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Ecological Financial Management of Artificial Intelligence Data E-Commerce Green Environment

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Abstract: Science and technology have been greatly developed in today's era, especially the application of artificial intelligence data, which has caused the society to pay more attention to the ecological financial management in the green environment of e-commerce. From 2018 to 2021, small and medium-sized enterprises were selected as research samples, and the RS (Rough Sets)-artificial intelligence model and the classic Logistic model were comprehensively, and this paper systematically compares and analyzes the early warning accuracy of ecological financial management of enterprises under the green environment of e-commerce in China. It was concluded that the RS-artificial intelligence model was more accurate for the early warning degree of ecological financial management, and the artificial intelligence single classifier was introduced to the existing financial crisis to establish the ecological financial management early warning model. The early warning model of ecological financial management analysis of ecological enterprises based on artificial intelligence data analysis of e-commerce green environment highlighted the advantages of using artificial intelligence data models to analyze the ecological financial management of enterprises with stronger objectivity and interpretability. At the same time, it had a high early warning accuracy rate of 98%, which was 17% higher than that without the use of artificial intelligence data algorithms.

1. Introduction

The use of artificial intelligence data models will bring huge opportunities for the transformation of enterprise ecological financial management methods and the improvement of work efficiency [1]. Through the application of artificial intelligence data technology, the information distortion rate of enterprise ecological financial management can be effectively reduced, and the complex daily affairs of financial personnel can be reduced, thereby improving the quality of financial information management. With the development of network information technology, the green environment of e-commerce is becoming more and more perfect. Therefore, the scope of application of the e-commerce model is becoming more and more extensive, which has actually changed the development and operation mode of the economy to a certain extent [2]. This makes it difficult for many enterprises to adapt to the green environment of e-commerce, and there are many problems in

ecological financial management, which further affects the survival and development of enterprises. Therefore, by combining the RS-artificial intelligence model and the classic Logical model, this paper systematically compares and analyzes the early warning of ecological financial management of enterprises in the green environment of e-commerce in China.

In terms of ecological financial management, many scholars have made a series of related research reports. Xiao C believed that sustainable development had a negative impact on the company's development, but the company needs to make sustainable development improvements [3]. Hrza F studied the important impact and changes of the global economic crisis on the government's ecological financial management, as well as the response speed of the government departments by studying the basic impact and changes of the global economic crisis on the Czech municipal ecological financial management [4]. Zhao W studied the need of restructuring the environmental financial management of offshore companies and the application of big data in the environmental financial management of the company [5]. Jiang X Z believed that with the development of social networks and modernization, the ecological financial management of enterprises had changed from the traditional management mode to the computerized management mode, and the work efficiency and efficiency of the financial department of the enterprise had been significantly improved [6].

Regarding artificial intelligence data analysis, its research has always been very hot, and relevant research reports are emerging one after another. Babu N V utilized various artificial intelligence techniques for emotion recognition and deep learning algorithms for multi-class classification in sentiment analysis [7]. Narimatsu H studied in the structure of time series data and derived the utility of "state duration" and "state interval" of events. The proposed model has superior performance compared to HSMM [8]. Wang Y believed that the application of artificial intelligence data technology in the field of energy can realize intelligent analysis and deep mining of energy big data and provide better scientific decision-making, which has become a worthy issue for research [9]. Gong K believed that with the advent of intelligent and networked vehicles, the industrial production technology of new energy vehicles and artificial intelligence production technology can progress together [10]. These studies have little research on the ecological financial management of artificial intelligence data analysis e-commerce green environment, and it is necessary to fully apply these technologies to the research in this field.

Based on the analysis of the enterprise's own characteristics and ecological financial management, the theoretical feasibility of selecting financial and corporate governance indicators in this paper was proposed. By comparing the RS-artificial intelligence model and the classic Logistic model, the advantages, disadvantages and applicable conditions of the classical statistical model to the artificial intelligence data model were studied. On this basis, it was proposed that the use of artificial intelligence data model to analyze the ecological financial management of enterprises in the green environment of e-commerce had the advantages of more perfect objectivity and interpretability. It showed that the data model based on artificial intelligence can improve the early warning accuracy of ecological financial management, and can better use the ecological financial management system in the green environment of e-commerce.

2. Artificial Intelligence Data for Ecological Financial Management

Artificial intelligence is a very high-precision system, and its computer system operation efficiency can generally exceed billions of times per second, which has incomparable advantages compared with manual computing [11]. In the process of carrying out the ecological financial analysis of the enterprise, if the artificial intelligence data analysis can be used, and the artificial intelligence system can be used, it is possible to carry out a specific and reasonable ecological

analysis of the overall financial situation of the enterprise. And all the useful information collected by the system can be distributed to each template to achieve a reasonable integration of resources, and through continuous practice, a unified standard can be established [12]. Even changing any of the more subtle data can have a certain impact. For such a situation, if an enterprise can accurately identify some problems that may exist in ecological financial management, and then combine artificial intelligence technology, it can prevent adverse effects on the overall economic benefits of the enterprise and its future development. Through these, it can be known that artificial intelligence data analysis technology plays a key role in the ecological financial management of enterprises in the green environment of e-commerce [13-15].

2.1. Application Value of Artificial Intelligence Data in Financial Management

With the development of artificial intelligence technology, big data, the Internet of Things, blockchain, 5G and other information technologies have been widely used in the field of environmental financial management, which has a great impact on the daily financial management of households. -work [16]. It is mainly shown in these three places. Generally speaking, financial work is mainly based on recording, accounting and analyzing data, among which data verification and processing are an important part of financial daily work. In the past, enterprises mainly relied on manual management mode for financial management. In this management mode, financial personnel may face a time-consuming process, which may lead to book re-accounting due to a little error in ordinary times.

Under the background of artificial intelligence, through the sharing center and intelligent financial management system, financial personnel can keep abreast of the operation dynamics of the enterprise, and comprehensively supervise various businesses before, during and after the event, so as to focus on risk management and control [17-18]. Through artificial intelligence technology, the historical data of previous years and the annual budget data of the current year can be automatically compared, and the financial risk points can be warned in time according to the changes in the data, as well as the current or future risks of the enterprise can be predicted. At the same time, practical countermeasures or plans are formed to improve financial forecasting and early warning capabilities, so as to reasonably deal with corporate financial risks in the operation process [19].

2.2. PSO-LSSVM Algorithm

Support vector machines are methods of machine learning for classification and nonlinear regression. The PSO-LSSVM (Particle Swarm Optimization-Least Squares Support Vector Machine) algorithm is a support vector machine in the separable mode, and it is suitable for finding a balance between the capacity of the model and the learning ability when the data source is relatively insufficient. Then its actual risk is minimized to obtain the best generalization ability [20]. The feasibility of this method is based on a class of linearly separable problems. The basic expression is:

$$z = \sum_{i=1}^{n}\left(\partial_i - \hat{\partial}_i\right)k(x_i, x) + c \tag{1}$$

In Formula (1), k(y, y) is the kernel function, and the model uses the Radial Basis Function (RBF) kernel function:

$$K\left(y_i, y_j\right) = \exp\left(-\frac{||y_i, y_j||}{2\delta^2}\right)..\delta > 0 \tag{2}$$

The least squares support vector machine (LSSVM) is used to simplify the calculation of.in Formula (1), and the unequal constraint of the standard support vector machine is changed into an

equal constraint, and its function is:

$$\frac{1}{2}\rho\sum_{i=1}^{n}\varepsilon 2_i+\frac{1}{2}||\omega||2 \tag{3}$$

For the initialized particle population, first set the relevant data, and then set the value range, the penalty factor γ and the value range of the radial basis kernel function parameter. The particle's position y and velocity V are initialized to random values.

$$\text{Model} = \text{trainlessvm} \tag{4}$$

Figure 1 is a flowchart of the PSO-LSSVM algorithm:

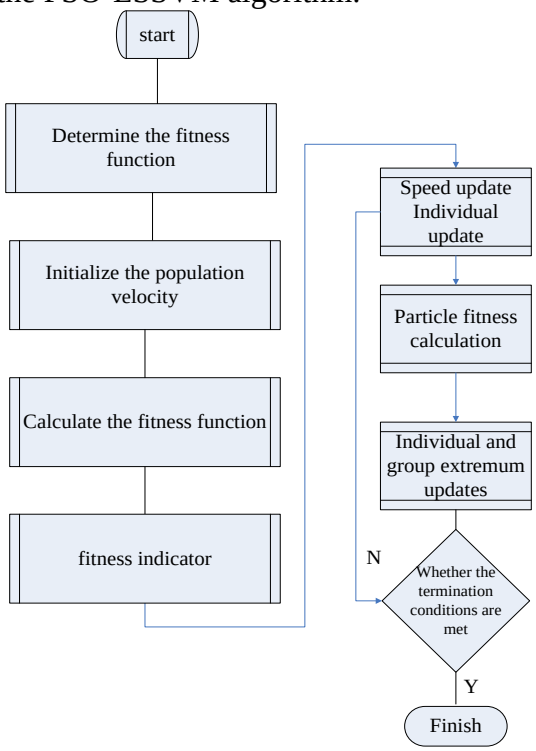

Figure 1: Flowchart of the PSO-LSSVM algorithm

2.3. Bayesnet Algorithm

The distinguishing principle of the Bayesnet algorithm is to use the Bayesian formula to estimate the result of the prior probability of a known object and then check the probability. That is, the probability that the object belongs to a class to distinguish which class has the highest posterior probability that the object belongs to that class [21]. The basic Bayesian formula is as:

$$P(a|x) = \frac{P(a)P(a|x)}{P(x)} \tag{5}$$

Among them, P(a) is the prior probability, and P(a|x) is the conditional probability that the sample x is equivalent to the label a.

2.4. RF Algorithms

Random Forest (RF) is a data mining classification algorithm based on information theory and statistical sampling theory, and its essence is a collection of tree classifiers. Among them, the base classifier $f((x, \rho_k)$ is an unpruned decision tree constructed by the decision tree algorithm, and X is

the input vector, and.is an independent and identically distributed random vector. The classification results are determined by majority voting method [22]. Each object is voted according to the results of g classification, and the class with the most votes is the class to which the object belongs [23].

RF improves the degree of discrepancy between classification models by constructing different training sets. First, through g-round training, a classification model sequence $\{f^1(X),f^2(X),....f^k(X)\}$ can be obtained. The final classification decision is:

$$F(x) = \arg\max \sum_{i=1}^{g} I(f_i(x)=Y) \tag{6}$$

Among them, F(x) represents the classification model, is a single classification model, Y represents the output variable of the classification model, and I is the model indicative function.

For a given dataset, the reduction in information entropy before and after division is called information gain, that is:

$$igain(Y,X) = Entropy(Y) - \sum_{P=1}^{P} \frac{|Y|}{|X|} Entropy(Y_P) \tag{7}$$

Among them, Entropy(Y) represents the information entropy of the dataset Y, and PK represents the number of samples belonging to the p-th class.

$$Entropy(Y) = -\sum_{K=1}^{K} P_K \log_2 P_k \tag{8}$$

3. Comparison of Financial Management of Bayesnet, RF and LogLogisti

According to the "Notice on Printing and Distributing the Standards for the Classification of Small and Medium-sized Enterprises" issued by the National Development and Reform Commission and the Ministry of Finance, and in conjunction with the actual accounting service of China, it has developed measures important to suit China's conditions. The standard is specifically formulated according to the number of employees, sales revenue and other indicators of the enterprise, combined with the characteristics of each industry. According to the "Notice", China's small and medium-sized (SMEs) enterprises in different industries are judged according to the standards shown in Figure 2.

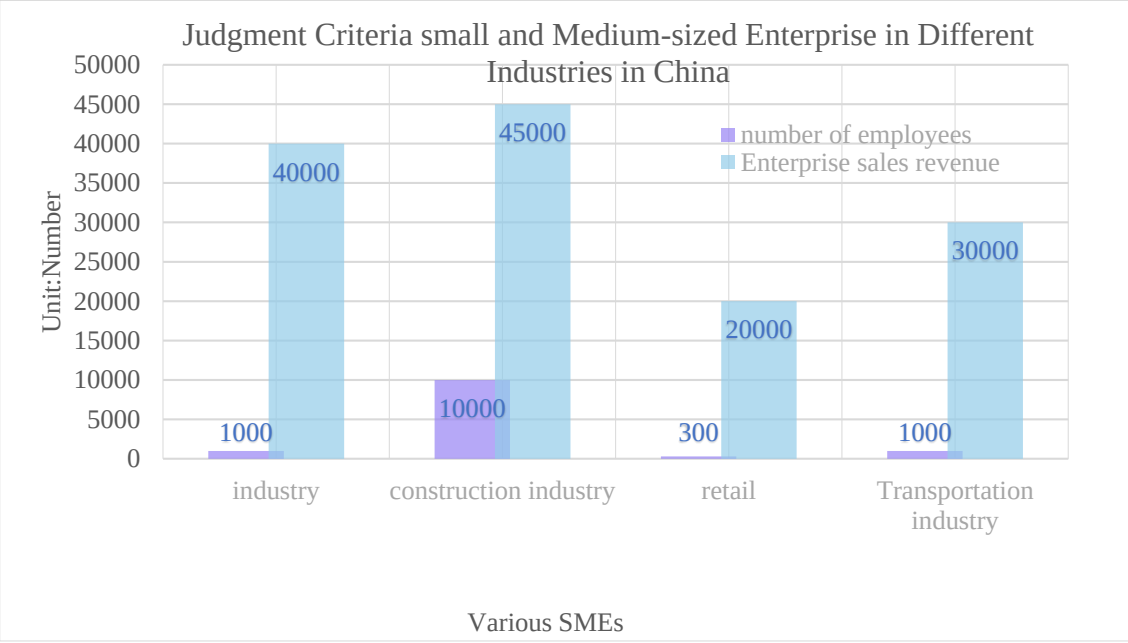

Figure 2: Classification criteria for SMEs in different industries in China

Based on the judging criteria of SMEs in different industries in China in Figure 2, this paper made simple statistics on the number of small and medium-sized enterprises.

3.1. Financial Management Attribute Selection of Bayesnet, RF and LogLogisti

This section mainly reduces the attributes of the early-warning system that has passed the saliency test according to the principle of rough set method, so as to extract key attributes. The data results of Bayesnet, RF and LogLogisti are compared from the perspective of financial management crisis. This is to verify whether "corporate governance indicators" would affect the early warning effect in the early warning of SMEs' financial crisis, and which of Bayesnet, RF and LogLogisti is more effective in ecological financial management. In this paper, the attributes of Bayesnet, RF and LogLogisti are reduced for the index system including financial indicators and the index system including both financial and corporate governance indicators.

Table 1: "Asset size matching" RS attribute reduction

Time	Financial Indicator	Financial + Corporate Governance Indicators
A-2	Current ratio, total asset turnover ratio, total asset net profit margin	Net profit margin of total assets, equity concentration, current ratio
A-3	Asset-liability ratio, total asset turnover ratio, earnings per share, operating net profit margin, operating profit margin before interest and tax	Asset-liability ratio, total asset turnover ratio, business before interest and tax, profit margin, earnings per share, equity concentration
A-4	Current ratio, asset-liability ratio, total asset turnover ratio, current ratio, asset-liability ratio, total asset turnover ratio	Operating net profit margin, net cash content of operating income, operating net profit margin, equity concentration

By analyzing the reduction results in Table 1, it can be seen that: in the case of matching according to the principle of "similar asset size", the set of indicators that may be predictive are set to cover debt repayment ability, per share indicators, operational capabilities, and corporate governance indicators. Among them, the three indicators of the current ratio of funds, the concentration of equity, and the turnover rate of total assets have been retained for three consecutive years in A-2, A-3, and A-4 after the significance test and RS feature selection. They have predictive robustness and deserve special attention from SME operators and management. When abnormal financial crisis is detected in time, it is hoped that measures can be taken as early as possible for crisis warning. In addition, the reduction results in Table 1 preliminarily verify that the financial crisis of SMEs is affected by the ratio of corporate liquidity, debt ratio of assets, turnover ratio of total assets, net profit margin of business, the net cash content of operating income and other aspects on financial management indicators. At the same time, the corporate governance index "equity concentration" of SMEs is also related to the formation of the financial management analysis of SMEs. The results shown in Table 2 are matched according to the principle of "similar number of employees", and the indicators cover several aspects such as measuring the solvency, operating ability, profitability, and corporate governance indicators of the enterprise. The specific index items included are quite different from the index items included in the results of the paired index set based on the principle of “similar asset size”, but it also verified that corporate governance indicators such as quick ratio, return on assets, net operating margin and sustainable growth rate have a predictive role in the research on financial crisis early warning of SMEs.

Table 2: "Employee number pairing" RS attribute reduction results

Time	Financial Indicator	Financial + Corporate Governance Indicators
A-2	Quick Ratio, Fixed Assets Turnover, Return on Assets, Earnings Per Share Quick Ratio, Fixed Assets Turnover, Earnings Per Share	Shareholding concentration, concurrent positions of chairman and general manager
A-3	Quick Ratio, Fixed Assets Turnover, Return on Assets, Sustainable Growth Rate, Earnings Per Share	Quick Ratio, Fixed Asset Turnover Ratio, Return on Assets, Sustainable Growth Rate, Equity Concentration, Total Remuneration of the top three Executives, nature of actual controller, concurrent positions of chairman and general manager
A-4	Quick Ratio, Fixed Assets Turnover, Return on Assets, Sustainable Growth Rate, Earnings Per Share	Quick Ratio, Fixed Assets Turnover Ratio, Return on Assets, Net Operating Interest Rate, Shareholding Concentration

The above has carried out the significance test and RS attribute reduction on the selected financial indicators and corporate governance indicators in turn.

Figure 3 Statistical chart can clearly see the comparison of the experimental results of the company's ecological financial management using Bayesnet, RF and LogLogisti modes. The prediction accuracy of the logistic model in A-2, A-3 and A-4 years is 80%, 83% and 88% respectively. The obvious comparison between the Bayesnet and RF artificial intelligence models for the classification accuracy of financial crisis early warning of small and medium-sized enterprises, Bayesnet is 94%, 95%, and 96% in A-2, A-3, and A-4, respectively; RF is 95%, 96%, 96% in A-2, A-3, A-4, respectively; Logistic model, its prediction accuracy is lower than the early warning effect of the model built by the reduced index system. Through the above test, it can be concluded that if the artificial intelligence data analysis mode is used for attribute reduction, the number of early warning indicators can be reduced, and the feature selection of the artificial intelligence data analysis method can be further verified.

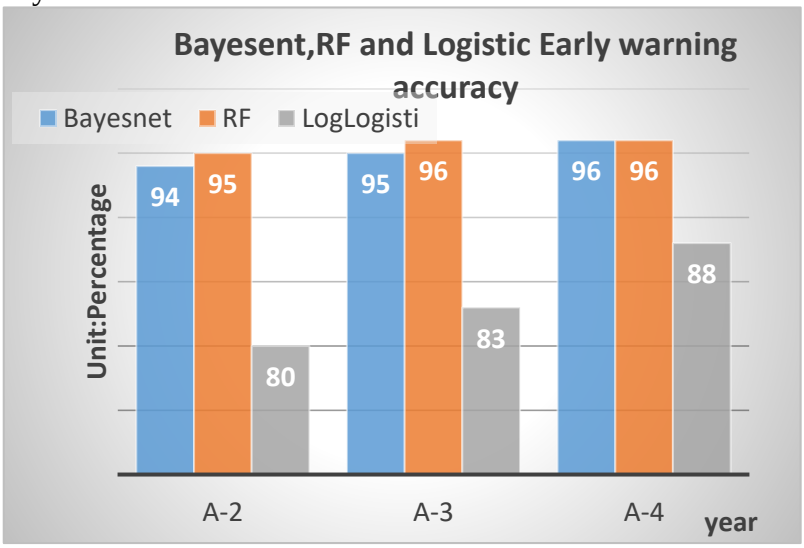

Figure 3: Bayesent, RF and Logistic early warning accuracy

In the future green environment of e-commerce, more and more enterprises would apply artificial intelligence data analysis technology to their daily financial management work. It would play more and more roles in ecological financial management, and its status would gradually increase, so as to further realize and improve the efficiency and level of financial management [24].

3.2. Application of PSO-LSSVM in Financial Early Warning

First, 300 companies from SMEs from 2018 to 2021 are selected in this paper. Then, 50 sample companies with normal financial situation and 50 sample companies with financial crisis are randomly selected by random sampling method to form prediction samples, and the remaining 100 sample companies are used as training samples. Table 3 lists the simulation of training samples and prediction samples with and without the PSO-LSSVM model, respectively, and the result retrieval tables in Table 3 are obtained.

Table 3: PSO-LSSVM and Model-free result check table

Group	Method	Training Samples		Prediction Samples	
— —		Actual Number	Judgment Number	Correct Rate	Judgment Number
Financially Sound	PSO-LSSVM	50	46	92%	50
Financially Sound	Model-free	50	38	76%	50
Financial Crisis	PSO-LSSVM	50	43	86%	50
Financial Crisis	Model-free	50	35	70%	50
Overall Accuracy	PSO-LSSVM	— —	89%	—	98%
Overall Accuracy	Model-free	— —	73%	—	81%

From the correct judgment rates in Tables 3, it can be seen that the correct judgment rates of PSO-LSSVM training samples and prediction samples reached 89% and 98%, respectively; the accurate judgment rate without using artificial intelligence data algorithm is only 73% and 81%. By comparing the two, it is found that the judgment of the artificial intelligence data analysis algorithm PSO-LSSVM is much higher. Based on the PSO-LSSVM method, the correct judgment rate of the financial early warning model has been greatly improved, and the running speed has also been significantly improved. This result fully demonstrates the absolute advantage of combining traditional statistical methods and artificial intelligence algorithms with high precision and simplified operations, and the early warning effect is better than financial early warning without any algorithm.

4. Conclusions

In this paper, the research variables selected were statistically tested and the RS attribute was reduced, and the obtained index set was used to establish Bayesnet, RF and Logistic ecological financial management analysis for comparison. Through the test and comparative analysis of several groups of models, the following main results are obtained: first, the early-warning accuracy rate of the model incorporating corporate governance indicators was higher than that of the early-warning model that simply considers financial indicators; second, artificial intelligence models such as Bayesnet and RF had better prediction effects in the early warning of financial crisis management of small and medium-sized enterprises; third, the early warning accuracy of artificial intelligence models such as Bayesnet and RF was better than that of the Logistic model, which verifies that the RS method can effectively reduce attributes. At the same time, this paper also simply established an artificial intelligence single classifier mainly based on PSO-LSSVM, which aimed to provide intelligent early warning for the financial status of middle and lower enterprises in my country. It can be seen from the results that the artificial intelligence single classifier established by PSO-LSSVM showed better results in the training group and the prediction group.

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