

Research Article

Rule Analysis of Teaching Evaluation System Based on Data Mining under Web Platform

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In order to understand the advantages of the teaching evaluation system to teachers and students more intuitively, according to the data analysis, the lowest total score of teachers is $\rightarrow 1.04$, and the five index values are all negative, so the relevant teaching contents should be changed according to the index factors of relevant teaching evaluation to make it easier for students to understand and accept. Through the analysis of the total evaluation scores of several teachers surveyed in each semester, we can see that the total evaluation scores of teachers 4 and 7 fluctuate greatly, so we should choose suitable teaching content for rectification. By classifying teachers, they are divided into three categories by means of discipline colleges, etc. It can be seen from the figure that the lowest total score of teachers in category 3 is $\rightarrow 2.12$, which shows that teachers in this category may have similar problems in teaching methods. By comparing the information entropy algorithm of teaching evaluation, we know that the information entropy under the AVF algorithm model takes about 1 ms to the teaching evaluation algorithm, while the greedy algorithm model takes about 20 ms to test the teaching evaluation system. We know that the teaching evaluation system based on the proposed algorithm information entropy algorithm and the teaching evaluation system under the AVF algorithm model and traditional information entropy all pass the test. However, combined with the images, the AVF algorithm model has the highest computational efficiency and the shortest time, followed by the proposed algorithm model. Compared with the traditional teaching evaluation algorithm, it is inefficient and takes a long time. When the number of requests is 1000, the average response time of the AVF algorithm method is 17 ms, and the longest time of the traditional method is 32 ms. Combined with images, when the number of requests is 1000, 1500, 200, 2500, 3000, 350, and 4000, the average response time increases with the increase of the number of requests, but the AVF algorithm method takes the shortest time and meets most teaching evaluation requirements. Combined with the success rate image, we can see that the success rate decreases slightly with the increase of request times, but the success rate of the AVF algorithm method is relatively stable, with the lowest of 99.6% when the request times are 3500. Through a large number of charts and analyses, we can see that the teaching evaluation under the AVF algorithm method has the highest efficiency and the shortest time.

1. Introduction

Through the research of data mining technology, we can get the related methods to improve data mining technology and establish and analyze the teaching evaluation system so as to improve the teaching evaluation system from many aspects. At the same time, the information entropy is calculated by the AVF algorithm, which can improve the efficiency and time of teaching evaluation.

The gene is transferred from its natural genome to the substitute of the same code, which becomes “codon

optimization” [1]. However, the scientific community lacks a systematic understanding of this method and puts forward the method of “synthetic gene designer” to solve this problem. In order to meet the needs of high-capacity wireless communication, engineers continue to develop technologies [2]. At the same time, students also need to know how to learn this technology. Literature [3] for efficient computation and analysis of 3DFD uses a web platform for related research. In order to complete 3DFD, it is necessary to combine CUDA with web GL and other emerging technologies. Literature [4] carries out learning tasks such as

genome comparison by annotating position sequences and studying gene models. This method is applied to sequence comparison by BLAST. *JBrowse* is easy to embed in a website or application. It is built in JavaScript and HTML5 [5], and it is much faster and more scalable. At the same time, *JBrowse* can distinguish pictures offline. As an independent web page, you can easily use plug-ins to add, analyze, and perform other operations. Literature [6] can describe the number of lymphocytes by RepSeg method. Lymphocytes can recognize specific antigens and have specificity. The application of Vidjil involves four steps. Through Witten and Frank's book on output knowledge [7], we understand the main methods of data mining. Literature [8] studies data mining through basic input, input algorithms, and schemes. Combining data mining with open source machine science and other data modeling and analyzing it with illustrations and tables to discuss its uses in-depth and also make the analysis more in-depth, more comprehensive, and efficient. Data mining, a hot topic, has been listed as a high-income mode by many companies [9], and at the same time, many researchers are taking data mining as a related research topic. Data mining technology has attracted many researchers' attention, and they want to better understand customer behavior through related data mining so as to increase business opportunities. Literature [10] has reported that data mining can dig out secrets from massive data. Data mining is very important for customer information and relationship management [11], but there are also some problems, such as a lack of relevant literature reviews. In order to improve the teaching quality, students, as the main body [12], should evaluate the teaching quality through questionnaires and interviews. Literature [13] evaluates and investigates 6395 students, including 3200 undergraduates and 300 postgraduates, and analyzes the overall teaching achievements. Then, according to the relevant reward and punishment system and the balance between teaching and research, the teaching system is discussed and formulated. In order to make dictation play an important role in foreign language teaching [14], and teaching evaluation analyzes the common mistakes in foreign language listening based on many years of English teaching experience and obtains some changes in nature and function. Literature [15] experiences its use in the learning environment by writing role-playing.

2. Model and Process Analysis

2.1. Web Platform Based on Revit Model. Revit models fall into two categories, users and administrators. Administrators log in to the web platform for user management, system messages, file processing, and other operations [16]. Revit file processing includes saving data into a database, obtaining Revit files, building 3D models, and other operations [17]. As shown in Figure 1.

Revit model has the following advantages as the core of system platform processing:

- Projects: each project has a separate database
- Family: contains all the information of the parameter model

Program interface: can create new functional modules and model construction

The overall operation of the web platform is as follows:

The web management system mainly includes login and then displaying the web interface, Revit file management, and the functions of the interface management and other functions.

Revit file processing plug-in mainly includes geometric parameter data conversion, attribute parameter data extraction, and other operational processes. As shown in Figure 2.

2.2. Platform Operation Diagram. The overall process of the platform is as follows: by logging in to the platform and carrying out the Revit file management interface, it can process data and content in many aspects, export data, and convert data. Finally, the data is logged in to the database and the process ends [18], as shown in Figure 3.

2.3. Web Services Platform Flow Chart. Users enter the login interface by sending login requests, enter the Web management system for file uploading and verification after successful login, and finally process files in the Revit file processing plug-in interface [19], as shown in Figure 4.

2.4. Teaching Evaluation System. By establishing a teaching evaluation system to investigate the teaching quality of teachers, the data can be obtained [20]. The low score of the teaching evaluation indicates that the teaching method is not suitable for students or the teaching difficulty coefficient is large, so the teaching scheme should be adjusted according to the specific teaching evaluation factors. The high score of the teaching evaluation indicates that most students are suitable for the teacher's teaching method, and the teaching quality is monitored normally through teaching evaluation so as to adjust the teaching plan [21], as shown in Figure 5.

2.5. Data Mining Technology. Data mining includes screening data, extracting target data, preprocessing data, mining data, evaluating related data, and finally transforming them into knowledge [22], as shown in Figure 6.

3. Data Mining and Teaching Evaluation Techniques

3.1. Data Mining

3.1.1. Apriori Basic Algorithm. X and Y are arbitrary itemsets, then

$$\text{sup}(X \cup Y) = \frac{|X \cup Y|}{|D|}. \quad (1)$$

Confidence is

$$\text{conf}(X \cup Y) = \frac{|X \cup Y|}{|X|}. \quad (2)$$

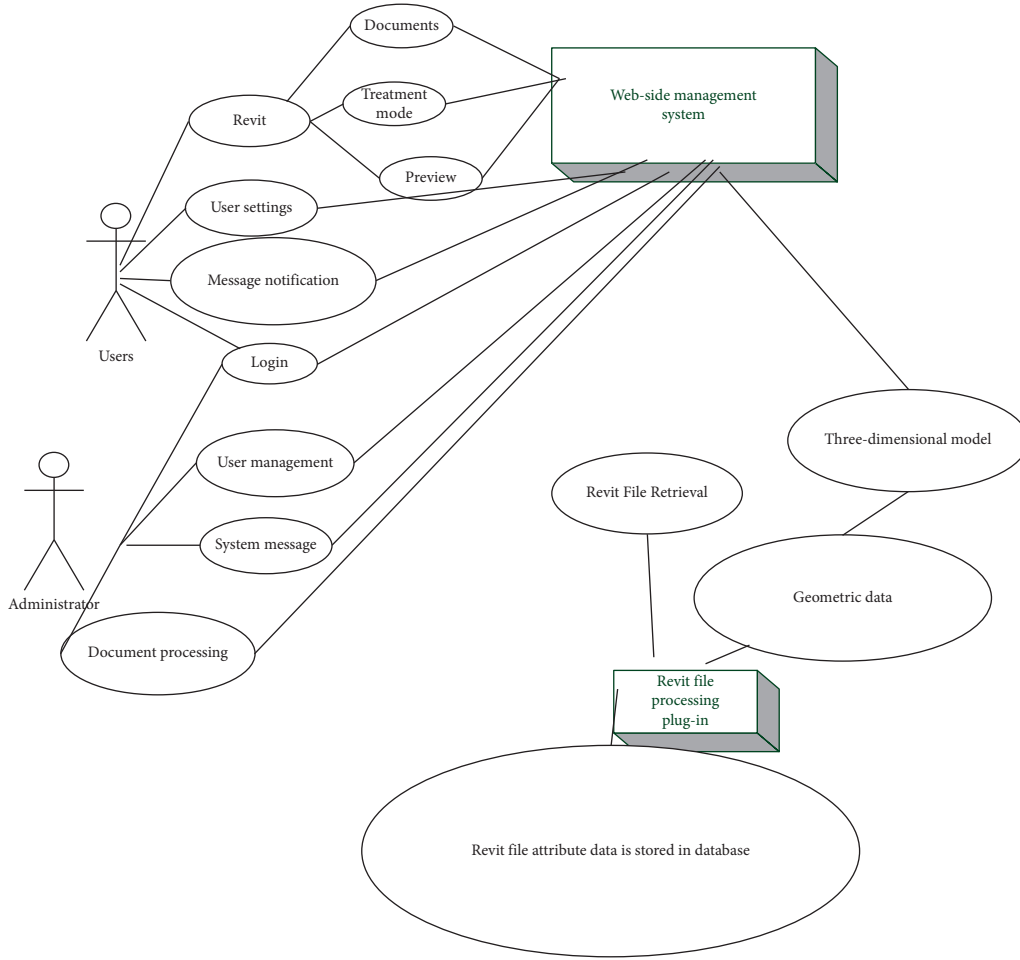


FIGURE 1: Web platform under Revit.

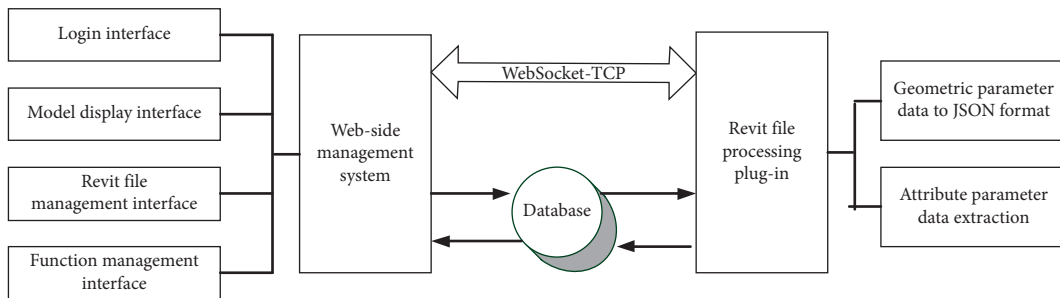


FIGURE 2: Overall diagram of the web platform.

3.1.2. *Weighting Factor Algorithm.* $w \sup_w(I)$ is the weighted minimum support and it is represented as follows:

$$w \sup_w(I) = \frac{1}{k-2} \sum_{i \in I} w_i \sup(I). \quad (3)$$

$w \text{ conf}_w I$ is the weighted minimum confidence and it is represented as follows:

$$(w \text{ conf}_w I \longrightarrow J) = \frac{w \sup(I \cup J)}{w \sup(I)}. \quad (4)$$

3.2. *Information Entropy of Teaching Evaluation*

3.2.1. *Information Entropy Algorithm.* The probability is

$$P_i = \frac{x_i}{x}. \quad (5)$$

Sample classification information entropy

X is the set of data samples, and X is the number of X . C is the attribute class variable, n is the total number of classes, and x_i is the number of samples contained in the C_i class. Then

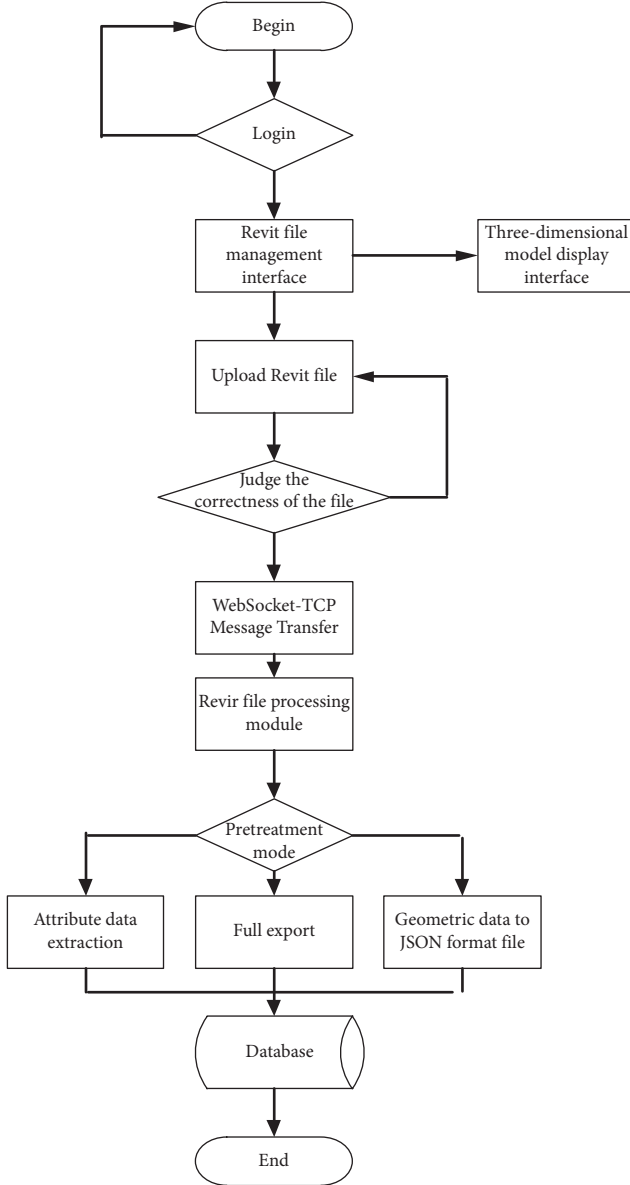


FIGURE 3: Overall flow chart of the platform.

$$I(x_1, x_2, \dots, x_n) = - \sum_{i=1}^n p_i \log_2 p_i. \quad (6)$$

The information entropy of Y is

$$E(Y) = \sum_{j=1}^m \frac{x_{1j} + x_{2j} + \dots + x_{nj}}{x} \times I(x_{1j}, x_{2j}, \dots, x_{nj}). \quad (7)$$

Information gain is calculated as

$$\text{Gain} = I(x_1, x_2, \dots, x_n) - E(Y). \quad (8)$$

3.2.2. Improvement of Information Entropy Algorithm

$$p_i = \frac{1 - s_i}{1 + s_i}. \quad (9)$$

From formula (9)

$$s_i = \frac{1 - p_i}{1 + p_i}. \quad (10)$$

The entropy of information brought into sample classification is

$$- \sum_{i=1}^n \frac{1 - s_i}{1 + s_i} \log_2 \frac{1 - s_i}{1 + s_i} = - \sum_{i=1}^n \frac{1 - s_i}{1 + s_i} \frac{\ln 1 - s_i / 1 + s_i}{\ln 2}. \quad (11)$$

The formula for calculating information entropy is

$$\frac{1}{x} \sum_{i=1}^n \frac{x_i (x^3 - x_i^3)}{(x + x_i)^3}. \quad (12)$$

3.2.3. Teacher-Driven Algorithm

(1) Through relevant teaching evaluation, teachers' driving force is divided into four entropies: excellent, good, medium, and poor [24].

$$E(X_{\text{Excellent}}) = 0,$$

$$E(X_{\text{Good}}) = 0.3,$$

$$E(X_{\text{Medium}}) = 0,$$

$$E(X_{\text{Difference}}) = - \left(\frac{1}{1}\right) \log_2 \left(\frac{1}{1}\right) = 0,$$

$$E(X_{\text{Teacher-driven}}) = \left(\frac{5}{10}\right)E(X_{\text{Excellent}}) + \left(\frac{3}{10}\right)E(X_{\text{Good}}) + \left(\frac{1}{10}\right)E(X_{\text{Medium}}) + \left(\frac{1}{10}\right)E(X_{\text{Difference}}) = 0.2. \quad (13)$$

(2) Participating in interaction (Boolean variable), then

$$E(X_{\text{Yes}}) = 0.3, \quad (14)$$

$$E(X_{\text{No}}) = 0.2.$$

The entropy obtained from the information entropy is

$$E(X_{\text{Doyouparticipateintheinteraction}}) = \left(\frac{3}{10}\right)E(X_{\text{Yes}}) + \left(\frac{7}{10}\right)E(X_{\text{No}}) = 0.3. \quad (15)$$

(3) Curriculum difficulty entropy includes four variables: easy, acceptable, hard, and difficult. They are expressed as

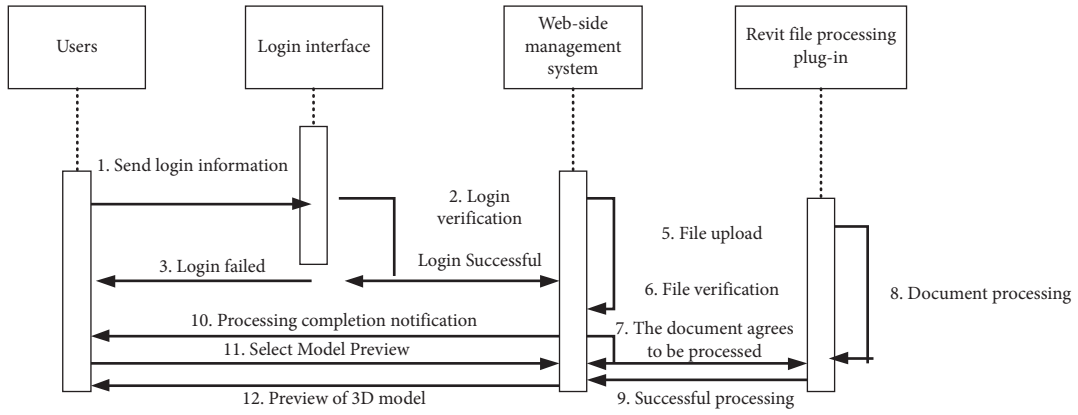


FIGURE 4: Web services flow chart.

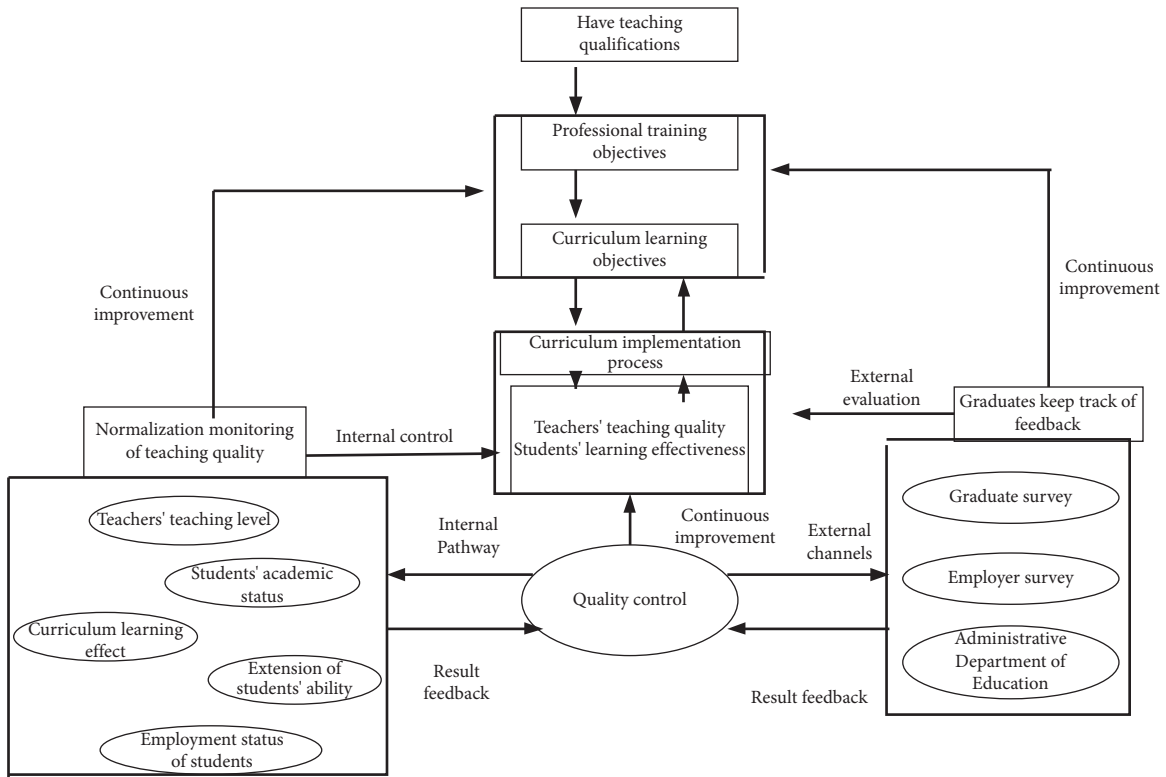


FIGURE 5: Model diagram of teaching evaluation system.

$$\begin{aligned}
 E(X_{\text{Easy}}) &= 0, \\
 E(X_{\text{Acceptable}}) &= 0.2, \\
 E(X_{\text{Hard}}) &= 0.1, \\
 E(X_{\text{Difficult}}) &= 0.3.
 \end{aligned}
 \tag{16}$$

$$\begin{aligned}
 E(X_{\text{Coursedifficulty}}) &= \left(\frac{2}{10}\right)E(X_{\text{Easy}}) + \left(\frac{3}{10}\right)E(X_{\text{Acceptable}}) \\
 &\quad + \left(\frac{2}{10}\right)E(X_{\text{Hard}}) \\
 &\quad + \left(\frac{3}{10}\right)E(X_{\text{Difficult}}) = 0.3.
 \end{aligned}
 \tag{17}$$

The characteristic entropy of course difficulty is:

(17)

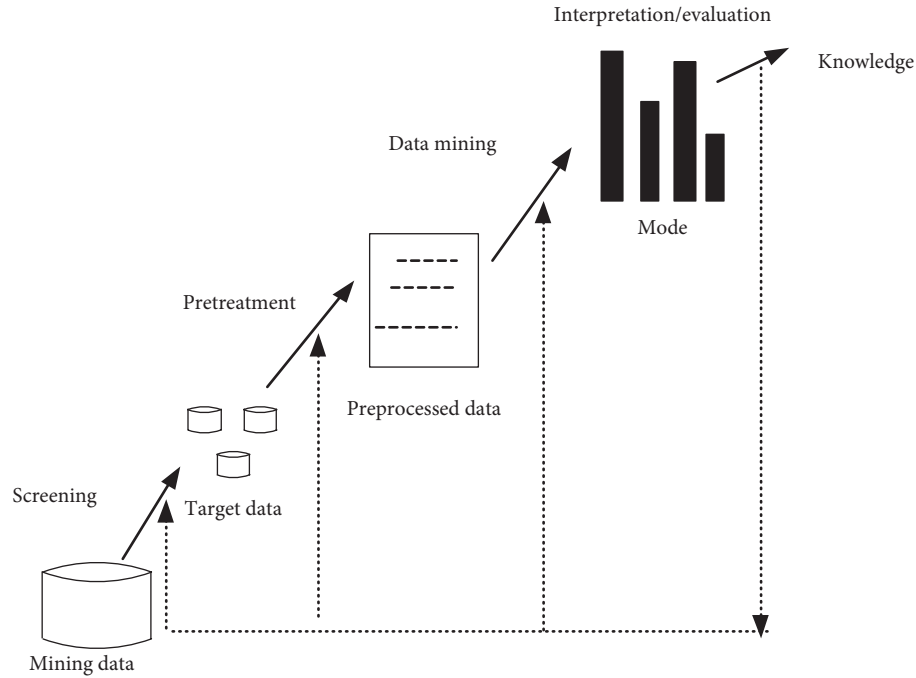


FIGURE 6: Data mining flow chart.

- (4) Curriculum neutralization evaluation entropy is divided into four attributes: excellent, good, medium, and poor [11]. They are expressed as

$$\begin{aligned}
 E(X_{\text{Excellent}}) &= 0, \\
 E(X_{\text{Good}}) &= 0.1, \\
 E(X_{\text{Medium}}) &= 0.5, \\
 E(X_{\text{Difference}}) &= 0.
 \end{aligned} \tag{18}$$

The entropy of curriculum attribute neutralization and evaluation is as follows:

$$\begin{aligned}
 &E(X_{\text{Comprehensiveevaluationofcurriculum}}) \\
 &= \left(\frac{3}{10}\right)E(X_{\text{Excellent}}) + \left(\frac{2}{10}\right)E(X_{\text{Good}}) + \left(\frac{5}{10}\right)E(X_{\text{Medium}}) \\
 &\quad + \left(\frac{0}{10}\right)E(X_{\text{Difference}}) = 0.1.
 \end{aligned} \tag{19}$$

4. Analysis of Teaching Evaluation System

4.1. Analysis of Teacher Evaluation Index

4.1.1. Analysis of Teachers' Indicators. According to the analysis of five indexes of nine teachers in a college in the following figure, the total score of teacher 1 is -1, of which the highest index 5 is -0.7 and the lowest index 2 is -1.2. The total score of teacher 2 is 0.68, among which the highest score of index 5 is 0.8 and the lowest scores of indexes 2 and 3 are 0.6. The total score of teacher 3 is 1.24, among which the lowest score of index 2 is 1.1 and the highest score of

index 5 is 1.4. The total score of teacher 4 is -0.24, and the lowest score is index 2 is -0.3. The total score of teacher 5 is 0.26 and the highest score of index 4 is 0.4. The total score of teacher 6 is -1.04 and the highest score of index 3 is -1. The total score of teacher 7 is 1.18 and the highest scores of indicators 1 and 4 are 1.3. The total scores of teachers 8 and 9 are 0.38 and 0.84, respectively. Compared with the total scores of 9 teachers, the highest total score of teacher 3 is 1.24, and the lowest total score of teacher 6 is -1.04. Through the analysis of the total score, it can be seen that among the 9 teachers, teacher 3 has a better teaching evaluation, and the teaching method may be more acceptable to students. At the same time, the total scores of teachers 1 and 6 are relatively low, and the teaching quality or methods need to be improved. The teaching evaluation index represents a comprehensive evaluation of teachers in many aspects, which can represent teachers' driving force, participation in class, course difficulty, teaching wit, teachers' dress, and so on, as shown in Figure 7.

4.1.2. Analysis of Teachers' Evaluation in Each Semester.

Through the analysis of the following figure, it can be seen that the total score of teacher 1 decreased slightly from the 123rd semester to the 125th semester and increased slightly from the 126th semester to the 127th semester, indicating that the teacher gradually found an adaptive teaching method after the 126th semester, and the total score of the teaching evaluation increased. The total score of teacher 2's teaching evaluation basically remained between -0.3 and 0.4, with little change. Teacher 4's total score of the teaching evaluation fluctuates greatly, falling to about -3.6 in the 127th semester. We should analyze the small scores of each index, adjust the relevant teaching methods as soon as

```

(i) Input: transaction set  $T$ , minimum support  $\text{min\_sup}$ , and minimum confidence  $\text{min\_conf}$  [23].
Output: frequent itemset  $L$ 
BEGIN
1)  $\forall T \neq \text{NULL}$ 
2)  $C_1 = \text{Generate\_}C_1(T)$ ;
3)  $L_1 = \{c \in C_1 | \text{sup}(c) \geq \text{min\_sup}\}$ ;
4)  $K = 2$ ;
5) While ( $L_k > 0$ )do
6)  $\{K++\}$ ;
7)  $C_k = \text{Generate\_}C_k(T_{k-1})$ ;
8)  $L_k = \{c \in C_k | \text{sup}(c) \geq \text{min\_sup}\}$ ;
9)  $L = \cup L_k$ ;
10)  $R = \text{Generate\_Rule}(L); // \text{min\_conf}$ 
END.
    
```

ALGORITHM 1: Apriori classical algorithm.

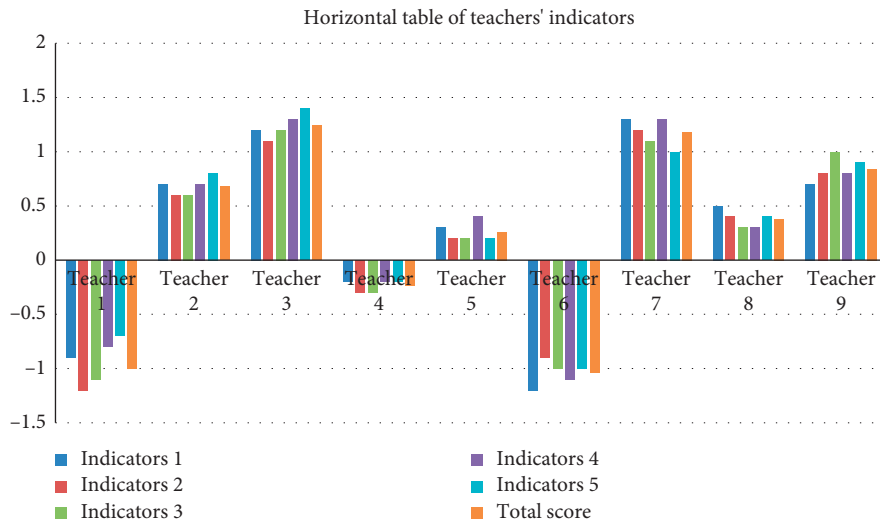


FIGURE 7: Horizontal analysis of teaching evaluation.

possible, and provide students with more suitable teaching content. The scores of teachers 6 and 8 fluctuate a little, and the total score of teachers 7 dropped to -1.4 in the 127th semester, so teaching methods should be improved as soon as possible. As shown in Figure 8.

4.1.3. *Analysis of Teacher Classification Index.* According to the disciplines and colleges taught by their teachers, teachers are divided into three categories. The total score of teacher category 1 is -0.68. The scores of indicators 1 to 5 are relatively average and do not fluctuate much, but indicators 1 to 5 are all negative. Teaching quality and students' acceptance should be improved through the analysis of various indicators. The total score of teacher category 2 is 0.68, and the scores of indicators 1–5 are relatively average. The lowest total score of teachers' category 3 is -2.12, and most of its indexes are lower than -1.7, which is low. Therefore, teaching

methods should be changed as soon as possible to improve the scores of each index. As shown in Figure 9.

4.2. *Comparison of Data Mining Algorithms.* As can be seen from Table 1, the total time consumption of the improved Apriori algorithm is 264, which saves more time than the other two data mining algorithms. The total time consumed by the Apriori algorithm is 443, the total time consumed by the improved Apriori algorithm is 264, and the total time consumed by the ID3 algorithm is 524. The analysis shows that the Apriori algorithm can save time and have higher efficiency than the ID3 algorithm. Compared with the traditional Apriori algorithm, the improved Apriori algorithm further shortens the data mining time and improves the efficiency again. Therefore, in order to improve the efficiency of data mining, the improved Apriori algorithm should be preferred.

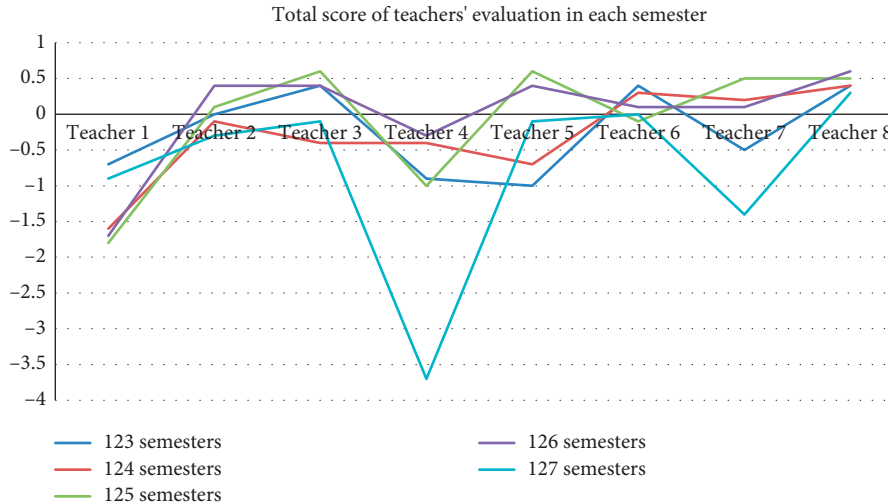


FIGURE 8: Analysis of the total score of teaching evaluation in each semester.

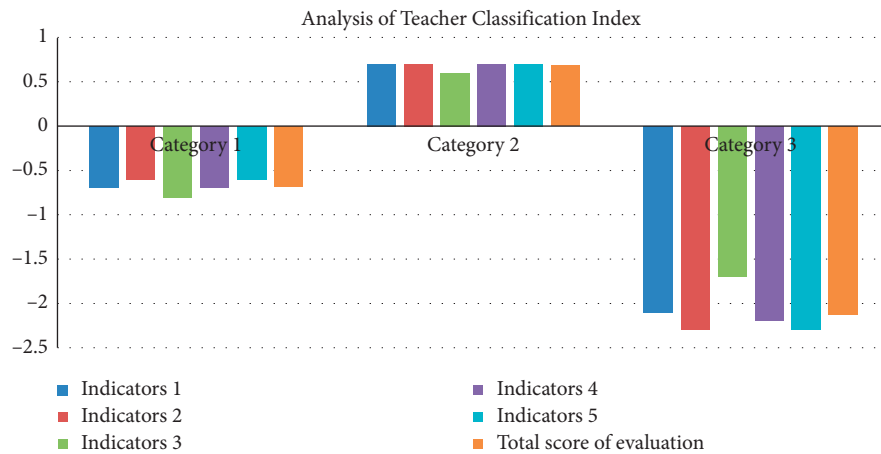


FIGURE 9: Classification index analysis.

TABLE 1: Comparison of data mining algorithms.

Algorithm	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	总耗时
Apriori algorithm	153	163	239	156	132	133	443
Improved Apriori algorithm	151	79	144	68	31	16	264
ID3 algorithm	164	152	248	173	158	147	524

Through image analysis in Figure 10, we can see that the curve trend of the Apriori algorithm is similar to that of the improved Apriori algorithm, but the improved Apriori algorithm takes less time, so the algorithm is preferred when selecting the algorithm.

4.3. Comparison of Information Entropy Algorithms in Teaching Evaluation. By comparing three kinds of information entropy in teaching evaluation, we can see that the longest running time of the information entropy calculation of greedy algorithm model is 20 ms, the longest running time of the information entropy calculation of the proposed

algorithm is about 4 ms, and the shortest running time of the information entropy calculation of the AVF algorithm is about 1 ms. In contrast, this method has the shortest running time and the highest efficiency, as shown in Figure 11.

4.4. System Test. The average response time and peak flow response time of the system are tested and analyzed by teaching evaluations of 1000, 2000, and 3000 people at the same time.

As can be seen from Table 2, in the teaching evaluation system based on the proposed algorithm information entropy algorithm, when the number of evaluators is 1000, the

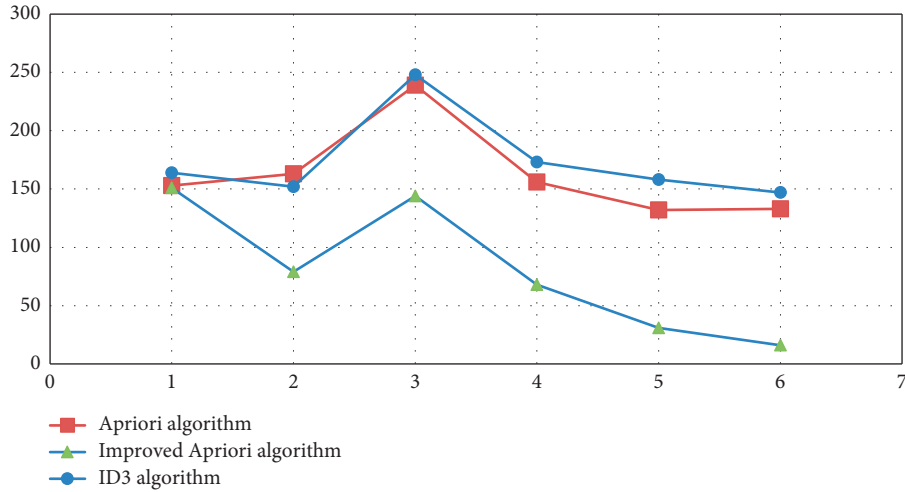


FIGURE 10: Comparison of data mining algorithms.

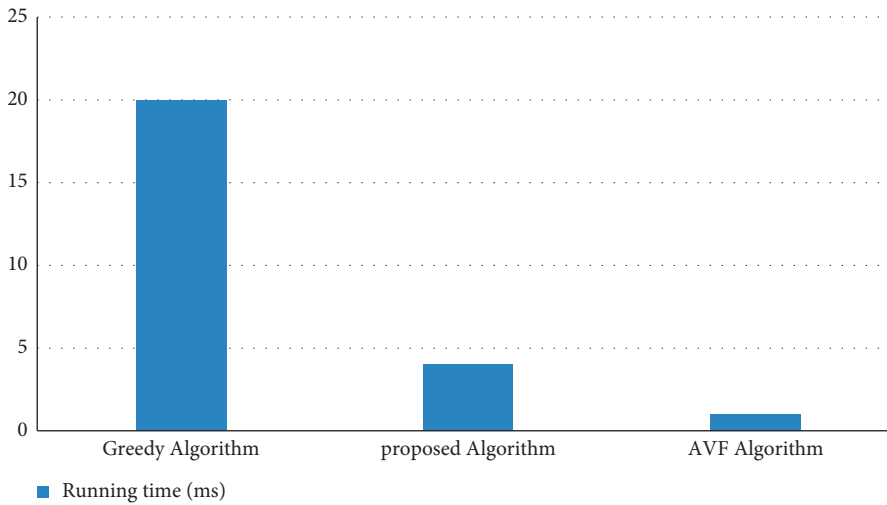


FIGURE 11: Comparison of information entropy operations.

TABLE 2: Proposed algorithm model analysis.

Number of evaluators	Average response time (ms)	Peak flow response time (ms)	Test conclusion
1000	1.323	1.468	Pass
2000	1.654	2.031	Pass
3000	2.346	2.447	Pass

average response time is 1.323 ms, and the peak flow response time is 1.468 ms; when the number of evaluators is 2000, the average response time is 1.654 ms, and the peak flow response time is 2.03 ms; and when the number of evaluators is 3000, the average response time is 2.346 ms, and the peak flow response time is 2.44 ms. The test results are all passed.

According to the data in the following Table 3, the average response time of the teaching evaluation system

based on the AVF algorithm information entropy algorithm is 0.656 ms, 1.212 ms and 1.99 ms respectively when the number of evaluators is 1000, 2000 and 3000; The peak response times were 0.785 ms, 1.454 ms and 2.107 ms, respectively. All three groups of evaluators passed the test.

It can be seen from Table 4 that the average response time of the traditional information entropy algorithm is 2.546 ms, 2.987 ms, and 3.231 ms, respectively, when the

TABLE 3: Teaching analysis under AVF model.

Number of evaluators	Average response time (ms)	Peak flow response time (ms)	Test conclusion
1000	0.656	0.785	Pass
2000	1.212	1.454	Pass
3000	1.996	2.107	Pass

TABLE 4: Teaching evaluation system based on traditional information entropy algorithm.

Number of evaluators	Average response time (ms)	Peak flow response time (ms)	Test conclusion
1000	2.546	2.878	Pass
2000	2.987	3.024	Pass
3000	3.231	3.546	Pass

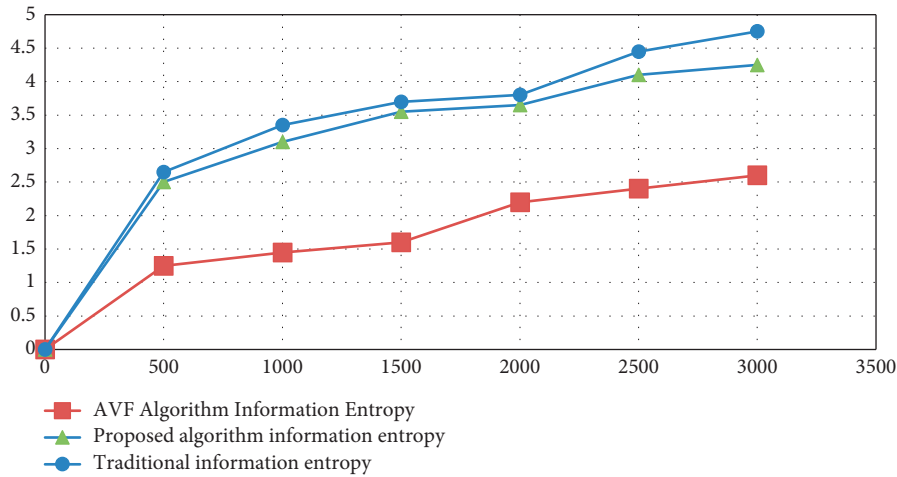


FIGURE 12: Comparison of teaching evaluation algorithms.

number of evaluators is 1000, 2000, and 3000. When the number of evaluators is 1000, the peak response time is 0.785 ms. The peak response time is 1.454 ms and 2.107 ms when the number of people is 2000 and 3000, respectively. The test results are all passed.

Through the analysis of the proposed algorithm model in Table 2, the teaching analysis under the AVF model in Table 3, and the teaching evaluation system table analysis based on the traditional information entropy algorithm in Table 4, it is known that the three methods compared in this paper have passed the system test. When the unified variable is 3000 people and the relevant teaching evaluation is carried out at the same time, the average response time of the proposed model is 2.346, and the peak response time is 2.447; the AVF model is 1.996, 2.107; the traditional algorithms are 3.231 and 3.546, respectively. In contrast, the teaching evaluation system based on the AVF algorithm information entropy algorithm needs the shortest time and the highest efficiency, while the traditional teaching evaluation system needs the longest time, as shown in Figure 12.

4.5. Comparison of Specific Function Tests of the System. The number of teaching evaluation requests is divided into seven groups: 1000, 1500, 2000, 2500, 3000, 3500, and 4000. As shown in Table 5.

By comparing the teaching evaluation system under the proposed algorithm method with the teaching system under the AVF algorithm method and the teaching evaluation system under the traditional method, we can see that the average response time increases with the increase of the number of evaluators at the same time, but the average response time required by the teaching evaluation system under the AVF algorithm method is shorter and the efficiency is higher, as shown in Figure 13.

It can be seen from Figure 14 that when the number of experimenters is 1000 to 4000, the lowest success rate of the teaching evaluation system under the AVF algorithm method is 99.6%, the lowest success rate of the teaching evaluation system under the proposed algorithm method is 98.7%, and the lowest success rate of the teaching evaluation system under the traditional method is 99%. The success rate and average response time of the teaching evaluation system

TABLE 5: System function test.

System	Number of evaluation requests	1000	1500	2000	2500	3000	3500	4000
Proposed algorithm method	Mean response time (ms)	21	37	69	113	167	198	236
	Success rate (%)	100	99.8	99.7	99.8	99.5	99.1	98.7
AVF algorithm method	Mean response time (ms)	17	32	43	82	101	146	187
	Success rate (%)	100	100	99.9	99.8	99.9	99.6	99.8
Traditional method	Mean response time (ms)	32	54	87	166	221	312	452
	Success rate (%)	100	99.6	99.4	99.2	99.2	99.2	99

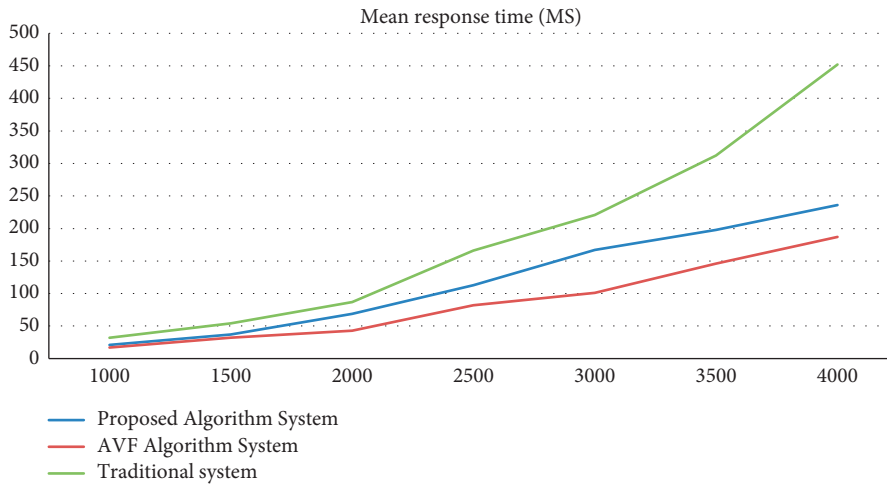


FIGURE 13: Average response time.

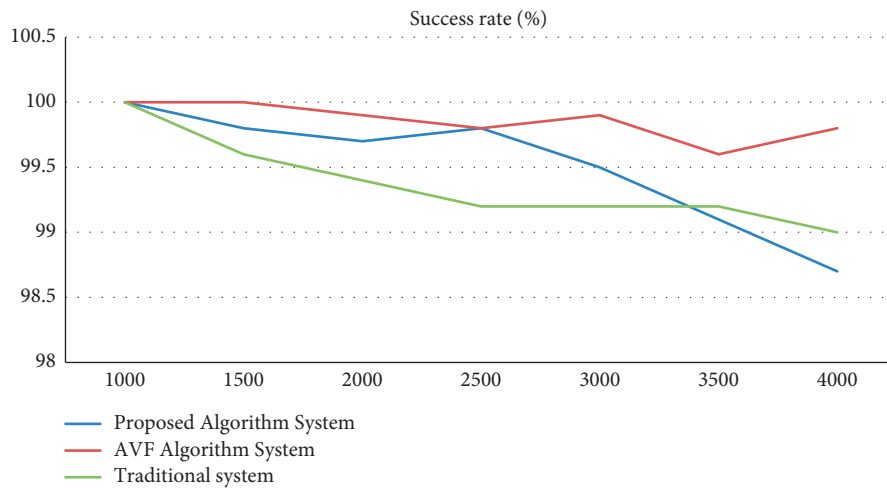


FIGURE 14: Success rate analysis chart.

based on the AVF algorithm are better than those based on traditional methods, so this method should be preferred.

5. Conclusion

By testing the efficiency and accuracy of data mining technology from a variety of calculation methods and improving the quality and efficiency of teaching evaluation through a variety of model methods, we can intuitively

analyze what problems exist in the teaching content and then improve it. Through the comparison of multimethod models, the improved Apriori method can improve the efficiency of data mining, and the information entropy algorithm of teaching evaluation under the AVF method can save more time. It can be seen that the teaching evaluation system can effectively improve efficiency. In the future, teaching evaluations based on data mining should give priority to teaching evaluations based on the AVF algorithm.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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