

Research Article

Development and Training Strategies of College Teachers Based on Data Mining Technology

Yan Zhou 

College of Mathematics and Informatics, South China Agricultural University, Guangdong 510642, China

Correspondence should be addressed to Yan Zhou; zhouyan1980@scau.edu.cn

Received 16 May 2022; Revised 26 July 2022; Accepted 8 August 2022; Published 10 February 2023

Academic Editor: Mian Ahmad Jan

Copyright © 2023 Yan Zhou. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the increasing investment in education in China, higher education institutions have higher requirements for the introduction of teachers. This research mainly discusses the development and training strategies of college teachers based on data mining technology. Data mining technology is dedicated to data analysis and understanding, and the technology of revealing the information contained in the data. It is a frontier research topic in the field of information and database technology. Therefore, the system of monitoring and evaluation of college teaching quality based on data mining is designed for the management of educational affairs in colleges provided convenience. This paper selects an unsupervised classification method: a cluster analysis. This method can not only obtain reasonable classification results but also give consideration to the comprehensiveness of employee development and give reasonable development suggestions for each employee through classification results. For a series of introduced teacher's information, personnel management module should provide the following functions: teacher information management, contract information management, resignation information management, and query teacher personnel information. The recruitment management module often collects the candidate information, registers and stores it, and then conducts a series of personnel screening for these candidates according to the recruitment criteria, and finally determines the possible candidates. Afterwards, a series of comprehensive evaluations are carried out on these selected candidates, and finally the candidates are selected for admission based on the comprehensive performance of the candidates. The K-means clustering algorithm in the cluster analysis method is adopted. This algorithm has the excellent characteristics of high computational efficiency and is suitable for the operation of large amount of data. Through the clustering algorithm, a reasonable assessment method is established, and it is effectively used in the human resources assessment management system. Among the introduced teachers, the number of teachers whose professional title is high, the highest degree is doctorate, and the number of teachers whose papers are published at SCI level accounts for 16%. The data tested by the data mining tool contains 1,400 rows of data. The minimum support is 5%, and the minimum confidence is 90%. This study is helpful for the rational planning of human resources and the promotion of comprehensive competitiveness of colleges and universities.

1. Introduction

When facing the problems existing in the teaching ability of newly recruited teachers and needing to adopt methods and means, after comparing and analyzing the advantages and disadvantages of a single training mode, a series of intervention measures have been taken, such as integrating the methods of teacher training. The birth of data mining technology is significance, and its scope is inseparable in the high-tech field. The high-tech field refers to the process of human secret discovery, which is exactly consistent.

Therefore, it is an important subject to study and explore the establishment of university management information system suitable for China's national conditions. This is a way to achieve the school's requirements for educating people and cultivating talents. Therefore, we should understand the structure of the teaching staff, the quality of teachers, and the working conditions, identify problems and deficiencies, adjust the teaching staff in a targeted manner, and analyze the academic performance of students and the quality of the test papers, so as to obtain a variety of valuable information in order to better formulate teaching objectives and training

methods suitable for students, and promote the comprehensive and healthy development of students. Education is the cornerstone of social progress and national rejuvenation, and higher education is the booster of social development. College teachers are the implementers of higher education, playing multiple roles such as teachers, scholars, and service providers, which fundamentally determine the level of education, teaching, and scientific research in colleges and universities [1].

The research on the cultivation and improvement of teachers' teaching ability is mostly based on experience, showing the characteristics of individuality and looseness. The proposed solutions can no longer fully cover the current development of education. Since the establishment of the teacher development center, various aspects conditions have improved and levels have been raised. At present, the most urgent thing is that it can better serve the data resources of colleges. How to use these data has become the top priority, find its potential law, let the senior managers of colleges and universities provide a feasible way to integrate the data, and use data mining technology to find out the potential law and association, for the future of colleges and universities in various fields to make correct decision-making judgment. Data mining technology can also be applied to the teaching quality management in colleges and universities. Using data mining technology to find useful information in massive data has far-reaching significance for improving the teaching quality and management level of schools.

Buczak A believes that focused literature surveys on machine learning ML [2]. Lu et al. believes that of discovering symbol classification rules using neural networks, his research lacks data [3]. Zhu et al. can discover their inter-relationships and coupling effects. Although he proposed numerical simulation data mining, his research lacks data [4]. Figueiredo et al. studied the use of data mining tools, with the purpose of examining the impact of the methodology used in the chemistry laboratory course on students attributable to laboratory work on learning and their motivation. Response frequency analysis cannot distinguish the interviewee's views based on the types of teaching methods used in the experimental class. Although he used the k -means clustering method in the process of data mining, his research is not novel enough [5]. In order to help new teachers solve their confusion and build up their confidence in teaching, a platform for solving confusion or providing consultation is needed, that is, the teacher development center comes into play.

With the advancement of technology, data mining is continuously applied in different fields. Among them, education data mining is an interdisciplinary field that results from the application of data mining in the field of education. This paper chooses an unsupervised classification method: cluster analysis. In addition to obtaining reasonable classification results, this method can also give reasonable development suggestions for each employee through the classification results. The recruitment management module is often to collect applicant information, register in the database, and then perform a series of personnel screening according to the employment criteria, and finally determine

the possible candidate teachers, and then conduct a series of comprehensive assessments such as written examinations and interviews, and finally according to the applicants comprehensive results of the students will be selected for admission. The algorithm has high computational efficiency and is suitable for large-capacity data operations. Through the mutual cooperation of national and regional colleges and universities, by formulating high-quality college teacher development and strategic plans, focusing on personal development, so as to promote the effectiveness of college teacher development and training.

2. Recruitment and Introduction of University Teachers

2.1. Recruitment of College Teachers. The recruitment of teachers in China's universities is the needs of China's universities for their development. Based on the status of universities and academic research capabilities, to a large extent, they are directly determined by the quality of the university's faculty. Therefore, all universities attach great importance to the recruitment of teachers. At the same time, the national higher education management department also realizes that talents play a nonnegligible role in the development of education, and has formulated and implemented a series of policies to support and guide the recruitment of teachers in major universities. This includes the introduction of a system for rewarding academic leaders at the end of the last century; in recent years, a series of preferential policies for Chinese students returning to work in the country have been formulated; in the recent period, increased financial investment in higher education, improved college teachers treatment, and the formulation of policies for vigorously developing higher education. [6, 7]. The definition of abnormal data is very important. The result of finding abnormal data depends on the definition of abnormal data [8]. The relative information entropy of object x relative to A is defined as follows:

$$RHA(x) = \frac{Hx(A)}{H(A)}. \quad (1)$$

Among them, $H(A)$ is the information entropy of A [9]. Let $IS = (U, A, V, f)$ be the information system, and the abnormality of object x is defined as follows [10, 11]:

$$EOF(x) = 1 - \frac{(\sum_{i=1}^k RH\{a\}W\{a\} + \sum_i RH\{a\})}{|U|}. \quad (2)$$

2.2. Personnel Management in Universities. The functional requirements of the university personnel management system must be determined closely in conjunction with the actual needs [12]. The staff involved in the personnel management system of colleges mainly include staff personnel department, teaching affairs, finance department, scientific research department, and other departments, and also include all teachers and leaders of the school. The personnel department is the management department of

human resources and corporate public affairs of an enterprise or group [13]. They mainly use this system to complete some daily management or statistical inquiries and other tasks. To this end, the system must meet the following requirements:

- (1) Dynamic personnel management. In order to improve the efficiency and quality of personnel management, teachers can devote themselves to the education of the school. The information system required to manage it must be able to reflect the relevant data in the system in real-time and accurately according to the actual work situation of the teacher [14, 15].
- (2) Complete statistical analysis function. In order to provide valuable data and parameter basis for school leaders or relevant decision-making departments. It is required that the personnel management system of colleges and universities realizes the dynamic management of personnel work, and can also perform a certain intelligent analysis of the stored personnel-related data according to the needs of the school and provide scientific, reasonable, accurate, and comprehensive statistical analysis reports in order to better serve the school leaders and the management of the personnel department, to make scientific decisions. According to the abovementioned system architecture design and analysis, the system each corresponding to a layered model, combined with Visual Studio2010 development tools, the structure of the personnel management system is shown in Figure 1. Visual Studio 2010 Chinese version is a professional development environment used by software design and development workers in their daily work.

The fuzzy relationship matrix from evaluation factor F to evaluation grade C is the factor evaluation matrix [16]:

$$r_{ij} = \mu_b(F, V). \quad (3)$$

Among them, $V \in (0, 1)$. In the teacher performance appraisal management module, the degree of membership refers to the weight of each evaluation index of teacher performance [17]. Evaluation weight is defined as follows:

$$B = (\beta_1, \beta_2, \dots, \beta_n). \quad (4)$$

Evaluation index collection [18]:

$$F = (F_1, F_2, \dots, F_n). \quad (5)$$

Evaluation level collection [19]:

$$C = (C_1, C_2, \dots, C_n). \quad (6)$$

The evaluation index weight set B and the relation set R are combined into operation [20].

$$H = B \bullet R = (\beta_1, \beta_2, \dots, \beta_n) \begin{bmatrix} R_{11} & \dots & R_{1m} \\ \dots & \dots & \dots \\ R_{m1} & \dots & R_{mm} \end{bmatrix}, \quad (7)$$

$$\sum_{i=1}^m \beta r = [(\beta_1 R_1 + \beta_2 R_2 + \dots + \beta_M R_M) \chi] = (H_{11}, H_{12}, \dots, H_{km}) \chi.$$

Among them, $i = 1, 2, \dots, m21$.

2.3. *Data Mining*. Similar synonyms with data mining include data fusion, data analysis, and decision support. [22].

$$\bar{X} = \frac{1}{N} \sum_{i=1}^n (x_i + y_i). \quad (8)$$

The scope of clustering data mining RAND is defined as follows:

$$\text{RAND} = \max\{\|\bar{x} - x_i\|\}. \quad (9)$$

If A is used as the test attribute, the information entropy of the divided subsets is shown in the following formula:

$$E(A) = \sum_{j=1}^v \frac{X_{1j} + X_{2j} + \dots + X_{mj}}{X}. \quad (10)$$

Information entropy is a rather abstract concept in mathematics. Here, information entropy may be understood as the probability of occurrence of certain information. The information entropy of a given sample classification is defined as follows:

$$I(X_1, X_2, \dots, X_m) = - \sum_{i=1}^m P_i \log_2(P_i). \quad (11)$$

Among them, X_1, X_2, \dots, X_m is a data collection.

$$u' = \frac{u - \min_A}{\max_A - \min_A} (\max_A - \min_A) + \min_A. \quad (12)$$

Among them, if the new value interval is $[0, 1]$, the formula can be simplified to

$$u' = \frac{u - \min_A}{\max_A - \min_A}. \quad (13)$$

3. Experiments on the Recruitment and Training of College Teachers

3.1. *Overall Design of the System*. The overall function is subdivided into the following functional modules: college management module, personnel management module, recruitment management module, performance appraisal module, and promotion management module.

3.1.1. *Design of the College Management Module*. Corresponding college management module is relatively simple, maintain manage information unit and department,

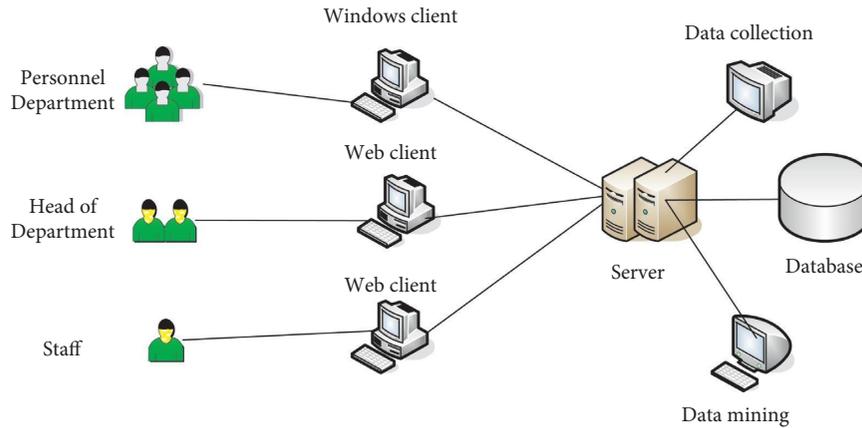


FIGURE 1: The structure of the personnel management system.

including a series of information such as department name, department address, department telephone, and employees. After sorting and summarizing the common operations of this module, it mainly includes several types: add department information, delete department information, and modify department information. All operations of the above college management module are assigned different operation permissions based on different user permissions. All users can query department information, but only the college administrator can add, delete, and modify department information.

3.1.2. Design of the Personnel Management Module. The personnel management module is mainly used to maintain and manage the teacher information of the unit. This kind of information mainly includes the teacher's family information, identity information, academic information, title information, and postinformation. In view of the abovementioned series of imported teacher information, the functions that the personnel management module should provide mainly include the following categories: teacher information management, contract information management, resignation information management, and querying teacher personnel information. The operation of this module should also be given different user rights according to different user roles. For general users, only part of the personal information can be viewed and modified. If you want to modify some of the more important personal information, you must modify it through the personnel management specialist with greater authority; for the personnel management commissioner, the authority is relatively large, and the teacher will be introduced. All functional querying information should have the authority to execute. The function of the personnel management module is trivial, and there are more teachers' personal information that needs to be maintained, but it is often repetitive and organized and revised work.

3.1.3. Recruitment Management Module Design. Realizes the management and maintenance of school recruitment and employment information. In the normal recruitment process of a unit, generally, the employing department first proposes recruitment requirements based on the actual work tasks of the department, and then after confirmation by the

supervisor, it is sent to the human resources recruitment department to form the actual recruitment plan. In the initial stage, it is often to collect applicant information, register in the database, and then conduct a series of personnel screening according to the employment criteria, and finally determine the possible candidate teachers, and then conduct a series of comprehensive assessments such as written examinations and interviews, and finally according to the applicants The overall results of the candidates will be selected for admission. In response to the above work requirements, the functions that the recruitment management module should provide mainly include the following types: recruitment plan management, teacher application management, teacher performance management, teacher recruitment management and other modules. The teachers who are finally recruited into the unit will be recruited through personnel In the management module, the personnel management commissioner enters other personal information related to it.

3.1.4. Design of the Performance Appraisal Module. The design and development of performance appraisal module must carry out detailed index division and process design. The selection of indicators for performance appraisal includes a total of seven appraisal indicators: team spirit, work ability, sense of responsibility, communication and coordination ability, morality, words and deeds, cost awareness, and innovative spirit. These indicators are obtained through extensive research and expert opinions, and they are comprehensive. And persuasive. In the K-means clustering algorithm, K-means to cluster the data into K clusters, and means that the mean of the data in each cluster is used as the center of the cluster, also known as the centroid. In the year-end assessment, the index score of each introduced teacher of the unit is scored by the assessment team composed of teacher leaders and selected teachers. For the calculation process of the performance appraisal module, the K-means in the clustering analysis is adopted. The algorithm has high computational efficiency and is suitable for large-capacity data operations. Through the clustering algorithm, a reasonable assessment method is formulated, and it is effectively used in this article. The training of new teachers'

teaching ability mainly depends on the establishment of international organizations to promote teachers' professional development, the establishment of teachers' teaching training institutions, and the development of teacher development activities.

3.1.5. Design of the Promotion Management Module. This module mainly manages and maintains the reward and punishment information of faculty and staff according to the results of performance appraisal. Including awards for teaching, scientific research, competitions and other work of faculty and staff. At the same time, it also includes the punishment record. The changes of the module data will be reflected in the salary management module in time, and will have a certain impact on the staff salary information.

The promotion management module is mainly used to maintain and manage the promotion information of employees, including employee information, original department, original position, current department, current position, promotion time, promotion reason, special instructions, etc., which is somewhat similar to employee job position management. In response to the operational requirements of promotion management in the actual work of the unit, the promotion management module should provide the following four types of operational functions: (1) Increase employee promotion information. (2) Modify employee promotion information. (3) Delete employee promotion information. (4) Query employee promotion information.

3.1.6. Attendance Management Module. This module can meet the diverse attendance management systems of colleges and universities, mainly to manage the daily attendance of faculty and staff, including information such as lateness, early leaving, absenteeism, leave, and actual attendance days. You can also set the parameters according to the attendance, and analyze and count the attendance results of all faculty and staff.

3.1.7. System Login Module Design. The system login module is often the direct entrance of the entire system, and the corresponding execution function is relatively simple. On the one hand, it is necessary to verify the user's identity information, and on the other hand, according to the execution authority granted to the user by the administrator. The login interface is shown in Figure 2. Use data mining technology to build a predictive model, and conduct in-depth mining and learning of the data provided by the university to predict student performance and teaching quality.

3.2. Database Design. Database management systems can be simply divided into three categories. Relational database systems have good data organization capabilities and fast data query capabilities. Therefore, modern large-capacity data storage systems often choose relational databases. The more representative ones are Oracle, MySQL, SqlServer, and

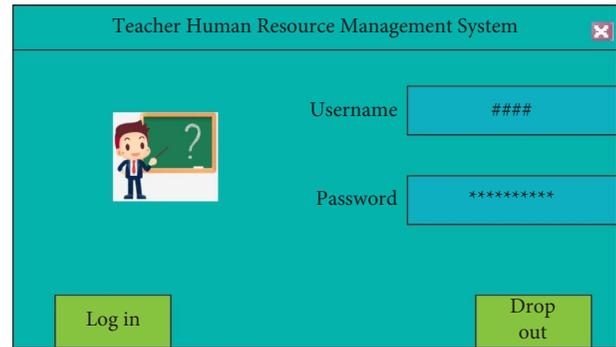


FIGURE 2: Login interface.

other high-performance database management systems. MySQL is a relational database management system and one of the most popular relational database management systems.

The first stage of database design is often to use entity-relationship diagram (E-R diagram for short) to abstract the relational patterns, and then design the table structure in the database. The entity-connection graph is represented by three basic elements: entity, attribute and connection. In addition, the connection can also be accompanied by its own attribute information. After analysis, the following entity information exists in the human resources assessment system: department information, employee information, recruitment plan, applicants, and promotion information. The connection between these entities is more complicated, for example, the relationship between employees and departments is 1:1. Contact information, 1:n contact information between recruitment plan and applicants, etc. Including employee information table, contract information table, department information table, resignation information table, assessment information table, promotion information table, applicant information table, and recruitment plan information table.

The employee information table is composed of employee ID, name, gender, ethnicity, native place, education, job title, ID number, home address, department ID, job name, recruitment source, login password, entry time, and remarks. It is used for employee information management. Data storage basis, the specific structure is shown in Table 1.

3.3. Teacher Assessment Index. This paper chooses an unsupervised classification method: a cluster analysis. This method does not require human supervision and classification, but is automatically classified by algorithms. It only needs to set the number of classifications. The results obtained have no human participation and have high credibility. And the principle of cluster analysis is the nearest neighbor principle, which can classify objects with relatively close development of various factors into one category. In addition to obtaining reasonable classification results, it can also take into account the comprehensiveness of employee development and give it through classification results. Reasonable development suggestions for each employee. Teachers are the main body of colleges and universities, the

TABLE 1: Employee information management.

Column name	Type of data	Length	Meaning	Is it empty	Restrictions
Empl_ID	Int	4	Employee ID (automatic number)	Not null	Primary key
Empl_Name	nvarchar	10	employee's name	Not null	Nonprimary key
Empl_Sex	nvarchar	4	Employee gender	Not null	Nonprimary key
Empl_Nation	nvarchar	20	Employee nationality	Not null	Nonprimary key
Empl_Origion	nvarchar	20	Employees' birthplace	Not null	Nonprimary key

driving force of college development, and the leader of social progress. The world's higher education is undergoing profound changes, and the development of university teachers is highly valued by governments, societies, scholars, and university administrators.

4. Results and Discussion

Operations that this module needs to perform are mainly, querying and deleting database department information. Therefore, in the development process of this module, the C++ language is mainly used to call a series of SQL statements that perform the reservation function to achieve maintenance function of department information. For the above four different operations, the corresponding calling process is similar, and the only difference is the SQL statement with different functions. The final implementation effect is shown in Figure 2. All the functions of the college management module are only valid for the administrator's authority. For other user's authority, the module will be automatically hidden and cannot be executed. The college management module displays all existing department information in the system by default. The user enters the corresponding parameter information in the query box at the top, then you can query the specified department information, and place "add department information," "delete department information," and "modify" below. There are three function buttons for "department rest." Click "add department information" to add a new department. If the user selects a piece of department information, he can "delete department information" and "modify department information." Before "delete department information," the system will throw out the corresponding prompt information to remind the user whether to delete the department information. The college management module is shown in Figure 3.

Full score for each item is 10 points, and the minimum is 0 points. Part of the scoring results is shown in Table 2.

On the surface, it seems that R9 is better, but the results of the analysis data are shown in Table 3. The total score of R9 is higher than R3, but its scores vary greatly. Among them, the score of innovation is 9 and the score of communication and coordination is only 3. The score of R3 is lower than that of R9, but its scores are more different. The overall score is relatively average, which is the main difference between the traditional classification method and the unsupervised clustering method proposed in this article. The score classification method only looks at the overall score and ignores the balance of the overall development of the individual.

Competent object data results are shown in Table 4. Competent objects are: clustering method competent persons are R9, R11, and R12; scoring method competent persons are R3, R5, R11, and R12. In the first type of analysis, it is known that R3 is classified as an excellent grade, and comparing R9 and R5, it can be seen that the overall score of R9 has a clear advantage over R5, and R9 is better than R5 in the classification of the scoring method itself. For the results obtained by the clustering method, it is derived from the abnormal data of R5. R5's morality, words, and deeds score only 2 points, which has a greater impact on the overall index, while the overall score of R9 is much better than that of R5.

The clustering method is R5, R6, and R7, the scoring method is R6 and R7, and the main difference is the object R5. For R6 and R7, obviously, the overall score is low, and there are more different data. Part of the division results is shown in Table 5. In R6's score, the two scores of morality and deeds and innovative spirit are 1 and 3, both of which are low scores. They are differential data in the overall data, and the scores of other items except these two are overall in the middle; R7's differential data. For cost awareness and innovation, the scores are 2 and 3 points, respectively. The higher score for the sense of responsibility is 9 points, and the scores for the remaining items are between 4–6 points, which belong to the middle deviation score situation, so these two objects were clearly classified as incompetent.

The data tested by the data mining tool contains 1,400 rows of data. The minimum support is 5% and the minimum confidence is 90%. The final generated results are shown in Table 6. Support is used to measure the frequency of clustering in the entire data set, and confidence is used to measure the credibility of clustering. The clustering in the table can be visually analyzed in this way. Among the 50–60-year-old, the number of professors with a doctorate degree is the highest. Although there are some professors with a master's degree, it has not yet reached the minimum support of 5%. For doctoral students under the age of 35, although some teachers are already associate professors, the proportion is relatively small and does not reach the minimum support of 5%.

The results of the credibility analysis are shown in Figure 4. From the data mining results obtained, the number of teachers in the teaching and research positions of the school is the largest among doctors between the ages of 45–49 and 50–60. The number of PhDs is the largest number of year-olds; the number of PhDs with lecturers under 35 and the number of masters aged 35–39 is the largest. It can be seen that most of the professors are doctoral students between the ages of 45–49 while most of the young teachers

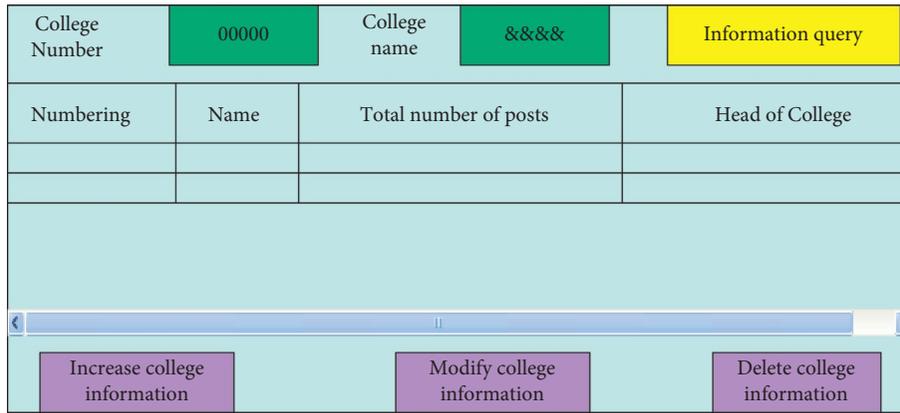


FIGURE 3: College management module.

TABLE 2: Part of the scoring results.

Name	Team spirit	Ability to work	Sense of responsibility	Communication and coordination	Moral words and deeds
R1	7	6	8	5	6
R2	6	4	5	9	7
R3	4	5	6	7	8
R4	4	5	2	8	9
R5	7	8	5	4	2
R6	5	8	7	4	1

TABLE 3: Analysis data results.

Name	Team spirit	Ability to work	Sense of responsibility	Communication and coordination	Moral words and deeds
R3	4	5	6	7	8
R9	5	8	6	3	7

TABLE 4: Competent object data results.

Name	Team spirit	Ability to work	Sense of responsibility	Communication and coordination	Moral words and deeds
R3	4	5	6	7	8
R9	5	8	6	3	7
R5	8	7	4	5	6

TABLE 5: Differential data division results.

Name	Team spirit	Ability to work	Sense of responsibility	Communication and coordination	Moral words and deeds
R6	4	7	7	5	3
R7	4	6	8	3	4

TABLE 6: Final generated results.

Association rules	Support (%)	Confidence (%)
40–60years old, PhD=>professor	4.21	83.2
44–49years old, PhD => professor	4.32	86.0
40–44years old, PhD => associate professor	4.41	84.3
34–39-years old, master’s degree => lecturer	4.21	86.3
Under 34-years-old, PhD => lecturer	4.89	86.0

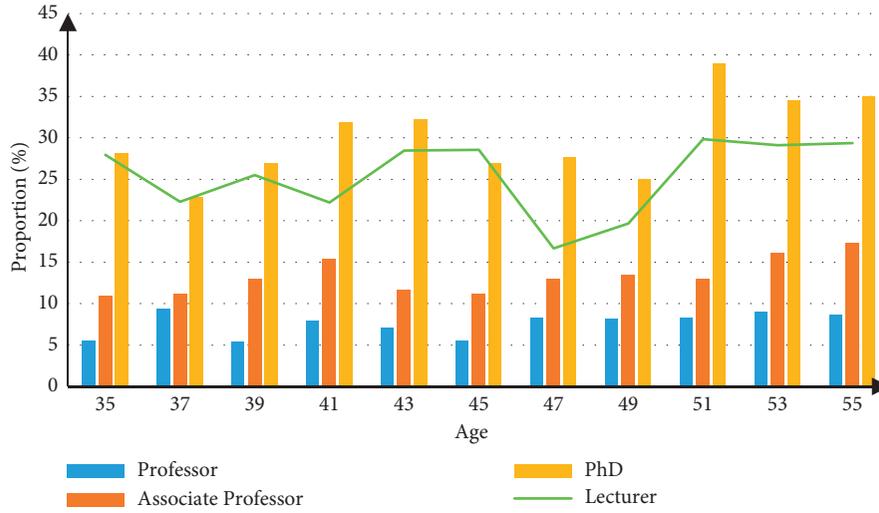


FIGURE 4: Results of credibility analysis.

TABLE 7: Test situation.

Test items	Testing requirements	Test results
User login test	① Whether legal users can log in smoothly. ② Whether illegal users can successfully log in. ③ Whether they can successfully enter the system	Meet the test requirements
System logging test	① Can the user login information be recorded correctly. ② Can the user operation log be completely saved. ③ Can the system operation alarm information be saved	Meet the test requirements

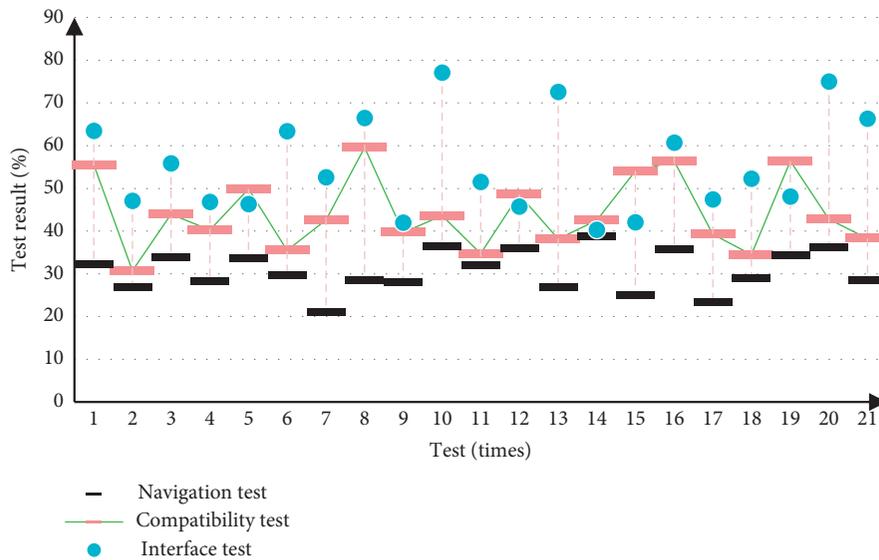


FIGURE 5: Some test situations in interface testing.

have doctoral degrees and there are no doctoral degree teachers. This analysis result is consistent with the school's title review and talent introduction in recent years, so the data excavated is reasonable and effective.

Security is very important for a qualified application. Adopting appropriate methods and means is conducive to improving the security of data and effectively preventing illegal login to the system. Of course, there are many aspects

of security measures to be considered. From the user's perspective, some simple security performance tests are carried out on the system. The test conditions are shown in Table 7.

The friendly and intuitive program interface can bring users a good experience effect, and can effectively reduce the difficulty of user learning and operation. The following shows some test situations of the system in the interface test are shown in Figure 5.

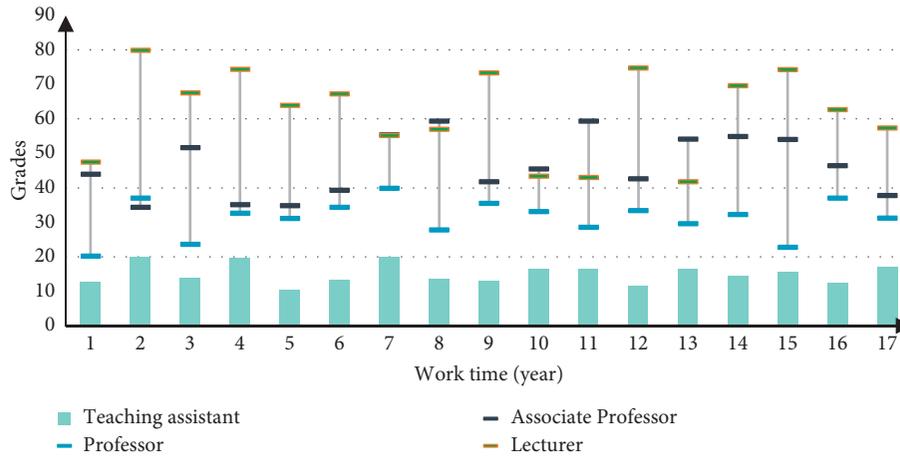


FIGURE 6: Teachers' working years and students' academic performance.

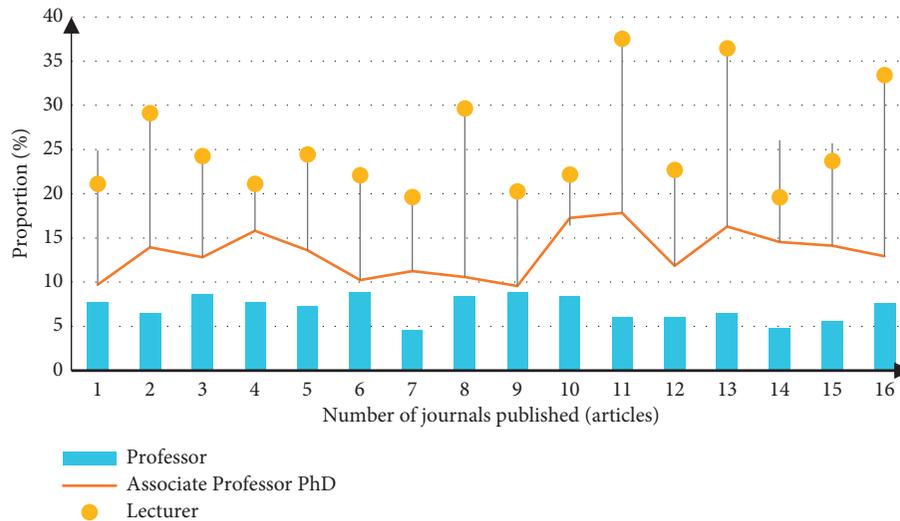


FIGURE 7: The introduction of teachers' papers.

In the correlation analysis of teacher information, data mining can reveal the hidden internal connection between the teacher's personal situation and the student's academic performance, and then, through targeted measures teacher's quality, thus promoting the development of school teaching and scientific research. The confidence level is 66% and the support level is 46%. It shows that the higher the professional title and educational background, the higher the average grade of the students taught. Therefore, it is necessary to actively improve the professional title and educational background of the teacher, encourage young teachers to actively participate in learning, and improve their own educational background. The age of teachers and working years in colleges and universities can affect students' academic performance. The older the teacher and the longer the working years in colleges and universities, the higher the student's performance. Therefore, we must pay attention to the role of old teachers in teaching, so that young teachers can learn from old teachers in teaching methods, to improve

the level of lectures. Teachers' working years and students' academic performance are shown in Figure 6.

The professional title of the introduced teachers is orthometric height level, the highest degree is a doctorate, and the number of SCI-published teachers accounted for 16% of the total number. From these data, we can find the intrinsic relationship between some attributes, such as: the higher the professional title, the higher the level of the paper; the level of a teacher's published papers has a lot to do with their academic qualifications and professional titles, and the professional title is also affected by academic qualifications and papers' level of influence. Through these associations, it can help school leaders to make decisions to improve the overall level of scientific research, such as introducing highly educated talents, or sending existing faculty members of the school for further training, and can also encourage teachers to take the initiative to study and publish high-quality papers. The papers published by the introduced teachers are shown in Figure 7.

5. Conclusion

With the informatization of higher education, the continuous development of various management information systems, and the continuous progress of improving the accumulation and construction of teaching materials, data mining technology will be more in-depth and extensive in colleges and universities. Data mining technology can also provide some data in teacher training, especially in the quality evaluation system of teachers, to support university managers to help managers make effective and reasonable decisions. Based on data mining technology, designed and implemented a teaching quality monitoring and evaluation system of a university, obtained a large number of evaluation data ideas, based on the use of this system and its related data bits, established a data warehouse by applying association rules mining the design of technology and the data mining module of the teaching quality monitoring and evaluation system, using the module's analysis data warehouse, some association rules. This paper chooses an unsupervised classification method: cluster analysis. In addition to obtaining reasonable classification results, this method can also take into account the comprehensiveness of employee development. The recruitment management module is often to collect applicant information, register in the database, and then perform a series of personnel screening according to the employment criteria, and finally determine the possible candidate teachers, and then conduct a series of comprehensive assessments such as written examinations and interviews, and finally according to the applicants comprehensive results of the students will be selected for admission. This research contributes to the reasonable planning of human resources in universities and enhances the comprehensive competitiveness of universities. In the future introduction of talents from colleges, after clarifying the development positioning of colleges, we can understand the type and quantity of talents needed, and avoid the recruitment risks and school costs caused by blindly pursuing high academic qualifications and high professional titles. Of course, for the introduction of certain high-level talents or special talents, colleges and universities can also consider simplifying the recruitment procedures appropriately and adopting some relatively flexible policies. Although the selection of research samples meets the requirements of institutional research, it still has certain limitations. The representativeness of local undergraduate colleges and universities is not enough, and the characteristics of teachers are not obvious enough. Further research and empirical evidence are needed.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

Acknowledgments

This work was supported by University-Industry Collaborative Education Program (202102197002).

References

- [1] K. Y. Chau, K. M. Y. Law, and Y. M. Tang, "Impact of self-directed learning and educational technology readiness on synchronous E-learning," *Journal of Organizational and End User Computing*, vol. 33, no. 6, pp. 1–20, 2021.
- [2] A. L. Buczak and E. Guven, "A survey of data mining and machine learning methods for cyber security intrusion detection," *IEEE Communications Surveys & Tutorials*, vol. 18, no. 2, pp. 1153–1176, 2016.
- [3] H. Lu, R. Setiono, and H. Liu, "Effective data mining using neural networks," *Knowledge & Data Engineering IEEE Transactions on*, vol. 8, no. 6, pp. 957–961, 2016.
- [4] F. Zhu, A. Kalra, T. Saif, Z. Yang, K. H. Yang, and A. I. King, "Parametric analysis of the biomechanical response of head subjected to the primary blast loading – a data mining approach," *Computer Methods in Biomechanics and Biomedical Engineering*, vol. 19, no. 10, pp. 1053–1059, 2016.
- [5] M. Figueiredo, L. Esteves, J. Neves, and H. Vicente, "A data mining approach to study the impact of the methodology followed in chemistry lab classes on the weight attributed by the students to the lab work on learning and motivation," *Chemistry Education: Research and Practice*, vol. 17, no. 1, pp. 156–171, 2016.
- [6] H. Necir, "A data mining approach for efficient selection bitmap join index," *International Journal of Data Mining, Modelling and Management*, vol. 2, no. 3, pp. 238–251, 2010.
- [7] A. Chinchuluun, P. Xanthopoulos, V. Tomaino, and P. M. Pardalos, "Data mining techniques in agricultural and environmental sciences," *International Journal of Agricultural and Environmental Information Systems*, vol. 1, no. 1, pp. 8–12, 2017.
- [8] S. R. Joseph, H. Hlomani, and K. Letsholo, "Data mining algorithms: an overview," *Neuroence*, vol. 12, no. 3, pp. 719–743, 2016.
- [9] H. Wei, B. wei, and Y. Tan, "Data mining and big data," *IEEE Transactions on Knowledge and Data Engineering*, vol. 26, no. 1, pp. 97–107, 2016.
- [10] H. Zheng, K. M. Langner, G. P. Shields et al., "Data mining of iron(II) and iron(III) bond-valence parameters, and their relevance for macromolecular crystallography," *Acta Crystallographica Section D Structural Biology*, vol. 73, no. 4, pp. 316–325, 2017.
- [11] R. J. Oskouei, N. M. Kor, and S. A. Maleki, "Data mining and medical world: breast cancers' diagnosis, treatment, prognosis and challenges," *Am J Cancer Res*, vol. 7, no. 3, pp. 610–627, 2017.
- [12] W. Bao, H. Zhou, and F. Xie, "An optimal design of web-based online English teaching by using struts framework," *Boletin Tecnico/technical Bulletin*, vol. 55, no. 10, pp. 58–63, 2017.
- [13] J. Chen, Z. Lv, and H. Song, "Design of personnel big data management system based on blockchain," *Future Generation Computer Systems*, vol. 101, pp. 1122–1129, 2019.
- [14] C. Helma, T. Cramer, S. Kramer, and L. De Raedt, "Data mining and machine learning techniques for the identification of mutagenicity inducing substructures and structure activity relationships of noncongeneric compounds," *Journal of Chemical Information and Computer Sciences*, vol. 44, no. 4, pp. 1402–1411, 2004.

- [15] R. I. Hariani, "Detection of cyberbullying on social media using data mining techniques," *International Journal of Computer ence and Information Security*, vol. 15, no. 3, pp. 244–250, 2017.
- [16] J. Ma, H. Tang, X. Hu et al., "Identification of causal factors for the Majiagou landslide using modern data mining methods," *Landslides*, vol. 14, no. 1, pp. 311–322, 2016.
- [17] K. A. Nihuka and J. Voogt, "Collaborative e-learning course design: impacts on instructors in the Open University of Tanzania," *Australasian Journal of Educational Technology*, vol. 28, no. 2, pp. 232–248, 2012.
- [18] K. Foote and S. Martino, "Implementing investigative labs and writing intensive reports in large university physics courses," *The Physics Teacher*, vol. 56, no. 7, pp. 466–469, 2018.
- [19] A. Naylor and J. Gibbs, "Deep learning: enriching teacher training through mobile technology and international collaboration," *International Journal of Mobile and Blended Learning*, vol. 10, no. 1, pp. 62–77, 2018.
- [20] A. Muthanna and G. Sang, "State of university library: challenges and solutions for Yemen," *The Journal of Academic Librarianship*, vol. 45, no. 2, pp. 119–125, 2019.
- [21] P. W. Schaefer and A. Borondy Kitts, "Introduction to the wellness issue," *Journal of the American College of Radiology*, vol. 18, no. 5, pp. 637–638, 2021.
- [22] T. Bradway, "Introduction: the promise of experimental writing," *College Literature*, vol. 46, no. 1, pp. 1–31, 2019.