Retraction

Retracted: Design of Chinese Teaching Evaluation System for International Students under the Background of Data Mining

Security and Communication Networks

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Wang, "Design of Chinese Teaching Evaluation System for International Students under the Background of Data Mining," *Security and Communication Networks*, vol. 2022, Article ID 6556956, 7 pages, 2022.

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Research Article

Design of Chinese Teaching Evaluation System for International Students under the Background of Data Mining

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In the Chinese teaching for foreign students, Chinese teachers do not participate in the assessment of their institutions, which is not conducive to the sustainable development of Chinese language education. The potential value of the teaching evaluation is not floating on the surface, so the data mining is used to discover implicit correlations between the data. The application of data mining in the evaluation of Chinese teaching for foreign students helps to ensure safety of the teaching evaluation system for foreign students. In this paper, a Chinese teaching evaluation system that is based on the data mining is built, in which the DA is applied to the evaluation of Chinese teaching. Finally, the performance of the algorithm is tested, the results show that the DA greatly improves the classification accuracy of the model, the improved model can largely alleviate overfitting, and the feature dimension data extracted by DA are more representative. The system proposed in this paper has good performance, which can greatly improve the security of the Chinese teaching evaluation system.

1. Introduction

In the Chinese teaching for foreign students, the differences between teachers and students are more obvious compared with the domestic teaching environment [1, 2]. Some Chinese teachers teach in Confucius Institutes, while some Chinese teachers teach Chinese in educational institutions all over the world, the retention time of most Chinese teachers is relatively short. In the teaching process, Chinese teachers do not participate in the assessment of their own institutions, which is not conducive to the personal growth of Chinese teachers, but also not conducive to the sustainability of Chinese education [3, 4]. The teaching evaluation of students can stimulate the enthusiasm of Chinese teachers, which is also conducive to better reflect the real teaching ability of the teachers. The data in various fields are intertwined with each other, the potential value of the data is not floating on the surface, so the data mining is used to discover implicit correlations between the data [5]. The application of data mining in the evaluation of Chinese teaching for foreign students is a very challenging problem, which helps to

effectively and scientifically use the teaching evaluation of foreign students.

In recent years, the data in various fields are intertwined with each other, and these huge data are difficult to be processed by traditional software technology. The deep learning combines low-level features to form more abstract high-level representation attribute categories or features to discover distributed feature representations of data. The potential value of data is not floating on the surface, so the data analysis, data mining, and other technologies are used to discover the hidden correlation between the data. The knowledge discovery can be divided into five parts, the first step of knowledge discovery is to select the target data from the most original data [6]. The processed data are converted into data, then the patterns or rules are formed by data mining. The data mining is one of the important processes of knowledge discovery, which refers to producing a series of specific patterns for data under the acceptable constraints [7]. The data mining can be applied to different fields, the data mining can help decision makers build consumer portraits in the field of consumer market [8]. Google constructed a mathematical model by identifying keywords

related to influenza, which successfully predicted the official influenza epidemic in the United States [9]. BT has released a new product that can directly send mail to potential customers from data mining [10]. Through the data mining method, HSBC classifies its customers through data mining, and the most valuable users of each product are mined to reduce marketing costs [11]. It can be seen that data mining can solve difficult problems in different fields, which can greatly improve the efficiency of enterprises and reduce the operating costs of enterprises. The application of data mining in Chinese teaching evaluation is helpful to make good use of teaching evaluation, which is of great significance for the spread of Chinese culture.

Firstly, the functional requirements of the Chinese teaching evaluation system for international students are analyzed, and the overall process of the Chinese teaching evaluation system is determined, which is based on the basic principles of the design of the system. Then, the Chinese teaching evaluation system for international students is designed in detail from three aspects, which are the overall framework of the system, the data preprocessing and the system algorithm. Finally, the performance of Chinese teaching evaluation system is tested.

2. The Overall Framework of the System

The teaching evaluation of students can not only stimulate the enthusiasm of Chinese teachers, but also help to better reflect the real teaching ability of the teachers. In the Chinese teaching evaluation system for international students, data mining is helpful to make good use of foreign students teaching evaluation. From the perspective of data mining, this paper expounds the requirement analysis and basic principles of system design. The difficulties in the design of the system are analyzed, and the basic process and implementation of the system are carried out at the same time.

2.1. The Demand Analysis. In order to ensure the practicability and stability of the Chinese teaching evaluation system for foreign students, it is necessary to design a Chinese teaching evaluation system for international students that meets the design requirements. When designing the Chinese teaching evaluation system for foreign students, we should analyze the requirements of the system first.

Firstly, the system should have strong operability. When evaluating the Chinese teaching for foreign students, we should confirm whether the evaluation index system can meet the needs of the evaluation. The operability of the system is mainly manifested in three aspects, one is the determination of evaluation indicators, one is the observability of evaluation standard items, and the other is the subjectivity of evaluation indicators. Secondly, the system should focus on the evaluation of Chinese grammar. The Chinese teaching evaluation system should be different from the general Chinese teaching evaluation system, in which we should pay more attention to the evaluation of grammar teaching.

Then, the system needs to pay attention to the language evaluation by Chinese teachers. Compared with nonverbal evaluation, the verbal evaluation can express the praise and criticism of students more specifically. In the evaluation process of Chinese teaching, we should pay special attention to the language evaluation of students by Chinese teachers. Finally, the systematic evaluation should focus on the individual development of the students. Teachers will evaluate the classroom situation of each student, and each individual performance of the students will get feedback from teachers. The evaluation of Chinese teachers can encourage the learning atmosphere of the whole class, which can also increase the cohesion of the class.

2.2. The Basic Principles. The main work of the Chinese teaching evaluation system is to apply data mining to the Chinese teaching evaluation, which can effectively make good use of the teaching evaluation through data mining. To design a good Chinese teaching evaluation system for foreign students, we need to meet the following three requirements.

Firstly, the teaching evaluation index should have multiple evaluation methods. The evaluation mechanism in Chinese teaching refers to the evaluation of the learning situation and curriculum quality of the students. The evaluation mechanism in the traditional teaching mode is usually used for the evaluation of students, which ignore the evaluation of the curriculum quality. The evaluation system for foreign students should focus on the diversification of evaluation subjects and evaluation methods, which can further improve the teaching evaluation mechanism.

Then, the system should have the ability to collect information and seek fundamental theory. The knowledge management are of great importance in the Chinese teaching evaluation system for foreign students, so the analysis of information data and knowledge mining play an important auxiliary role in the analysis of teaching evaluation. Therefore, the Chinese teaching evaluation system for foreign students should have strong ability of knowledge mining.

Finally, the system should pay attention to the differences of evaluation objects. In the classroom, teachers only focus on the differences of cultural background, but do not pay enough attention to the individual learning differences of the students. The differences of teaching objects are more obvious compared with other subjects, so the difference of the evaluation objects is very important for Chinese teaching evaluation.

2.3. The Overall Process. The main research content of this paper is divided into six modules, which are the determination of evaluation indicators, the data collection, the data preprocessing, the model machine learning model building, the operation model visualization, and the result display. The specific process is shown in Figure 1.

Firstly, we need to comprehensively consider various factors to determine the teaching evaluation index, which is the basis of the Chinese teaching evaluation system for
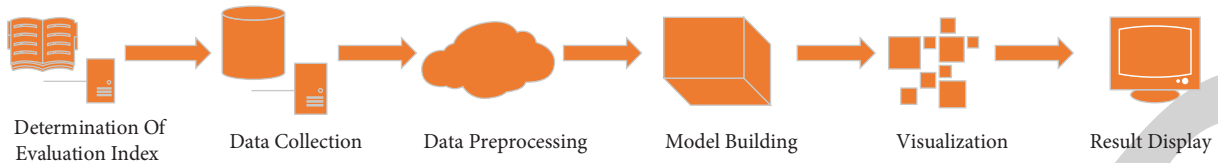
Determination Of Evaluation Index → Data Collection → Data Preprocessing → Model Building → Visualization → Result Display

FIGURE 1: System-specific process.

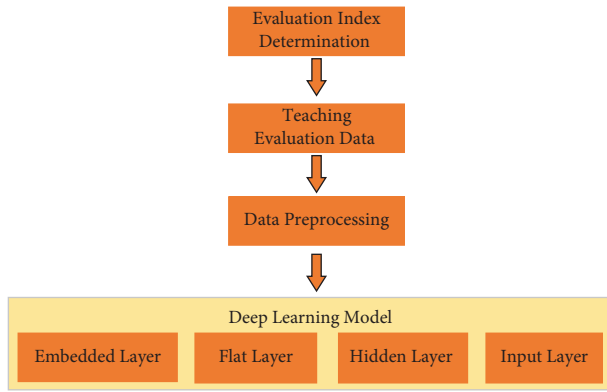

FIGURE 2: The overall framework.

FIGURE 3: The flow chart of the dragonfly algorithm.

foreign students [12]. Only when the evaluation standard is reasonable and scientific, the accuracy of the teaching evaluation system can be guaranteed, and the teaching evaluation index should have multiple evaluation methods. After the teaching evaluation index is determined, it is necessary to collect the evaluation of foreign students and establish a dataset, which is the data collection part of the system. The next step is the data preprocessing, in which the text needs to be preprocessed. The data preprocessing includes removing stop words and word segmentation, which can prepare for machine learning. The next step is to build the model and get the results by running the model. In order to make the results easy to show, the results also need to be visualized.

3. The Chinese Teaching Evaluation System for Foreign Students Based on Data Mining

In this paper, a Chinese teaching evaluation system for foreign students based on data mining is built, in which the overall framework of the Chinese teaching evaluation system for foreign students is introduced. The dragonfly algorithm is applied to the Chinese teaching evaluation of foreign students, and the data preprocessing method is introduced.

3.1. The Overall Framework of the System. The Chinese teaching evaluation system for foreign students based on data mining is divided into four parts, which are the determination of evaluation index, the evaluation data, the data preprocessing, and the model. The model is the most important part of the system, which is mainly composed of four parts, namely, the embedded layer, the flat layer, the hidden layer, and the input layer. The overall framework of the
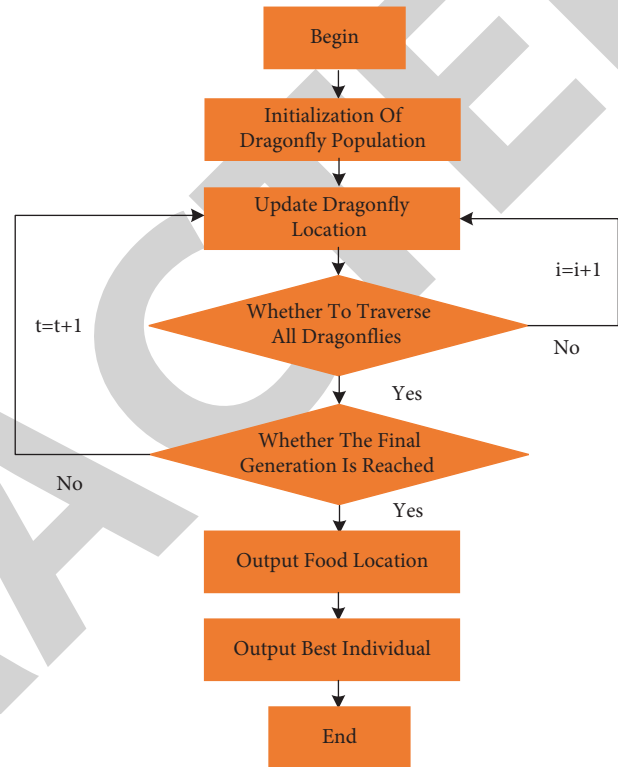
Chinese teaching evaluation system for foreign students is shown in Figure 2.

The computer program is the foundation of the model training part, the model has selected an open-source advanced deep learning program library, which can establish the deep learning model more efficiently and quickly [13]. The learning library is one of the most widely used deep learning modules with TensorFlow as the backend, which is easy to use and expand. The learning library can design the models based on TensorFlow modules, which includes the embedding layer, the flat layer, the hidden layer, and the output layer [14]. As shown in Figure 3, the embedding layer mainly converts the input number list into a vector list, the flat layer transforms the multidimensional input layer into one dimension. The function of the hidden layer is mainly the setting of neurons, while the function of the output layer is to represent the dimension of Chinese teaching evaluation through neurons.

3.2. The Data Preprocessing. After the teaching evaluation index is determined, we need to collect the teaching evaluation data firstly, then we need to preprocess the data.

Before the specific feature analysis and construction, it is necessary to clean the data, which can avoid the data quality problems caused by external factors. The data cleaning is an important means to solve the problem of data quality, whose content includes missing filling, error detection, duplicate filtering, and consistency checking. For the missing part of the questionnaire, we need to complete the data through specific filling strategy. For the problem of missing fields, we need to fill the data in two ways, one is zero value filling, the other is mean filling. The error detection means that the fields with certain specifications are verified by rules. For fields such as gender, the data content should be in a given set. It is inevitable to produce duplicate data during the data collection. The duplicate filtering refers to eliminating the merged data in the duplicate data to ensure the uniqueness of the data. When a data field has multiple data sources, the data between multiple data sources must be consistent, and the inconsistent data needs to be corrected by rules.

3.3. The Model Construction. The purpose of the Chinese teaching evaluation system for foreign students based on data mining is to evaluate the teaching of teachers through the evaluation data. Based on the data mining related algorithms introduced above, this chapter will build the model of Chinese teaching evaluation system for international students from specific data.

The GA is the most common classifier, which has the problem of low precision. The dragonfly algorithm (DA) is a new swarm intelligence algorithm in recent years, which simulates the behavior of dragonfly population to achieve the optimal solution. The dragonfly algorithm has good optimization speed, which can not only improve the accuracy of the feature subset, but also improve the accuracy of the final classification results, so this paper selects the dragonfly algorithm to improve the accuracy of the solution.

The dragonfly algorithm can simulate the static and dynamic behavior of the dragonfly groups, in which the behavior of dragonfly can be transformed into five behavioral models, namely, separation behavior, queue behavior, aggregation behavior, predatory behavior, and enemy avoidance behavior. The dragonfly algorithm has strong global search ability, and dynamic group makes the algorithm have strong local development ability. The flow chart of the dragonfly algorithm is shown in Figure 3.

In the DA, the position of food represents the position that dragonflies need to approach, and the location of natural enemies represents the position that dragonflies need to avoid. The displacement of the dragonfly individuals in the separation behavior is shown as follows:

$$S_{id} = -\sum_{j=1}^{N} X_{id} - X_{jd}, \tag{1}$$

where $S_{i\,d}$ represents the displacement of the i-th dragonfly in the separation behavior, $X_{i\,d}$ represents the current position of the dragonfly, $X_{j\,d}$ represents the position of the j-th dragonfly adjacent to the i-th dragonfly at the current

iteration, and N represents the number of adjacent dragonflies.

The displacement of dragonfly individuals in the formation behavior is shown as follows:

$$A_{i\,d} = \frac{\left(\sum_{j=1}^{N} X_{j\,d}\right)}{N}, \tag{2}$$

where $A_{i\,d}$ represents the displacement of the i-th dragonfly during the procession and $X_{j\,d}$ represents the position of the j-th dragonfly adjacent to the i-th dragonfly in the current iteration.

The displacement of dragonfly individuals in aggregation behavior is shown as follows:

$$C_{i\,d} = \frac{\sum_{j=1}^{N} X_{i\,d}}{N} - X_{i\,d}, \tag{3}$$

where $C_{i\,d}$ represents the displacement of the i-th dragonfly in the aggregation behavior and $X_{i\,d}$ represents the current position of the i-th dragonfly.

The displacement of dragonfly individuals in the predatory behavior is shown as follows:

$$F_{i\,d} = X_f - X_{i\,d}, \tag{4}$$

where $F_{i\,d}$ represents the displacement of the i-th dragonfly in the aggregation behavior, and X_f represents the specific location of the food the dragonfly population needs to look for under the current iteration times.

The displacement of dragonfly individuals in avoiding enemies is shown as follows:

$$E_{i\,d} = X_e - X_{i\,d}, \tag{5}$$

where $E_{i\,d}$ represents the displacement of the i-th dragonfly individual in the avoidance behavior and X_e represents the specific location of the natural enemies found by the dragonfly population under the current iteration number.

The position vector of the i-th dragonfly is shown in equation (6). When the dragonfly has no adjacent individuals as a reference, the position update of the i-th dragonfly is shown as follows:

$$X_{i\,d}^{t+1} = X_{i\,d}^{t} + \Delta X_{i\,d}^{t+1}, \tag{6}$$

$$X_{i\,d}^{t+1} = X_{i\,d}^{t} + L_d \times X_{i\,d}^{t}, \tag{7}$$

where $X_{i\,d}^{t}$ represents the d-dimensional step size vector of the i-th dragonfly in the t-th iteration and L_d represents the Levy flight step size.

The DA used in this paper accelerates the process of chromosome evolution into better individuals, which can optimize the process of the genetic algorithm solution.

4. The System Performance Test

The design of the Chinese teaching evaluation system for international students based on data mining is a very heavy work, and its practicability needs to be tested in practice. In this paper, the DA is applied to the evaluation of Chinese teaching. In order to verify the performance of the algorithm
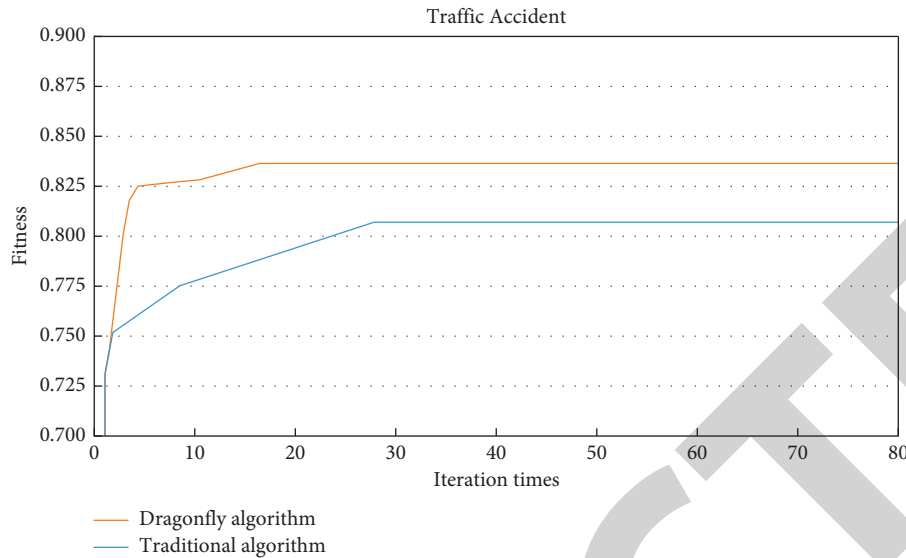
FIGURE 4: The fitness value of the model.

in evaluating the teaching level of Chinese teachers, the performance of the algorithm is tested.

4.1. The Fitness Value of the Model. The fitness is the index used to measure the individual quality in the population, the fitness in the genetic algorithm is the value of the criterion of the feature combination, which is the key to the genetic algorithm. In order to verify the classification accuracy of the model, the relationship between iteration number and classification accuracy under different data is studied. The traditional algorithm is set as the control group, and the DA is set as the experimental group. The feature subsets obtained by different algorithms are classified and identified, the classification accuracy varies with the number of iterations as shown in Figure 4.

This paper compares the convergence speed of different algorithms, it can be seen that the DA can improve the classification accuracy of the model. The DA can reach the convergence condition firstly, and the optimal feature subset can be found when the number of iterations is 18. The DA intervenes the optimization process on the basis of the genetic algorithm, so that the individuals with large fitness have greater probability to be inherited to the next generation. The DA has stronger globality, which can find better feature subset faster.

4.2. The Improvement Effect of the Training Model. The overfitting is a common problem in computer science, which refers to the fact that training data can be well fitted, but the data outside the training set cannot be well fitted. When the overfitting occurs, the accuracy of the model will decrease. The goal of the model is to improve generalization ability, the data outside the training set can also be correctly identified by the model.

During the training iteration, the discarded neurons in the model are increased from 0.2–0.4, and other parameters
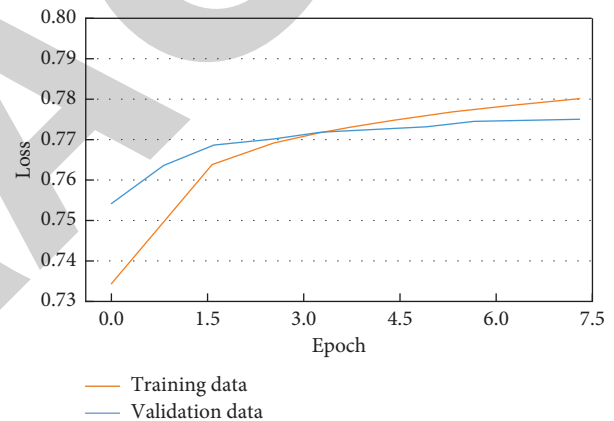

FIGURE 5: The improvement of the training model.

remain unchanged. The loss change process of the dataset after model retraining is shown in Figure 5.

It can be seen from Figure 5 that the gap between the loss curve of the training data and the verification data after the model improvement is greatly reduced, which indicates that the overfitting phenomenon has been greatly alleviated by the model. The overfitting phenomenon is mainly caused by sparse data, which can also be suppressed by improving the model.

4.3. The Accuracy, Recall, and F1 of the Model. Only from the above two aspects to illustrate the performance of the algorithm is obviously inadequate, so this paper selects the precision, recall, and F_1 value to verify the superiority of the algorithm. The precision reflects the proportion of correct classification in the classification results of each category, that is, the accuracy of each category judged by the model. The recall rate can reflect the sensitivity of the classification model to each category dataset. F_1 score is a new index, which is designed to represent the comprehensive
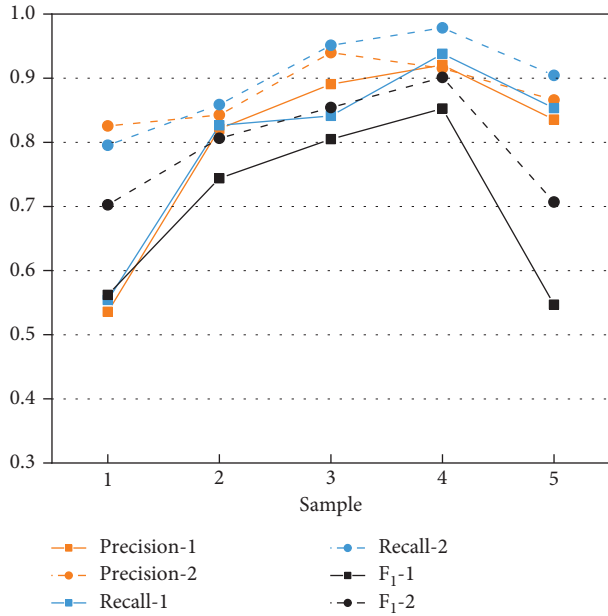
Figure 6: The evaluation index of the model.

performance of the model. The value range of F_1 score is 0 to 1, and the greater value, the better the effect of the model. The calculation methods of accuracy, recall, and F_1 score are shown in

$$\text{precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}, \tag{8}$$

$$\text{recall} = \frac{\text{TP}}{\text{TP} + \text{FN}}, \tag{9}$$

$$F_1 = \frac{2 \times \text{precision} \times \text{recall}}{\text{precision} + \text{recall}}, \tag{10}$$

where TP represents the prediction is correct when the actual results are positive, FN represents the prediction is wrong when the actual results are positive, FP represents the prediction is correct when the actual results are negative, and TN represents the prediction is wrong when the actual results are negative.

In order to verify the model, the model of feature extraction using the traditional algorithm was set as the control group, and the model of feature extraction using the dragonfly algorithm was set as the experimental group. The results are shown in Figure 6.

As can be seen from Figure 6, the DA has better performance than the traditional algorithm, which has better improvement effect on accuracy, recall rate, and F_1 parameters. The F_1 score of the traditional algorithm can reach 0.7021, and the F_1 score of the DA can reach 0.7942, indicating that the feature dimension data extracted by the dragonfly algorithm is more representative. The DA can also improve the accuracy and recall rate of the model, the proposed system has good performance, which has an important value for Chinese teaching.

The model proposed in this paper has good performance, but the sensitivity to different data is still unknown, which deserves further study.

5. Conclusion

Firstly, the functional requirements of the Chinese teaching evaluation system for international students are analyzed, and the system is designed in detail from three aspects, which are the overall framework, the data preprocessing, and the system algorithm. Then, the overall framework of the system is introduced, in which the DA is applied to the Chinese teaching evaluation, and the data preprocessing method is introduced. Finally, the performance of the algorithm is tested, the results show that the DA can improve the classification accuracy of the model and reach convergence condition faster. After improving the model, the interval between the training data and validation data is greatly reduced, which indicate the model can alleviate the overfitting to a great extent. The DA has better performance compared with the traditional algorithm, which can improve the accuracy, recall, and F_1 parameters of the model. The system in this paper has good performance in many aspects, which is of great significance for Chinese teaching.

Data Availability

The dataset used in this study are available from the author on request.

Conflicts of Interest

The author declares no conflicts of interest.

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