Research on Information Construction and Management of Education Management Based on Data Mining

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Abstract. With the continuous expansion of college enrollment, education has become flexible and diverse. Most colleges and universities are facing the contradiction between the sharp increase in the number of students and the increasing shortage of teaching resources, which has brought unprecedented challenges to education management. More and more teaching resources are pouring into higher education, and at the same time, strict requirements are put forward for higher education management. Data mining technology improves the application of data from low-level query operation to higher-level applications such as decision support, analysis and prediction. How to use information technology to serve the school management and decision-making better and more effectively has become an important symbol to measure the teaching management level and school strength of colleges and universities. The popularization and application of data mining technology is an exploration of informationization of teaching management in colleges and universities under the new situation. This paper summarizes the definition of data mining technology, analyzes its application methods and key points, and further studies and discusses the application of data mining technology in the informationization of teaching management in colleges and universities, in order to promote the development of education.

Keywords: Data mining, Teaching management, Informatization

1. Introduction
Under the new situation, the information management mode has been gradually promoted and affirmed in colleges and universities, and teaching management information systems have been constructed one after another [1]. However, with the increasing use time of teaching management information system and the number of students managed, a large amount of teaching management data is accumulated. With the continuous expansion of college enrollment, education has become flexible and diverse [2]. Most colleges and universities are facing the contradiction between the sharp increase in the number of students and the increasingly tense teaching resources, which has brought unprecedented challenges to education management. Under the guidance of such a new situation, the information management mode is becoming more and more popular and recognized by teachers and students, because under this management mode, teachers and students can cooperate with each other very well [3]. In the past, school education management only emphasized the particularity of
education field, to a certain extent, ignored the commonness between education management and general management, emphasized the particularity of school education too much, and emphasized the management mode based on experience [4]. Data mining technology improves the application of data from low-level query operation to more advanced applications such as decision support, analysis and prediction [5]. With the continuous development and improvement of science and technology and information technology, the information management mode has been gradually applied to college education. At present, most colleges and universities have established management information systems, which have largely broken through the drawbacks and shortcomings of traditional teaching management [6].

The purpose of teaching information management in colleges and universities is to optimize the allocation of teaching resources and give full play to the advantages of various resources, so as to import high-quality and high-skilled talents for the society and the country [7]. Data mining technology, which integrates database technology, artificial intelligence technology, mathematical statistics technology and visualization technology, is a new research field with broad prospects formed by the intersection and integration of multiple disciplines. With the deepening of the education system and the continuous development of information technology, more and more teaching resources are pouring into higher education, and strict requirements are also put forward for the teaching management of higher education [8]. How to use information technology to serve the school management and decision-making better and more effectively has become an important symbol to measure the teaching management level and school strength of colleges and universities. The popularization and application of data mining technology is an exploration of informationization of teaching management in colleges and universities under the new situation, which has important practical significance [9]. Adopting scientific data mining techniques and methods is of great practical significance to enhance the intelligence of education management, and will surely become the goal and key task of the next stage of teaching management informationization and digital campus construction in Chinese universities [10]. This paper briefly summarizes the definition of data mining technology, analyzes its application methods and key points, and then makes in-depth research and discussion on the application of data mining technology in university teaching management informationization, in order to promote the development of education.

2. Methods of Data Mining in Teaching Management

With the continuous expansion of enrollment in colleges and universities, the number of students in schools has risen sharply, which has greatly increased the workload of the management staff in all aspects of schools. At present, data mining technology is widely used in various industries, especially in the teaching management system of colleges and universities, which plays a positive role in understanding students' basic information, mastering students' learning characteristics and setting up teaching courses reasonably. The traditional manual management mode can no longer meet the needs of current work. There are many shortcomings in this management mode, such as efficiency and poor confidentiality. In addition, a large number of files and data will be produced after a long time, which brings a lot of difficulties in searching, updating and maintaining. The information management system is an indispensable part of an educational unit, and its content is very important to the school decision-makers and managers, so the information management system diagram should provide users with sufficient information and quick query means. Through data mining technology, the data content accumulated for a long time can be processed reasonably, incomplete and random data can be collected comprehensively and accurately, analyzed and counted in depth, and a set of more convenient statistical data system can be formed, so as to achieve the purpose that users can better apply and extract data [11]. In the process of learning data mining technology, we should constantly learn new knowledge and discover new knowledge. According to the local characteristics and laws of different systems, and the data can be updated in time, we should analyze the knowledge in the database carefully. At present, college teaching should not only teach students theoretical knowledge, but also pay attention to the cultivation of humanistic spirit and comprehensive quality, so as to apply
the learned knowledge to real life and output high-level and high-quality comprehensive talents for the society and the country.

Databases are generally very complex. In this complex database, resources are constantly utilized, and long-term accumulated data can be processed by learning and mastering data mining technology. This requires a lot of information, which is different in mode, concept and law, and has its own level. It has a future prediction direction for data and makes decisions at the same time. Data mining technology has broad and inevitable application prospects in modern education management, and it is also the key task and goal of teaching management construction in Chinese universities at present. Specifically, teachers must pay attention to students' psychological and physiological characteristics, give full play to students' dominant position, and then give full play to teachers' leading and auxiliary roles. Some data are random. If it is processed manually, it may increase the difficulty of workers' work and make the data messy. Users should learn to extract the data, so that the data can be better used in people's lives. Based on the spatial database, data mining technology extracts the data information needed for teaching from a large amount of spatial data through identification technology and statistical methods. By continuously optimizing and selecting these data information, the best practical application data processing mode is finally determined, thus providing scientific data support for the teaching management functional departments and leaders of colleges and universities.

3. Technological Process and Operation Method of Education Management Based on Data Mining Technology

3.1 Technical Process

Data mining technology has an inevitable and wide application prospect in modern education management, and will become the goal and key task of the next stage of teaching management informationization and digital campus construction in Chinese universities. At present, data mining technology has been widely used in efficient teaching management informationization, and has become an indispensable and important part of university education management. Through data mining technology, the quality and efficiency of teaching management have been significantly improved. The main problem to be solved by data mining of college teaching management is to apply the new computer data mining technology to the ways and methods of college teaching management through research, exploration and practice, and to promote the informationization of college teaching management to a higher level [12]. Students' test scores are one of the most important contents in the database of teaching management system. Through data mining and analysis of students' grades, and drawing relevant charts according to the data content, students' specific situation and basic information can be intuitively reflected, and the teaching quality and effect can be evaluated in time, and the curriculum and teaching scheme can be set and changed to promote the curriculum construction. With the help of data mining technology, the changes of students' grades in recent years can be analyzed, and the prediction basis for future development can be provided. With the help of behavior-related algorithms, we can scientifically grasp the changing trend of students' grades, and provide guiding significance for the development of school education and the construction of study style [13]. For example, the borrowing amount of a certain kind of books or a certain book in the library, the borrowing frequency of related books and so on. Through relevant algorithms and cluster analysis, students' reading preferences can be understood, thus providing a basis for building libraries and completing books.

The basis of information collection is the object of teaching management, because information objects have their own characteristics and also have their own differences, so we should collect data by analyzing these different characteristics and choose appropriate methods. Relying on the library management system, we can quickly find out the relevant information of book borrowing. It is necessary to actively reflect the importance and urgency of building educational management informationization to the heads of educational management institutions at all levels in universities. With the continuous development of technology, it is necessary to continuously absorb new
information and use new technologies in the information construction of education management. Figure 1 shows the breakdown of complexity factors in education management.

In the analysis of graduates' employment situation, we can mine the data of the teaching management information system, screen the students involved in the analysis, including their majors, work places, employment units, positions, etc., and design the data model of the obtained data, according to which the future schools can make decisions on the direction of students' employment training. Due to the huge content of qualified data and the long time of analysis and mining, attribute selection and sampling are carried out on the data, and the reduced representation of the data set is obtained according to the attributes and records in the original data set. The data of teaching management database is huge, and the data obtained after preprocessing and value measurement screening and the corresponding mining mode designed according to this data should be cyclically adjusted according to the needs of teaching management, and continuously selected and optimized. Finally, the data processing mode with the most practical application value is determined, and the knowledge of decision support is provided for the teaching management departments and school leaders in the form of data analysis report. Because the class culture of different classes and the teaching style of teachers are different, there are also differences in the curriculum suitable for students, and the wrong curriculum may have a great impact on students' overall performance. Therefore, data mining technology is used to analyze students and classes, summarize valuable rules and information, and help teachers to better set up courses.

![Figure 1](image_url)

**Figure 1** Classification of complexity factors in education management

### 3.2 Operation Method

At present, the application of data mining technology in the informationization of teaching management in colleges and universities is an inevitable requirement of social development and educational reform. Integrating data mining technology into the teaching process meets the curriculum requirements and standards in the new period. With the popularization and application of information-based teaching management system, the status of data mining technology is becoming more and more important, and it is an indispensable part of teaching management and university decision-making. Students' achievement information can be retrieved from the educational administration management system, and their average scores can be calculated. Through the library management system, students' book borrowing status can be understood in detail, and students' practice information can be understood through electronic files. Teachers can mine data according to different grades or students' personality characteristics through the network teaching system, and then stimulate students' strong interest in learning by combining materials such as words, pictures, animations and sounds. Teachers can also comprehensively compare and analyze students' achievements through data mining, and adopt targeted teaching methods for students' weak links to stimulate students' desire for urgent knowledge, so that students' creativity and potential can be released indefinitely.

Information entropy, called the average information amount in information theory, is used to measure the average value of transmitted information. The information sent from the source includes a limited number of mutually exclusive and complete events, all of which have a certain probability.
The average value is information entropy, and this value is equal to the mathematical expectation of the information amount of each event itself:

$$CPV(k) = \sum_{j=1}^{k} \frac{\lambda_j}{\sum_{j=1}^{m} \lambda_j}$$

(1)

The amount of information needed by decision tree to classify instances correctly is as follows

$$F_{ik} = \sum_{j=1}^{m} q_j x_{ij}$$

(2)

If the attribute is regarded as the root of the decision tree, and there are positive and negative examples, then the information entropy of the subset is as follows:

$$f(t) = \sum_{j=1}^{N} \sum_{k=1}^{d_k} \sum_{z=1}^{k} d_k \phi_{jk}(t) + \sum_{k=1}^{c_k} c_k \phi_{nk}(t)$$

(3)

The information entropy after classification based on attributes is:

$$E_{mi} = \sum_{i=1}^{4} (i \Delta t) \cdot |S_{mi}|^2$$

(4)

The information gain based on attribute is as follows:

$$E = \frac{E_{mi}}{\sqrt{\sum_{i=1}^{4} E_{mi}}}$$

(5)

In order to do a good job in education, college teachers can rely on management information system to find out special students, and provide the basis for developing necessary psychological education. Data mining is an inevitable stage in the development of informationization of teaching management in colleges and universities. Teaching management in colleges and universities needs to improve management efficiency and quality through electronic information technology, build a perfect education management information system, and make in-depth analysis of campus resources and data by using advanced data mining technology to improve the informationization of teaching management. In order to better promote the development of educational management informationization in colleges and universities, we must combine the educational management system with the actual situation of schools, fully realize the bottleneck problems existing in data mining, improve the accuracy and high quality of data analysis, and give full play to the real role of data mining. In today's information age, it is of great practical significance to build and improve the information management system with higher functional level, use scientific and advanced statistical analysis tools and use advanced and scientific mining technology to deeply analyze the educational management data, so as to enhance the intelligence intensity of educational management.

4. Conclusions

The application of data mining technology in university teaching management informationization has become an important part of university teaching task. In today's information age, it is of great practical significance to build and improve the information management system with higher functional level, use scientific and advanced statistical analysis tools and use advanced and scientific mining technology to deeply analyze the educational management data, so as to enhance the intelligence intensity of educational management. This paper discusses the research on informationization of teaching management in colleges and universities based on data mining technology, introduces the concept, technical process and operation method of data mining technology, and emphatically analyzes the application and significance of data mining technology in informationization of teaching management in colleges and universities. At present, the application of data mining technology in the informationization of teaching management in colleges and universities is an inevitable requirement of
social development and educational reform. Integrating data mining technology into the teaching process meets the curriculum requirements and standards in the new period. The main problem solved by data mining of teaching management in colleges and universities lies in applying the new computer data mining technology to the ways and methods of teaching management in colleges and universities through research, exploration and practice, and promoting the informationization of teaching management in colleges and universities to a higher level.

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