Retraction

Retracted: A Cluster Analysis Model for PhD Dissertation Quality Based on the Depth Algorithm

Security and Communication Networks

Security and Communication Networks has retracted the article titled "A Cluster Analysis Model for PhD Dissertation Quality Based on the Depth Algorithm" [1] due to concerns that the peer review process has been compromised.

Following an investigation conducted by the Hindawi Research Integrity team [2], significant concerns were identified with the peer reviewers assigned to this article; the investigation has concluded that the peer review process was compromised. We therefore can no longer trust the peer review process, and the article is being retracted with the agreement of the Chief Editor.

The author does not agree to the retraction.

References

[1] H. Zheng, "A Cluster Analysis Model for PhD Dissertation Quality Based on the Depth Algorithm," *Security and Communication Networks*, vol. 2022, Article ID 9689903, 8 pages, 2022.

[2] L. Ferguson, "Advancing Research Integrity Collaboratively and with Vigour," 2022, https://www.hindawi.com/post/advancing-research-integrity-collaboratively-and-vigour/.

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Research Article
A Cluster Analysis Model for PhD Dissertation Quality Based on the Depth Algorithm

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Doctoral education is an important part of higher education and plays an important role in cultivating many higher talents for the country. In doctoral education, thesis writing is an indispensable teaching section. The quality of the doctoral thesis will directly affect the graduation of doctoral students. Therefore, the analysis of the quality of the doctoral thesis is a typical aspect of the evaluation of doctoral education work. This paper aims to study the quality clustering analysis of the doctoral dissertation based on the depth algorithm. This paper establishes a doctoral paper quality cluster analysis model based on the depth algorithm and carries out the doctoral paper quality cluster analysis experiment based on this model. After the experiment, the main factors affecting the quality of doctoral dissertation were also analyzed. The conclusion is the following: The accuracy rate of the doctoral paper quality cluster analysis model based on the depth algorithm has reached 88.5%.

1. Introduction

With the development of education and science and technology, more and more technical means have been applied to education work, such as deep algorithms. The application of the deep algorithm in the education field mainly focuses on the establishment of the evaluation model of education work. In education, especially in higher education, doctoral education occupies an important proportion and also plays an important role in the training of national doctoral talents. In doctoral education, the evaluation of education and teaching work includes many parts, and the quality analysis of the doctoral thesis is one of them. Doctoral thesis writing is directly related to the progress of doctoral student graduation work. Therefore, it is very important for doctoral dissertation quality cluster analysis. This paper studies the quality cluster analysis of the doctoral thesis mainly based on the deep algorithm.

The innovations of this paper are as follows: (1) Based on the deep mining algorithm, this paper explores the cluster analysis of the quality of doctoral dissertation. (2) In this paper, combined with the fuzzy clustering algorithm of the deep mining algorithm, a doctoral dissertation quality

cluster analysis experiment was established and conducted based on this model.

2. Related Work

There are also many research studies related to deep mining algorithms in academia. Among them, Xue Y et al. mainly studied the application of the order-preserving sub-matrix (OPSM) biclustering model of the deep mining algorithm in biological gene expression data mining. Their research proposes a new and a more accurate data mining algorithm based on OPSM to optimize OPSM [1]. The research of Deep V focuses on the optimization of the k-means clustering algorithm in the deep mining algorithm. The main purpose of this research is to improve the computational accuracy and efficiency of the k-means algorithm by reducing the number of iterations and time-consuming [2]. Cui and Yan studied the application of the deep mining algorithm in the medical and health information service system. He proposed a method of mining effective information in a computer software knowledge base using the deep mining algorithm [3]. Shirani Faradonbeh and Taheri studied the feasibility of the deep mining algorithm for rockburst prediction, and

based on the deep mining algorithm, they proposed a more accurate and more practical new model for rockburst prediction [4]. The study of Abubakari et al. used the deep mining algorithm to establish a prediction model for predicting students' academic performance, and it was proved by experiments that the prediction accuracy of the model reached 76.8% [5]. Chen et al. mainly studied the application of the deep mining algorithm in predicting water inrush in the process of deep coal seam mining and proposed a risk prediction model based on the deep mining algorithm and support vector data description (SVDD) [6]. Although the above studies are related to deep mining algorithms, they can provide some references for the research methods of this article. However, these studies are not sufficiently practical for deep mining algorithms in feature comparison and analysis between different topic model products, and the experiments are complete. It takes a lot of time and energy, and it is not easy to operate.

3. Comparison and Analysis Methods of Product Features of Topic Models

3.1. Deep Data Mining. Deep data mining refers to data mining based on deep learning. It is a kind of comprehensive data mining based on deep learning algorithms. With the development of computer technology in today's technological era, human society is gradually being overwhelmed by data, and any behavior that occurs by people may be recorded. For example, in the field of education, the deep data mining algorithm can mine and analyze the recorded educational and teaching data [7]. Data mining is the process of extracting hidden, unknown, but useful information, and data from a large amount of incomplete, noisy, fuzzy, and random data. Data mining is generally considered to be one of the key steps in database knowledge discovery. With the continuous development of data mining technology, data mining research continues to absorb experience in other fields, such as databases, artificial intelligence, deep neural networks, and other fields, many ideas can be applied in the field of data mining [8].

The process of data mining can be divided into many processing stages, as shown in Figure 1.

Data mining has the following functions:

(1) Classification: According to the difference between the characteristics and attributes of the records, the records in the data are divided into different categories, and different things are described with different labels [9].

(2) Association rules and sequence pattern discovery: Association rules are accompanied by the occurrence of one event, and other events may also occur, so these two events have a kind of correlation.

(3) Clustering: It analyzes and extracts the inherent laws of the data, and classifies the data according to these laws.

(4) Prediction: According to the analysis of things, the rules of things are extracted, and the properties of things are predicted according to the rules.
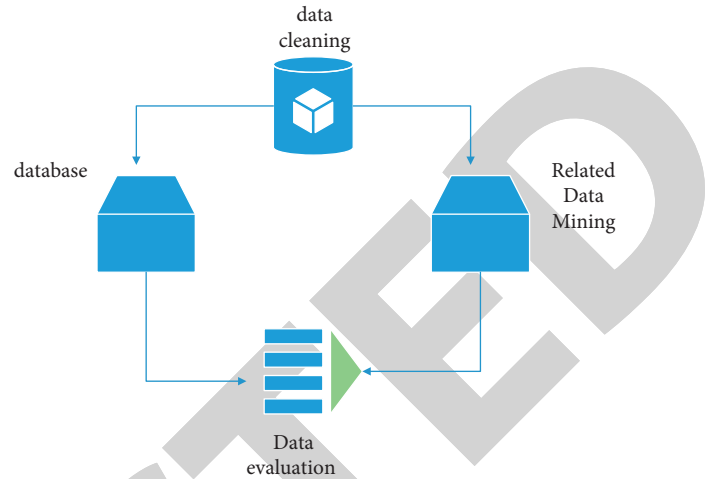

Figure 1: Data mining process.

(5) Bias prediction: It describes and analyzes individual special cases in the data, and points out the internal reasons.

These functions of data mining are all intrinsically related, they are interrelated and affect each other, and they cooperate with each other and play a role together in the process of data mining [10].

3.2. Features of Data Mining. Data mining has formed the following characteristics in the process of increasing development.

The first is multidisciplinary integration: as an application-driven field, data mining has absorbed important technologies from multiple fields [11], as shown in Figure 2.

This characteristic of data mining determines that it is meaningless to discuss data mining separately from the closely related disciplines, whether in a theoretical research or in practical application. Different disciplines and techniques are often combined for specific data mining tasks [12].

The second is for specific needs and applications. This feature of data mining means that different data types need to be processed for different scenarios and data mining tasks, and different analysis and processing techniques are used to obtain specific data mining models. On the other hand, in the face of specific user needs, different mining goals will also produce completely different results. Therefore, there is no best algorithm for data mining, only the most suitable algorithm for a specific data mining task [13].

Finally, the pattern is interesting. That is, the patterns and rules of data mining need to be easily understood by humans, and in order to effectively discover patterns that are valuable to a given user, pattern interest metrics, are indispensable. Pattern interest can be divided into subjective and objective measurement methods. Objective measures are generally processed by probability in statistics, such as association rule support or confidence. The subjective measure is based on the user's beliefs about the data, such as the pattern obtained is similar to the user's hunch or the
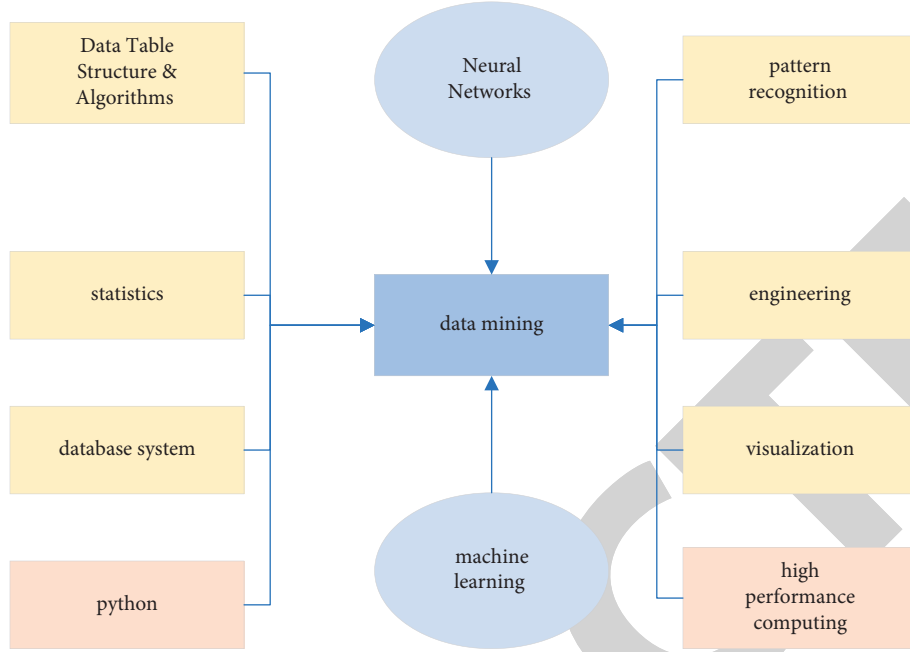
Figure 2: Multidisciplinary features of data mining.

pattern is unexpected, resulting in the same data being different for different users. Usually, these two metrics are complementary and combined with each other in practical applications [14].

3.3. Fuzzy Clustering Algorithm.

Fuzzy clustering algorithm is an algorithm that obtains the membership of each sample point to all class centers by optimizing the objective function, which determines the class genus of the sample point to achieve the purpose of automatically classifying the sample point data. In the process of data mining, data classification is inevitable, and to select the most reasonable classification result among many possible data classification results, it is necessary to establish reasonable data clustering criteria [15]. In hard classification, a common clustering criterion is the least squared error sum. Supposing is a hard partition matrix, and is the representative vector or cluster prototype vector of the ith class. Then, the objective function of cluster analysis is defined as

$$j(U, P) = \sum_{i=1}^{c} \sum_{x} \rho_{ik}. \tag{1}$$

Among them, represents the degree of distortion between typical samples of the ith class, which is often measured by the distance between two vectors. represents the sum of squares of errors between the samples in each category and other typical samples [16], which can also be expressed as

$$J_2(U, P) = \sum_{k=1}^{n} \sum_{i=1}^{c} u_{ik}. \tag{2}$$

The clustering criterion is to seek the best team (U, P) so that $J(U, P)$ is the smallest when constraint condition is satisfied. The most common way to solve this kind of

optimization problem is to use an iterative method to find the approximate minimum value of $J(U, P)$ [17].

In the above objective function, the general expression of the distance measure between the sample and the ith cluster prototype is

$$d_{ik} = \|x_k - p\|, \tag{3}$$

which is

$$d_{ik} = (x_k - p^{\gamma}A). \tag{4}$$

Among them, A is a symmetric positive definite matrix of order s ∗ s. When A takes the identity matrix I, the criterion for clustering is to take the minimum value of $J(U, P)$ [18]: $\min\{J(U, P)\}$

$$\min\{J(U, P)\} = \min\left\{ \sum_{k=1}^{n} \sum_{k=1}^{c} (U_{ik}) (d_{ik})^2 \right\} \tag{5}$$

which is

$$\min\{J(U, P)\} = \sum_{k=1}^{n} \min\left\{ \sum_{i=1}^{c} (d_{ik})^2 \right\}. \tag{6}$$

The constraint condition of the extreme value of the above formula is, which can be solved by the Lagrange multiplier method [19].

$$F = \sum_{i=1}^{c} (u_{ik}) (d_{ik})^2 + \gamma \left(\sum_{i=1}^{c} U_{ik} - 1 \right). \tag{7}$$

First-order necessary conditions for optimization are as follows:

$$\frac{\alpha F}{\gamma} = \left(\sum_{i=1}^{c} u_{ik} - 1 \right), \tag{8}$$

which is

$$\frac{\partial F}{\mu} = \left[m\left(u_{jt}\right)\left(d_{jt}\right)^2 - \gamma \right] = 0. \tag{9}$$

Therefore,

$$u_{jt} = \left[\frac{\gamma}{m\left(d_{jt}\right)^2} \right]. \tag{10}$$

Thus,

$$\frac{\gamma}{m} = \frac{1}{\sum_{i=1}^{c} \left[1/\left(d_{it}\right)^2 \right]^{1/m-1}}. \tag{11}$$

Considering that may be 0, the value of that makes $J(U, P)$ the minimum value is

$$u_{ik} = \frac{1}{\sum \left(d_{ik}/d_{jk}\right)^{2/m-1}}. \tag{12}$$

The value of when $J(U, P)$ is minimized, can be obtained in a similar way [20], let

$$\frac{\partial}{p_i} J(U, P) = 0. \tag{13}$$

It can get

$$\frac{\partial}{p_i} = \sum_{k=1}^{n} \left(U_{ik}\right)^m, \tag{14}$$

which is

$$\sum_{k=1}^{n} \left(\mu_{ik}\right)^m = \left[-2A\left(x_i - p\right) \right]. \tag{15}$$

From this, we can get

$$p_i = \frac{1}{\sum_{k=1}^{1} \left(\mu_{ik}\right)^m} \sum_{k=1}^{n} \left(\mu_{ik}\right)^{m x_k}. \tag{16}$$

The process of the fuzzy clustering algorithm is shown in Figure 3.

4. Experiment of Comparative Analysis of Product Features of Topic Model Based on Deep Mining Algorithm

4.1. Experimental Method.
The main method of this experiment is to build a doctoral thesis quality cluster analysis model based on the deep data mining algorithm, and then to carry out the doctoral thesis quality cluster analysis experiment based on this model. The cluster analysis of the selected doctoral thesis samples finally yielded the exact results of cluster analysis. The main factors affecting the quality of doctoral dissertation are discussed and analyzed.

4.2. Cluster Analysis Model of Doctoral Dissertation Quality.
Doctoral education has always been an important part of China's higher education. Today's society has put forward

Figure 3: Flow of the fuzzy clustering algorithm.

more requirements for doctoral education, and it has become particularly important to evaluate and analyze the main factors affecting the quality of doctoral dissertations. Big data refers to the collection of data that cannot be acquired, stored, managed, and processed with conventional data processing software tools within a limited time. Data mining refers to discovering and solving problems through exploration, processing, analysis, or modeling of data. This paper attempts to establish a clustering analysis model of doctoral dissertation combining big data and data mining technology to find out the main factors affecting the quality of doctoral dissertation. The cluster analysis model of doctoral dissertation established in this paper is shown in Figure 4.

Based on the above cluster analysis model, this paper conducts descriptive statistics on 8,600 comments of 1816 doctoral degree recipients from 2017 to 2019. The results are shown in Tables 1 and 2.

From the statistical results in the table, it can be seen that the average value of comprehensive evaluation and four subindices are all above 3.3, that is, the average is above good, indicating that the quality of doctoral dissertation is generally guaranteed. Among them, the average value of the comprehensive evaluation of the review is 3.990, which is higher than the average value of four indicators. This is mainly because the comprehensive evaluation results of the review are divided into five grades. Grade. The standard deviation of the mean of the comprehensive evaluation results is higher than the standard deviation of subindices, indicating that the experts' comprehensive evaluation of papers is more controversial than indicators. Among four sub-indicators, the average value of innovative achievements is the lowest, only 3.325, and the average value of the basic theory and specialized knowledge
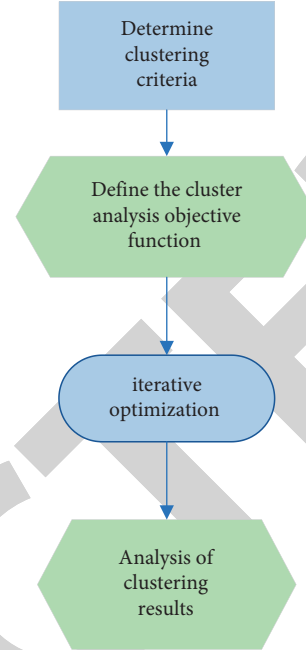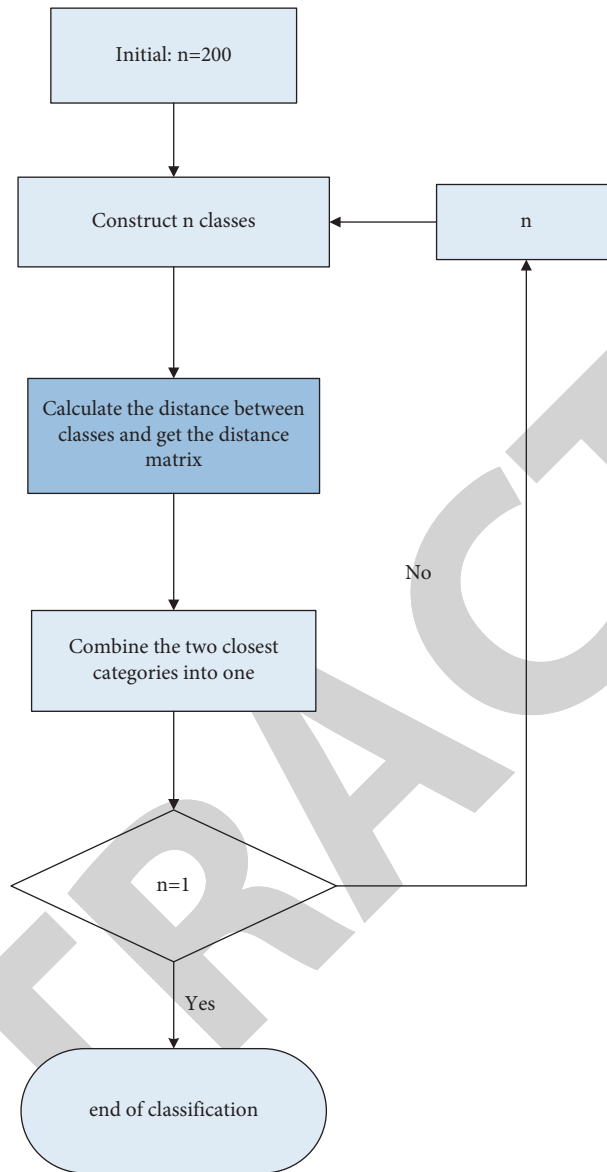
Figure 4: The cluster analysis model of doctoral dissertation.

Table 1: Review opinion results1.

Evaluation indicators	Sample size	Minimum value	Maximum value	Mean	Standard deviation
Indicator 1: innovative outcomes	1816	2.6	4.0	3.325	3180
Indicator 2: academic or practical value	1816	2.5	5.0	3.633	2892

is the highest, which is 3.835. The difference between the two is 0.51, and the ratio is as high as 15%. Among four subindices, the standard deviation of innovative achievements is also the largest, indicating that the evaluation opinions of reviewers on this indicator are most divergent; the standard deviation of the basic theory and specialized knowledge is the smallest, indicating that experts have the highest degree of understanding of doctoral students' mastery of basic theoretical knowledge. Recognition is still relatively consistent. Judging from the trend of the mean

frequency of four subindices, the indicator of innovative achievements is close to normal distribution, and the proportion of the highest score (4 points) for the basic theory and specialized knowledge is as high as 52.9%, indicating that review experts generally believe that doctoral students have mastered the basics. Strong theoretical ability. The two subindices of the academic value or the practical value and the writing level have roughly the same trends. The proportions of less than good (less than 3 points) are 1.2% and 1.0%, respectively, and the excellent

TABLE 2: Review opinion results2.

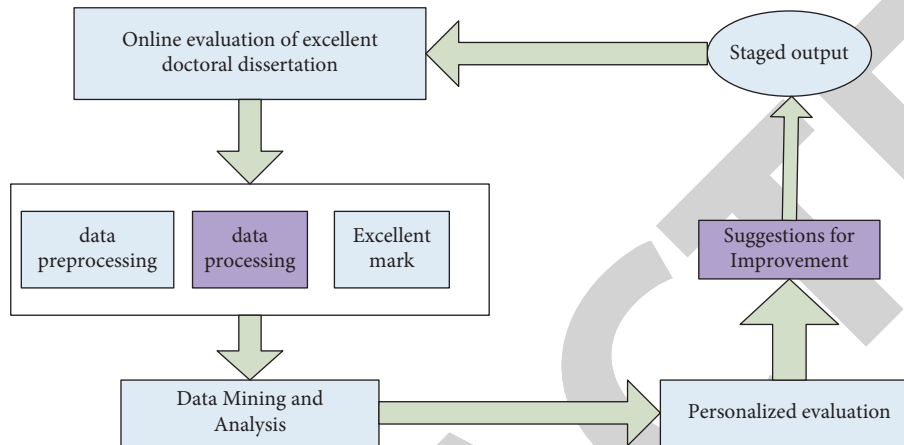| Evaluation indicators	Sample size	Minimum value	Maximum value	Mean	Standard deviation
Indicator 3: basic theory and expertise	1816	2.3	4.0	3.855	2242
Indicator 4: writing level	1816	2.4	4.0	3.621	2750
Overview:	1816	2.8	5.0	3.990	3386

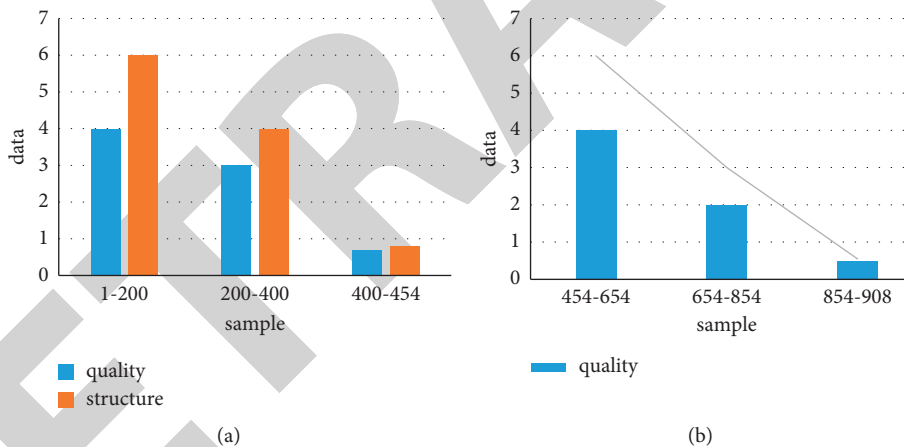FIGURE 5: Evaluation model of output ability of excellent doctoral dissertation.

FIGURE 6: The results of cluster analysis of first 908 doctoral dissertations. (a) First 454 PhD samples. (b) Last 454 PhD samples.

rates (4 points) are 17.5% and 25.7%, respectively. To sum up, the main factors affecting the quality of doctoral dissertation are doctoral students' ability to master professional theoretical knowledge, doctoral dissertation writing ability, and innovative achievements in doctoral dissertation.

4.3. Design of Output Ability Evaluation Model for Excellent Doctoral Dissertation Based on Data Mining.

The output ability evaluation model of excellent doctoral dissertation designed based on data mining technology in this paper is shown in Figure 5:

Using the above model, we can comprehensively evaluate the output ability of excellent doctoral dissertations,

and play a positive role in improving the quality of doctoral dissertations.

4.4. PhD Thesis Quality Cluster Analysis.

Based on the above established clustering analysis model of excellent doctoral dissertation quality, the cluster analysis experiment can be conducted on selected doctoral dissertation samples. Figures 6 and 7 show the results of the cluster analysis of 1816 PhD papers.

It can be seen from Figure 6 that the cluster analysis of the structure and quality of the first 908 doctoral dissertation samples is relatively comprehensive, based on the model, the first 908 doctoral papers were basically accurate, with an accuracy above 80%.
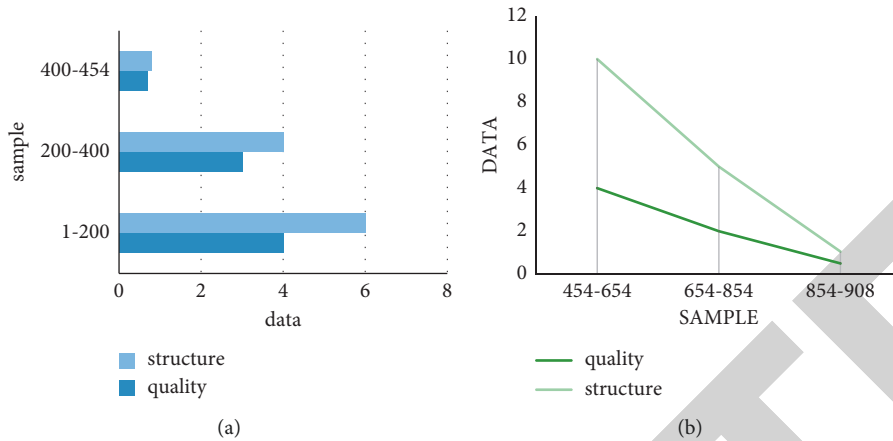
FIGURE 7: The results of cluster analysis of the last 908 doctoral dissertations. (a) 1–454 PhD samples. (b) 454–908 PhD samples.

It can be seen from Figure 7 that based on the designed quality clustering analysis model of doctoral dissertation, the clustering analysis results of the last 908 doctoral thesis samples are also basically accurate, and the accuracy rate is above 84%.

After calculation, the clustering analysis model of doctoral dissertation quality established based on the deep mining algorithm make the accuracy of doctoral dissertation quality clustering analysis reach 88.5%. This conclusion fully shows that the deep data mining algorithm has a more accurate cluster analysis effect in the doctoral thesis quality cluster analysis.

5. Discussion

With the development of social economy, science and technology and education are also constantly developing. In the development of education, the development of doctoral education is getting better and better [21–23].

In the development of doctoral education, the quality of doctoral thesis evaluation occupies an important part. This paper analyzes the quality of doctoral dissertation based on the deep mining algorithm [24–26].

In this paper, we establish a PhD dissertation quality cluster analysis model based on the deep data mining algorithm and conducted the experiments on a selected sample of 1816 doctoral dissertations. The conclusion of the experiment is as follows: The clustering analysis model of doctoral dissertation quality established based on the deep mining algorithm achieved the accuracy of 88.5% [27].

6. Conclusion

This paper first introduces the research background and research significance of the quality cluster analysis of doctoral thesis based on the deep data mining algorithm, and then lists some studies related to the deep data mining algorithm. Then the relevant concepts and algorithms of the deep data mining algorithm are introduced in detail. Finally, a doctoral dissertation quality cluster analysis model is established based on the deep data mining algorithm, and it

is conducted based on this model. The experiment comes to the conclusion that the clustering analysis model of doctoral dissertation quality established based on the deep mining algorithm achieved the accuracy of 88.5%. The research in this paper has some reference significance for promoting the quality evaluation of doctoral theory, and also has some value for improving the quality of doctoral education. It also has a certain positive significance to promote the development of higher education in China. However, due to the limited limitations of the study conditions and level, this paper also has some limitations. The research in this paper is not comprehensive enough in the research perspective, and the experimental methods are not innovative enough. I hope to do better in future research and make more contributions to promoting the development of doctoral education.

Data Availability

This article does not cover data research. No data were used to support this study.

Conflicts of Interest

The author declared that there are no conflicts of interest.

Acknowledgments

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