



# Application of Data Mining Technology in Personalized Curriculum Recommendation of Vocational Education Learning Platform

Zhongying Yang<sup>(✉)</sup>

Shandong Institute of Commerce and Technology, Jinan 250002, China  
zhongyingy2000@163.com

**Abstract.** In order to solve the problem of personalized learning, a kind of data mining technology is proposed as a recommended application in the personalized curriculum of the vocational education learning platform. This paper uses data mining technology and learning analysis technology to build relevant models in the field of education, explore the relationship between education variables, and apply the improved association rule mining algorithm to the analysis of the relationship between course settings and course grades in the network platform, find meaningful information between courses, and then analyze the valuable knowledge, Find out the gains and losses of various aspects of teaching and the internal factors that affect students' performance, and then provide decision support for students' course selection, teachers' teaching and teaching management.

**Keywords:** data mining · Learning · Personalized curriculum

## 1 Introduction

Data mining technology means that useful knowledge can be obtained from massive information, which can be used to assist managers in making some strategic decisions. Therefore, applying data mining technology to education will have more important practical significance and research significance. With the deepening of China's educational system reform, more and more new systems are gradually applied in higher education. For example, the course selection system has become a necessary education and teaching system in modern colleges and universities. The course selection system can open up students' knowledge acceptance range to some extent, and can also improve the training quality of modern high-quality talents. On the basis of ensuring the teaching of students' basic knowledge and professional knowledge, arranging corresponding extended courses by using the teaching gap between regular basic courses and specialized courses can enable students to accumulate rich knowledge, gradually improve their knowledge level and cultural accomplishment on the basis of course selection, and then cultivate students into talents with "one specialty and many abilities". In addition, the course selection system is also a part of the credit system, which breaks the traditional teaching mode and gives modern education room for development and progress. However,

© The Author(s) 2023

K. Hemachandran et al. (Eds.): ICAID 2023, AHIS 9, pp. 390–396, 2023.

[https://doi.org/10.2991/978-94-6463-222-4\\_42](https://doi.org/10.2991/978-94-6463-222-4_42)

there are still some problems in our country's elective system at present. When students choose courses, they are often not closely combined with disciplines and interests, so it is not suitable for students' cultivation. Therefore, using data mining technology to build a course selection system, according to students' academic achievements, interests and hobbies. Learning needs, professional distinction and other information are recommended for course selection, which effectively realizes the change from "blindness" to "evidence-based" in course selection. This technology can discover, retrieve and present mining objects. It is an operation and a process to mine a group of private hidden data from the fuzzy, complex and changeable environment. Secondly, at the commercial level, in view of the importance of information determining everything and information leading business opportunities, in today's increasingly competitive market economy, who can master effective data and information mining technology represents its business opportunities, so the value of this technology lies in economic effects [1, 2].

## 2 Data Mining Technology

Currently, there is no accepted and unified content of the concept of data mining, but we can define it from the business process and business level. From a technical point of view, information can only be defined as work: from vague, noisy, large, random, incomplete data, only information technology, technology for extracting information or knowledge with special needs from research conducted before the information system. People, hidden in this information, previously unknown to people, tab sis can be valuable. After twenty years of development, many technologies have changed and matured. Data mining technologies are divided into classification, prediction, group analysis, and analysis according to their role [3, 4].

### (1) Classification and Hypothesis

Classification and prediction are two simple types of data analysis that are used to extract and interpret important data and predict the development patterns of incoming data. A distribution can estimate the level of distribution of a data item without a distribution, whereas a prediction is used to predict a continuous value of a data item, so a consistent working pattern is required.

### (2) Focus group (group)

Aggregation refers to the abstract process or process of dividing a physical object into multiple classes with similar properties. The role of clustering is to store data and divide it into groups based on the characteristics of the actual data and their similarities. Only in front of the information, you will not know what you want from me, and you will not know the result. Categories are classified by characteristics. Then get good information after the group, some of which may be directly related to internal relationships between products, and some of which may need to be processed by other tools.

### (3) Association

Association rules are some of the rules contained in the configuration file. Data mining is an important part of data mining and it can be said that it is one of the most important models widely used in the field of data mining. Only information. Finding all relationships in data objects is the main goal of Association Rule Mining,

also known as association. Organizational analysis is the mining of interesting links hidden in big data, and organization mining rules play an important role in business selection, decision-making awareness, and business management. A typical use in networking platforms is to study audience reading by collecting videos that visitors frequently visit and search for together to create a custom learning process most of them [5].

### 2.1 Construction of Personalized Course Selection Recommendation System Based on Data Mining Technology

A collaborative filtering algorithm based on users is selected for design. By combining this algorithm with the network educational administration system of colleges and universities, relevant data of students can be extracted and analyzed, and then the most appropriate courses for students' development can be recommended to effectively improve the personalized course selection system of colleges and universities. Personalized course selection recommendation system basically includes three parts. The first part is the evaluation matrix, which can analyze students' related information, including students' majors, learning level, hobbies, course selection records and teachers' evaluation, etc., and obtain the corresponding student items through algorithm calculation. The second part is to search the nearest neighbor, and analyze the comparison of the corresponding student items in the evaluation matrix to find out the two items with the highest similarity. The third part is the recommendation part. After finding the two items with the highest similarity, we can recommend courses according to the similar items [6, 7].

### 2.2 Establishment of Evaluation Matrix

The data source of the evaluation matrix is the relevant data of the online educational administration system of colleges and universities, including students' names, genders, ages, majors, hobbies, records of elective courses, learning level, teacher evaluation, test scores and so on. Then, the data is transformed and screened, and the useless information is removed to form the evaluation matrix of students' elective courses needed by collaborative filtering algorithm [8]. As shown in Table 1:

**Table 1.** Evaluation matrix table of students' course selection under collaborative algorithm (n, N are natural numbers)

	Item 1	Item 2	Item n
Student 1	2	3	3
Student 2	4	5	1
Student N	3	5	4

### 2.3 Personalized Recommendation

After the similarity is determined, the evaluation results can be used for recommendation. The recommendation algorithm is shown in the following formula:

$$pa \cdot j = R_a + \frac{\sum sim(a \cdot n) \times (R_n \cdot j)}{\sum sim(u \cdot n)} \quad (1)$$

$pa \cdot j$  is the recommended value calculated by the recommendation algorithm;  $R_n \cdot j$  is the average value of R project scores. The recommendation algorithm is more suitable for the systems with a large number of students in the evaluation center. Since the relevant data of the network educational administration system of most colleges and universities have been collected for many years and the database capacity is large, the personalized recommendation results are relatively accurate.

### 2.4 Specific Application Process of Data Mining Technology

Data mining is mainly divided into three stages, including data preprocessing, concrete data mining implementation stage, result evaluation and presentation stage:

(1) The preprocessing stage of data is aimed at the dissimilation of mass data quality, and the quality of data has a great influence on its mining effect. The data preprocessing stage is to detect and correct the data quality, which is an important prerequisite for the development of data mining. The data preprocessing stage usually includes four processes, namely, DATA CLEANING stage, DATA INTEGRATION stage, DATA TRANSFORMATION stage, DATA REDUCTION stage and DATA DISCRETION discretization stage. (2) The concrete implementation of data mining, this stage is the key period of data mining, which mainly extracts the patterns of useful data through intelligent algorithms, and can play a practical role in mining effective data by processing the source data. It is worth noting that it is particularly critical to choose which intelligent algorithm at this stage. It mainly determines the choice of intelligent algorithm by defining the target before mining data. For example: classification, clustering, association discovery rules, etc. There are mainly two requirements in selecting intelligent algorithms:

1) Choose according to customer's needs; 2) Select the graph according to its different types of autonomous routing algorithms. 3) In the stage of evaluation and representation of mining results, it is necessary to clarify its standard in the evaluation process, that is, "discovering the interest of patterns". First, we must eliminate those redundant patterns that are precipitated and irrelevant. Fun has the following characteristics: 1) it is easy to understand; 2) The validity of the test data of freshmen's survival. Sex; 3) It has certain potential value; 4) New features, etc.

## 3 Specific Applications

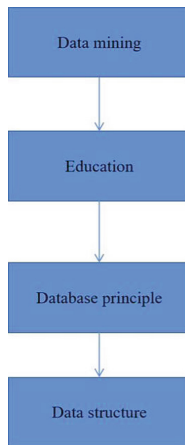
The application of decision-making in the course analysis, such as Table 2, shows the achievement fields and their meanings.

**Table 2.** Score Fields and Their Meaning

Field name	Specific righteousness	Field name	Concrete meaning
Student number	Student number	Calculation method	Calculation method score
C program design	C program design achievement	Computer network	Computer achievement
Java application	Java	Database principle	Database principle achievement

According to Table 2, the decision-making analysis of its discrete mathematics is made, and its influencing factors are database principle, software engineering and data structure, as shown in Fig. 1.

From Fig. 1, it can be seen that the discrete mathematics of the above three courses has influenced each other in different degrees. Therefore, we can build the teaching mode and effect according to the analysis results. The details are as follows: (1) The actual teaching effect of discrete mathematics in the follow-up courses can be improved by strengthening the data structure of the preparatory courses. (2) To select excellent teachers for its prerequisite course “Data Structure”, teachers with rich experience and high comprehensive quality must teach. (3) In terms of creating the teaching environment and atmosphere, we should ensure the demand and satisfaction of the pre-requisite course “Data Structure”. After the research, it is found that the knowledge concept and specialty play a great role in the support of decision-making. For example, in the course of data structure, teachers with rich teaching experience and high comprehensive quality must be selected in advance to take the advanced course, and the management and supervision level should be improved in the course of data structure. At the same



**Fig. 1.** Decision analysis diagram

time, we should integrate theme writing activities and practical activities, so that students can do it themselves, improve the effectiveness of combining theory with practice, and temper students' programming skills and hands-on ability in all aspects. (4) It plays an important role in improving students' ability to use what they have learned to solve practical problems, and lays a solid foundation for student-oriented education and core training [9, 10].

## 4 Conclusion

"Data mining technology" has a great impact on the improvement of management quality, data analysis and decision analysis. In this paper, data mining technology and learning analysis technology are used to build relevant models in the field of education and explore the correlation between education variables. It shows that the application of personalized course selection recommendation system can help students recommend their own relevant courses and provide effective learning methods for personalized development.

**Acknowledgment.** Project Category: Key Projects in Humanities and Social Sciences at Shandong Institute of Commerce and Technology.

Project Title: Research on the Strategic Deployment of Highlighting the Characteristics of Vocational Education in Higher Vocational Colleges NO: C130-1.

Poatcode: 250002.

## References

1. Zhang, L. , Liu, K. , Ilham, I. , & Fan, J. . (2022). Application of data mining technology based on data center. *Journal of Physics Conference Series*, 2146(1), 012017.
2. Dai, B. , Wang, F. , & Chang, Y. . (2022). Multi-objective economic load dispatch method based on data mining technology for large coal-fired power plants. *Control Engineering Practice*, 121, 10(50)18-.
3. Acharya, M. , Acharya, K. P. , Gyawali, K. , Acharya, P. , & Devkota. (2021). Discussing professor yin kejing's drug use law for mammary hyperplasia based on data mining technology. *International Journal of Clinical and Experimental Medicine*, 5(3), 403-407.
4. Rong, Z. , & Gang, Z. . (2021). An artificial intelligence data mining technology based evaluation model of education on political and ideological strategy of students. *Journal of Intelligent & Fuzzy Systems: Applications in Engineering and Technology*23(2), 40.
5. Wang, Y. , & Ku, J. . (2021). Research on collaborative innovation platform of internet of things industry based on data mining technology. *Journal of Physics: Conference Series*, 1881(4), 042072-.
6. Bai, K. J. . (2021). Research of the micro grid renewable energy control system based on renewable related data mining and forecasting technology. *International Journal of Computational Science and Engineering*, 24(4)23.
7. Zavarin, M. , Chang, E. , Wainwright, H. , Parham, N. , Kaukuntla, R. , & Zouabe, J. , et al. (2022). Community data mining approach for surface complexation database development. *Environmental Science & Technology: ES&T*17(4), 56.

8. Yosef, A. , Schneider, M. , & Shnaider, E. . (2022). Data mining method for identifying biased or misleading future outlook. *International Journal of Information Technology & Decision Making*23(1), 21.
9. Liu, N. , & Li, D. . (2021). Framework and performance analysis of college english testing system based on data mining technology. *Journal of Intelligent and Fuzzy Systems*,14(3), 1-11.
10. Xing, X. . (2021). Prediction of the optimal umbrella shape of insulators based on data mining technology. *IOP Conference Series Earth and Environmental Science*, 692(2), 022067.

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

