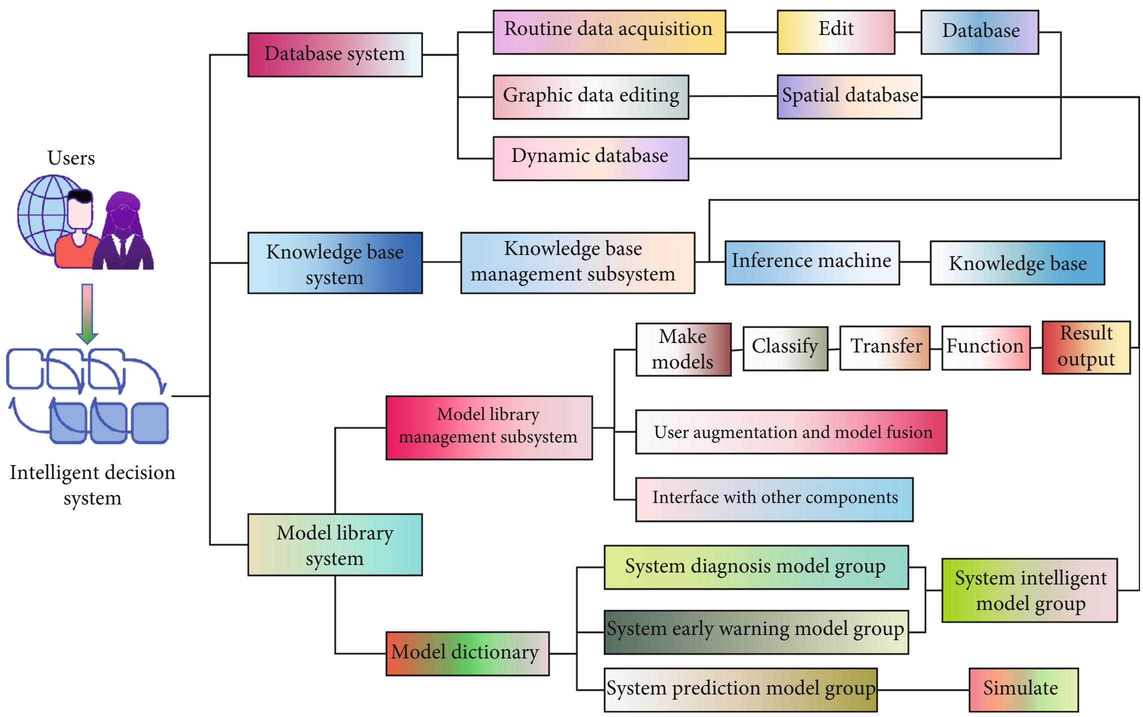

Figure 1: RF-based EIDSS architecture.

data related to activities, the system also stores a knowledge base of various specialized knowledge and experience related to decision-making, and various mathematical models and economic management models and methods are also stored in the model base in a certain organizational form for flexible calling. DSS is mainly composed of problem handling and human-computer interaction system, model base system, database system, and so on. The expert system mainly consists of knowledge base, inference engine and knowledge base management system. Generally speaking, intelligent learning and decision-making in enterprise management system is a tool that transforms data in enterprises into information and then becomes knowledge to help operators in enterprises make wise business decisions. The data mentioned here includes not only the order, inventory, transaction accounts, customers, and suppliers of the internal business system of the enterprise but also various other external data of the enterprise's environment. DSS inputs the factors that the computer cannot handle into the computer through a large number of repeated and frequent man-machine dialogues and inspects the discovered knowledge from different angles [27]. And express it in different forms, and express the requirements and results of data mining with high-level language and graphical interface, so as to regulate and influence the decision-making process.

DSS gives full play to the characteristics of solving qualitative analysis problems in the form of knowledge reasoning and also gives play to the characteristics of solving quantitative analysis problems with model calculation as the core. It fully combines qualitative analysis with quantitative analysis, which greatly develops the ability and scope of solving problems. Decision-making can be divided into high-level decision-making, middle-level decision-making, and operation decision-making according to the management level of enterprises. High-level decision-making focuses on solving the relationship between enterprises and external environment. The middle-level decision-making focuses on how to organize internal forces and master the operation progress. Operation decision is to effectively use existing resources to complete various activities, implement middle-level decisions, and realize high-level decisions. Enhancing the effectiveness of shareholders' meeting and board control in modern corporate governance theory is an important issue to be solved in the reform of corporate governance system and governance structure. The development of Internet provides a convenient, fast, and low-cost means for shareholders, directors and other business owners and senior managers to participate in business decision-making and strengthen the control of enterprises. Obviously, shareholders, directors, and other decision makers need the support of EIDSS including group intelligent decision support system to participate in business decisions in different places.

3.2. Implementation of EIDSS Based on RF. The first step to implement enterprise intelligent decision-making is to collect the original transaction data in the past. In the collection of original information, we should try our best to do two things, which are also two difficult points of data collection. (1) Try to ensure the authenticity of the data. (2) Collect the information of all relevant factors as much as possible. RF is a combined classifier algorithm [28]. The RF algorithm constructs different training sets by bootstrap method and uses CART (Classification and Regression Tree) method to build decision trees for each training sample and uses different feature sets to increase the differences between classification models. Finally, the decision trees based on different data sets are combined, and the final model results are predicted by voting method [29]. In the traditional CART algorithm, each internal node is a subset of the original data set, and the root node contains all the original data. At each internal node, find the best way to split from all attributes. Then, split the subsequent nodes in turn until the leaf nodes; finally, the test error is minimized by pruning. The basic core idea of RF is to increase the internal differences of the model by building some independent and related decision trees. These internal differences enable RF to make a correct judgment on complex data. In order to effectively support the senior managers of enterprises, the intelligent decision support system needs to have sufficient information, so it is often necessary to access a large number of data from different data sources, current or historical data. Then, the specific and detailed data are synthesized, summarized, and generalized. A large amount of pure data is of little help. It is necessary to turn a large amount of original, disorderly, and ubiquitous information into data useful for the future and supporting decision-making. This process is the process of constructing the data model and implementing it. The design of intelligent decision support system must meet the overall goal of the system. First of all, the system not only supports structured decision-making in enterprise management decision-making but also supports semistructured and partially unstructured decision-making. Secondly, the system should support the management problems of different management levels of enterprises. Finally, the system needs to be able to support users to modify and expand the database, model base, method base, and knowledge base. At the same time, it provides good data transmission function. A decision tree often has multiple leaf nodes, and the path from the root node to different leaf nodes represents different discrimination rules, but there is only one best discrimination rule for a given single study case. The process of enterprise data storage and intelligent decision-making is shown in Figure 2.

The framework of data model is the core of intelligent system implementation. Whether the framework of data model is reasonable and expandable directly determines whether the intelligent system can be implemented successfully and to what extent. Combine multiple models into a larger model in the model base, and access a large amount of data in the database to form a decision-making scheme of the problem. Running the scheme on the computer can calculate the result of the scheme, complete the evaluation of the scheme, and provide a strong basis for decision makers. The system implementation structure includes three main bodies. They are as follows: (1) model base system is the basis of decision support and provides the auxiliary decision information of quantitative analysis model calculation for decision problems; (2) database system extracts comprehensive data and information from the data warehouse, which reflects the intrinsic nature of a large amount of data; and (3) expert system is mining knowledge from a database and data warehouse and putting it into the knowledge base of an expert system, the expert system for knowledge reasoning can achieve qualitative analysis to assist decision-making. In order to improve the prediction accuracy of RF, the correlation between trees should be reduced and the classification efficiency of a single tree should be increased. Bagging method is used to form a new training set and randomly select features to split, so that RF can tolerate noise better and reduce the correlation between individual trees. A single tree can get low deviation without pruning, which ensures the classification efficiency of the classification tree. Single classifier has its potential shortcomings, but ensemble learning can gather multiple single classifiers to learn from each other's strengths and improve the performance of classifiers. Learning needs to construct a series of different metaclassifiers, then combine these classifiers in some form to predict, and finally get a comprehensive evaluation result.

Assuming that there is a combined classifier consisting of N binary classification models, where the classification error rate of each individual classification model is P, when voting is performed using a majority-minority voting strategy, the aggregated error formula is

$$p_{\text{error}} = \sum_{k=0}^{N/2} \binom{N}{k} (1-p)^k p^{N-k}. \quad (1)$$

It can be seen that when the value of p is less than 0.5, the error rate p_{error} becomes smaller when the value of N increases. The entropy of information is calculated by the probability of occurrence of the information. The expression of information entropy is

$$E(S) = \sum_{i=1}^{c} -p_i \log_2 p_i. \quad (2)$$

Among them, S is the random variable of the event, c is the number of results of the measured information, and P_i is the probability of occurrence of the ith result. The calculation expression of conditional entropy is

$$E(S, X) = \sum_{x \in X} p(x) E(S|X = x), \quad (3)$$

where X is a given attribute of the information and $p(x)B$ is the probability of the attribute value $X = x$. Mutual information is used to measure the degree to which the observed attribute results can reduce the uncertainty of the information, and its expression is

$$\text{Gain}(S, X) = E(S) - E(S, X). \quad (4)$$

Architecture data model should not only have professional data processing ability and knowledge DM but also be familiar with actual business processes. The database system includes two parts: database and database management system. A database is a collection of related data organized together according to a certain structure, and data can be queried, added, deleted, and modified through the database management system. The model base system consists of two parts: model base and model base management system. Model base is a collection of many models organized

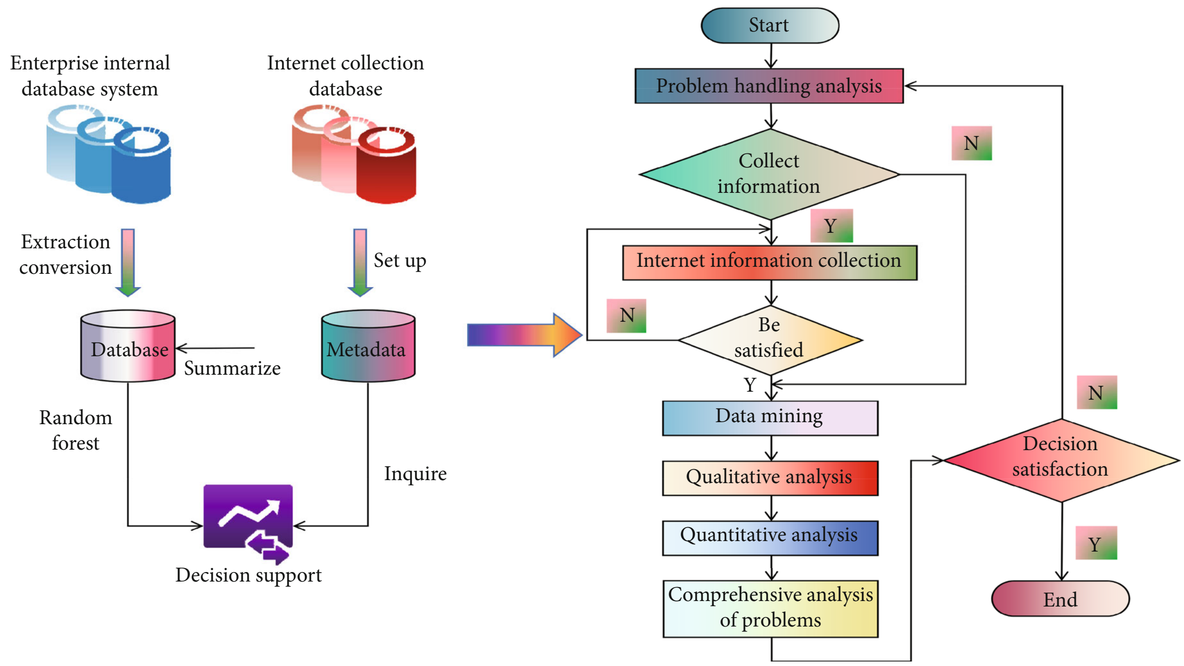

Figure 2: Enterprise data storage and intelligent decision-making process.

according to a certain structural form. Like database, it is a shared resource, and the models in the library can be reused. In order to introduce randomness into RF model, we use the method of randomly selecting features when training decision trees. In this way, the correlation between trees in RF can be reduced, and the relationship between trees can be maintained. Each tree uses a random vector generated from a fixed random probability as its input, and the random variables can be synthesized in many different ways during the training process. The ability of a classifier to correctly classify data outside the training set is called generalization, which is the goal of each learning algorithm to optimize. Generalization error is the misclassification rate of data outside the training set. m evaluation indicators constitute the evaluation value of n programs. The evaluation of n schemes by each evaluation index can be represented by the index feature quantity, namely,

$$X=\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} = \left(X_{ij}\right)_{m\times n}. \tag{5}$$

In the formula, $X_{ij}(i=1,2,\cdots,m;j=1,2,\cdots,n)$ is the index feature quantity of the ith evaluation factor of the jth scheme. Use the following formula to calculate the set-valued statistic x_{ij} of the i index of the jth scheme, namely,

$$X_{ij}=\frac{1}{2}\sum_{k=1}^{n}\left[\left({x_{2ij}}^{(k)}\right)^2-\left({x_{1ij}}^{(k)}\right)^2\right]/\sum_{k=1}^{n}\left[\left({x_{2ij}}^{(k)}\right)-\left({x_{1ij}}^{(k)}\right)\right]. \tag{6}$$

Define the strength of RF as the expectation of the edge function:

$$s=E(mr(X,Y)). \tag{7}$$

The strength estimate of the RF classifier is

$$s=\frac{1}{n}\sum_{k=1}^{n}\left[Q(X_i,Y)-\max_{\substack{j\neq Y\\ i=1}} Q(X_i,j)\right]. \tag{8}$$

Then, the correlation between the decision trees is

$$\bar{\rho}=\frac{\operatorname{var}(mr)}{sd(h(*))^2}=\frac{1/n\sum_{k=1}^{n}\left[Q(X_i,Y)-\max_{\substack{j\neq Y\\ i=1}} Q(X_i,j)\right]^2-s^2}{\left(1/k\sum_{u=1}^{k}\sqrt{p_u+\bar{p}_u+\left(p_u-\bar{p}_u\right)^2}\right)^2}, \tag{9}$$

$$p_u=\frac{\sum_{(x_i,y)\in O_i} I(h(x_i)=y)}{\sum_{(x_i,y)\in O_i} I(h(x_i))}, \tag{10}$$

$$\bar{p}_u=\frac{\sum_{(x_i,y)\in O_i} I\left(h(x_i)=y_j\right)}{\sum_{(x_i,y)\in O_i} I(h(x_i))}. \tag{11}$$

Among them, Pu represents the correct classification proportion of OOB (Out of bag data) samples; $\bar{P}u$ represents the proportion of OOB samples that are wrongly classified into multiclass samples y_j. $sd(h(*))$ is the square of the standard deviation of the RF classifier, and var (mr) is the variance of the marginal function.

If the result of the transaction accords with the result of the model formula, the accuracy of the model formula is enhanced. Otherwise, the accuracy of the model formula will be weakened. When the actual result of a transaction does not match the result of the model formula, it is necessary to study the transaction instance, find out the defects in the model formula, and update it. In this paper, the system uses relational data storage format to store massive business theme data, which enhances the ability of management and expansion of large data system. Parallel processing technology is used to process complex query request service, which realizes decision support query optimization and supports multidimensional analysis query mode. Based on RF algorithm, IDSS strengthens enterprise process management and standardizes business management with the help of workflow technology. Multiple mining of data produces a large amount of information that can be referenced by decision makers and provides support for enterprise decision-making.

4. Result Analysis and Discussion

In this section, the proposed RF-based algorithm is simulated and verified on MATLAB, and its performance is analyzed. The experimental data in this section should be normalized first. When it is not normalized, too large a value will cause confusion in numerical calculation. The biggest advantage of normalization is that it eliminates the influence of dimensions. Without normalization, the indexes with larger values will weaken the influence of those indexes with smaller values on the model. We usually normalize each index to [-1,+1] or [0, 1]. According to the defined enterprise data warehouse model, it extracts, cleans, purifies and loads the business data, clears, empties, removes and converts the format, adjusts the original data and its organization, and provides a stable and reliable data source for the follow-up inquiry, report, multidimensional analysis, DM, and other applications. Five feature subsets can be obtained by selecting features with quintuple cross data. The feature selection of quintuple crossover data is made for the model, and the experimental results are shown in Table 1.

In bootstrap sampling, in theory, there will be a part of the original sample that has never been sampled, and this part of the sample is called OOB sample. These samples are used to test the generalization ability of the model, namely OOB estimation method. The variation range of OOB error is calculated by the variation of RF characteristic variables, and then, the importance of variables is estimated. We used the methods of literature [19], literature [20], and RF to predict the data. The predicted results are shown in Figure 3.

From the figure, we can see that with the increase of iteration index, the prediction results become more accurate and the error becomes smaller and smaller. Compared with the algorithms in literature, RF algorithm has higher efficiency and better scalability.

Table 1: Feature subsets for quintuple crossover data selection.

Data set	Feature subset
Train1	3,6,8,9,10,13,14,21,24,26
Train2	5,6,8,9,10,13,14,19,24,26
Train3	3,5,6,8,9,10,13,14,24,26
Train4	3,6,8,9,10,13,14,16,19,24,26
Train5	3,5,6,8,9,10,13,14,24,26

According to the complexity of the actual transaction process, some data models will be very complicated, requiring a lot of logical judgments and jumps; some may be very simple, even with a simple logical judgment. Either way, you can first refine the process and divide a large complex process into several small processes. Then, put them together and make overall plans. IDSS uses DM to deeply analyze and mine historical, clear, internal, customer's and other multilevel and multiangle information and uses RF method to calculate and analyze the effective information, so as to assist decision makers to make strategic and tactical decisions. Realize the dynamic and intelligent decision-making of enterprises. In order to verify the performance of this algorithm, the simulation experiment is carried out, and the comparison of recall rates of different algorithms is shown in Figure 4.

In this paper, the outlier metric defined by RF algorithm is used to calculate the outlier metric of sample points, and then, a threshold value is determined to delete the sample points whose outlier metric value is greater than the threshold value. When the algorithm is trained, the voting test strategy is adopted to determine the final output after obtaining the results of all single submodels. The intensity of RF and the correlation between trees are related to the sample size of the initial training model. Because each node is only a part of the total input data, randomness will improve the training speed. The mixing matrix based on the discrimination result of contribution decision function is shown in Table 2.

In this paper, the indicators of enterprise investment decision-making evaluation are selected from the general index system according to the specific index data of the evaluation object, which can collectively represent the performance of enterprise investment decision-making. At the same time, due to the defects of data and statistical methods, the statistical data of all aspects cannot be completely copied by mathematical statistics methods, but should be integrated into people's subjective judgment. By combining subjective and objective judgment, the index system for specific evaluation objects is finally determined. This system comprehensively considers all possible factors affecting performance, defines these factors in the system in advance, and selects corresponding models for performance evaluation according to different possible problem types and their influencing factors. In this paper, the correlation between indicators is analyzed, and the evaluation index system is obtained after the highly linear correlation indicators are eliminated. The feature subset selected in this paper refers to the feature subset that can achieve the best classification effect and contains

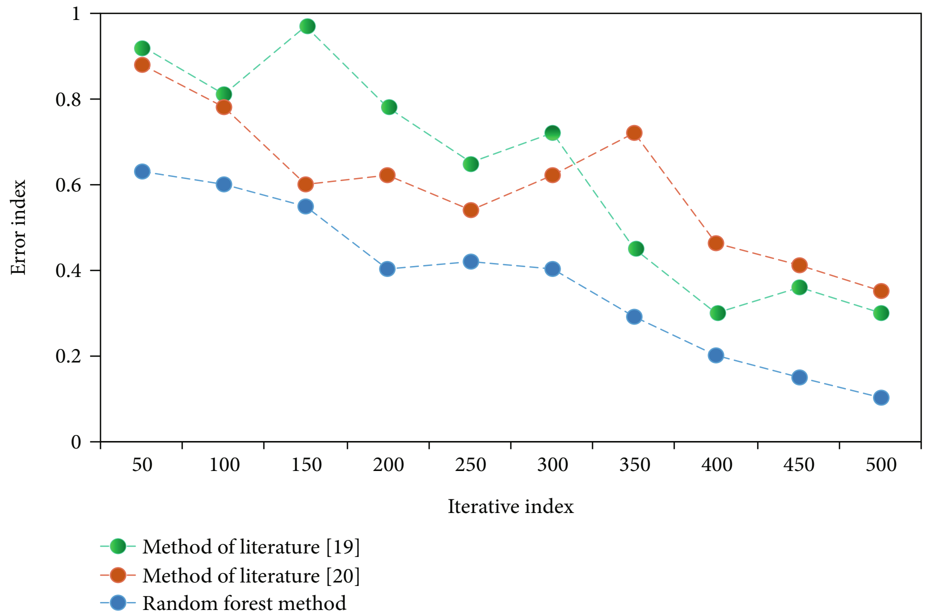

Figure 3: Prediction results of different methods.

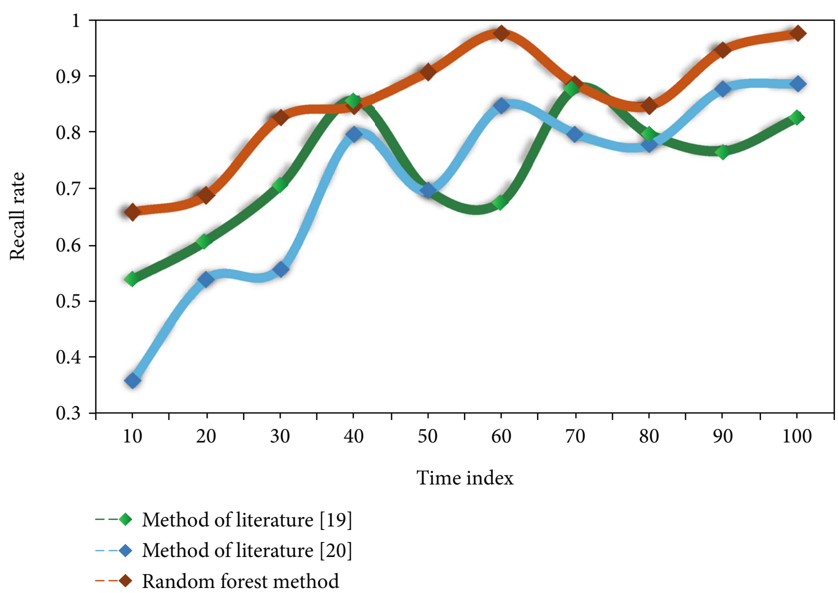

Figure 4: Comparison of recall results of different algorithms.

Table 2: Mixed matrix based on the discriminant result of the contribution decision function.

Mixed matrix		Forecast Positive sample	Forecast Negative sample	Total
Reality	Positive sample	110	8	118
	Negative sample	12	94	106
Total		122	102	224

relatively few features. Establish an evaluation model with training data with noise, and test the accuracy of the model with test data. Figure 5 shows the variation of error rate with noise.

The data of data warehouse in IDSS is oriented to analysis organization, which is more suitable for decision analysis than traditional database oriented to application organization. Data warehouse is rich in data types, large in data capacity, and long in storage time, which provides sufficient information for forecasting trends and making decision strategies, and makes decision-making schemes more objective. The operator of business affairs in the enterprise and the

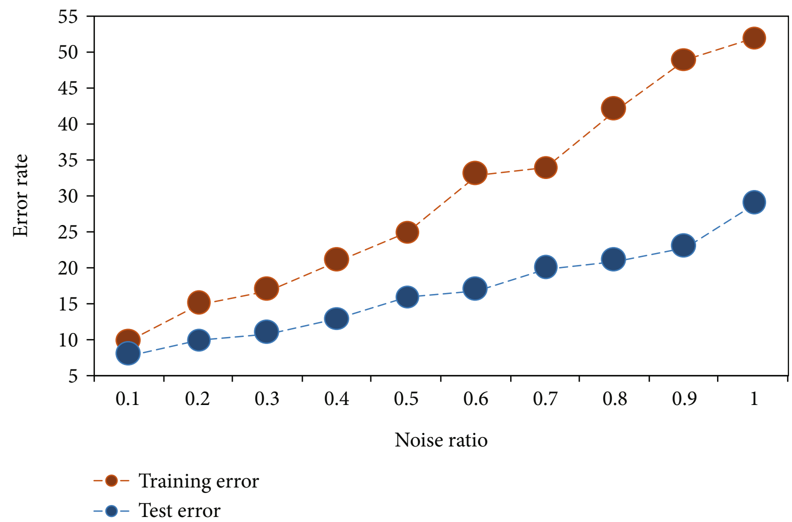

Figure 5: Error rate as a function of noise.

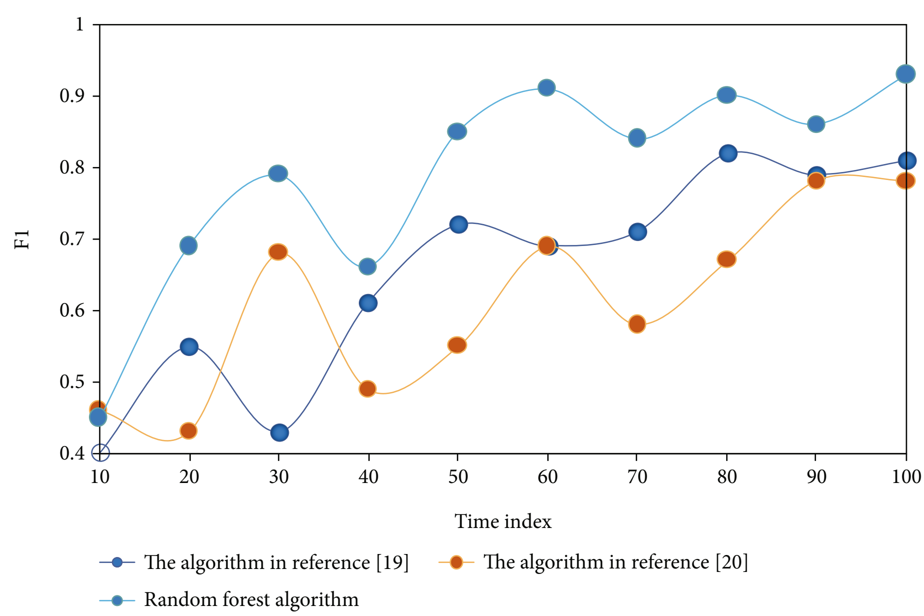

Figure 6: F1 value of different algorithms.

model formula used to complete intelligent decision-making in the system are mutually influential. On the one hand, transaction handlers help themselves to make correct choices and judgments with the help of the auxiliary results of model formulas. On the other hand, the model formula will track every actual operation of the actual transaction operator and adjust itself according to it. When cross-validation is used to validate the combined classification model, because the sample data used in its validation is based on the whole original data set, it will have the disadvantage of excessive computation, which will obviously reduce the efficiency of the whole model. RF integrates multiple decision trees to avoid overfitting of a single decision tree, so it also has a good prediction effect for data outside the training set, which is the characteristic of small generalization error of RF. In this paper, comparative experiments are carried out, and the F1 values of different algorithms are shown in Figure 6.

Relative to cross-validation, when OOB is used as the test data of the whole model, the out-of-pocket error of each decision tree can be calculated while training it. To get the generalization error of the combined model, only a small amount of calculation is needed to calculate the out-of-pocket error. This process shows that when OOB is used to verify the model, the verification effect is not worse than that of cross-authentication, and the efficiency is higher than that of cross-authentication. When the index value dimension of continuous variables is too large, the evaluation speed of RF algorithm is often slow, so we can consider discretization of continuous variables. By discretizing continuous variables, the distribution interval of variables is

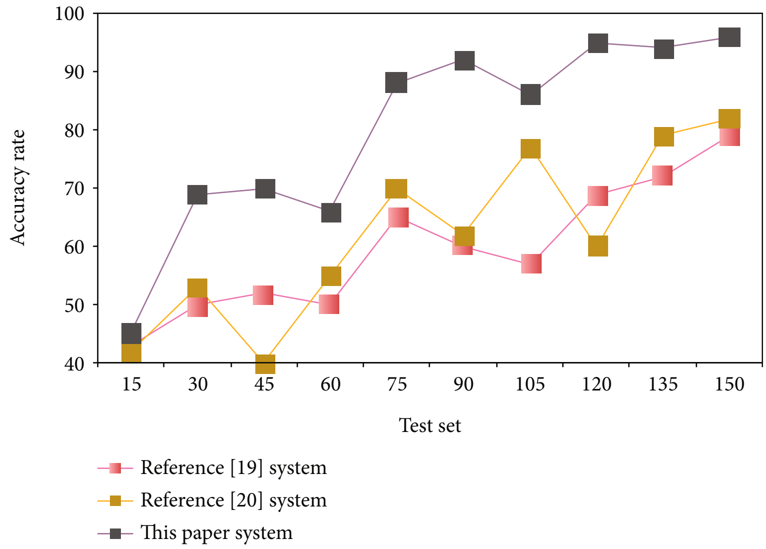

Figure 7: Model accuracy experimental results.

reduced, and the algorithm efficiency is improved. For outliers, discretization of continuous variables can also reduce its influence on classifiers. In order to verify the feasibility of the model constructed in this paper, we make experimental analysis on the decision accuracy of different models and get the results as shown in Figure 7.

It can be seen from the figure that the decision-making accuracy of this model is the highest compared with the other two models. It has certain superior performance. In this chapter, several simulation experiments were conducted to verify the performance of the EIDSS based on RF. The experimental results show that the system in this paper has good performance and is practical. And the accuracy of the system can reach 96%, which is about 17% higher than other systems. Systematic performance has reached a high level.

5. Conclusions

With the rapid development of market economy, more and more enterprises realize that correct and timely decision-making is an important link for the survival and development of enterprises. DSS can automatically and quickly obtain valuable decision-making information by deeply mining and analyzing current and historical production business and related data and quickly provide accurate and convenient decision-making support for enterprises. As a new information system formed by introducing AI technology into intelligent decision support system, it is increasingly becoming one of the important and effective technical support means of modern enterprise management. Based on RF algorithm, this paper mainly designs and implements the intelligent decision model of enterprise management. This paper obtains useful data from different data sources, cleans up the data to ensure the correctness of the data, and stores the data in data warehouse or data field after transformation and reconstruction. Data collation and analysis. Processing information through appropriate inquiry and analysis tools and DM tools; information presentation and representation. Present the knowledge needed for management and decision-making to users to support management and decision-making. The experimental results are consistent with the assumption. The accuracy of this system can reach 96%, which is about 17% higher than other systems. This system has certain practicability and feasibility. Through this method, we can make multiangle and multilevel analysis on the completion of enterprise production and planning and related environmental data, so that enterprise decision makers can grasp the operation and development trend of enterprises in time. It also provides theoretical guidance for making production plans and long-term plans and improves the management level and competitive advantage of enterprises. Obviously, the research in this paper has made some achievements, but in view of my knowledge level, research time, and other limitations, there are still some places to be improved. In the future work, knowledge representation and reasoning technology will be deeply studied.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

No competing interests exist concerning this study.

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