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Intelligent Educational Administration Management System Based on Data Mining Technology

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***A*bstract:** With the gradual acceleration of information construction in colleges and universities, digital campus and smart campus have gradually become important means for colleges and universities to scientifically manage the campus. They have been applied to teaching, scientific research, student management, and other fields, improving the quality and efficiency of management. This paper mainly studies the intelligent educational administration management system based on data mining technology. Firstly, this paper introduces the application process of data mining technology, and builds an intelligent educational administration management system based on data mining technology. Then, this paper optimizes the application of the Apriori algorithm in educational administration management through transaction compression and frequent sampling. Compared with the traditional Apriori algorithm, the optimized Apriori algorithm in this paper has a shorter execution time under the same minimum support.

Keywords: Data mining; Educational administration management; System construction; Apriori algorithm

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1. Introduction

With the development of information technology and emerging technology, technology businesses in various fields have been greatly promoted [1]. As far as the vast majority of current fields are concerned, the development of their business will rely on computer technology. For the management of schools, we can also use computer technology to improve the efficiency and level of management work, and to process control data, which can improve the security level of data. Computers also have faster efficiency and accuracy in processing complex and huge amounts of data. At present, there are many kinds of intelligent educational administration management systems in various schools in China. At the same time, primary and secondary schools have also begun to apply the intelligent educational administration management system [2,3]. However, in the process of practical work, especially in the primary and secondary schools in poor areas in Western China, due to the lagging development of their social environment, the needs of related technology, software, and hardware cannot be met, so it is difficult to realize the research and development of intelligent educational administration

management system. With the gradual deepening of the basic concept of teaching informatization construction, management also began to gradually change from a manual management mode to an information management mode [4]. Thanks to the rapid development of network technology, data technology, and social economy, the achievements of campus data construction are more and more obvious, and the school can complete its daily management with the help of information technology. Most schools have begun to apply an intelligent educational administration management system, but there are still many practical problems. In order to effectively solve these problems, the relevant research and analysis work should be more in-depth [5].

Foreign universities have always attached great importance to educational administration. Most of them have established their own educational administration management system, and increased the adaptability to mobile clients on the basis of the traditional educational administration management system, so as to build a set of complete campus Internet of Things [6]. This way makes the educational administration management mode more scientific, stable, and easier to manage, and builds a communication bridge between schools and students, teachers and students [7]. At the same time, the research on data mining technology has a history of many years abroad. Data mining technology has brought many benefits to the FMCG industry, the financial industry, and many other traditional industries. Major supermarkets in Europe and the United States have used data mining technology to process hundreds of millions of data, analyze each consumer's consumption habits and purchase tendencies, obtain effective information, and match the consumer's purchase history with relevant goods, It has provided consumers with more valuable, targeted consumption recommendations [8]. Now, more and more colleges and universities are also investing a lot of energy in combining data mining technology with college educational administration management systems to mine and deeply study valuable teaching data to serve educational administration management [9,10].

This paper designs an intelligent educational administration management system based on a mining algorithm. After applying this system in the school, it can help the school realize the standardized management objectives and improve the work efficiency of managers to a great extent.

2. Development of an educational administration system based on data mining

2.1. Data mining process

Generally, a complete data mining process includes three stages: data preprocessing, data mining, and result analysis and representation. It is mainly divided into the following steps: the first step is data preprocessing, which mainly includes data cleaning, data integration, data selection, data transformation, and data reduction. The second step is data mining, which uses intelligent methods to extract and discover patterns from a large amount of preprocessed data. The last step is to analyze and present the results, and evaluate whether the found patterns are interesting and can bring value to users according to a certain degree of interest measurement. At the same time, the mined knowledge or laws are presented to users with effective, novel, potentially useful, and easy-to-understand knowledge by relying on visualization or knowledge representation technology.

(1) Data preprocessing: In the data preprocessing stage, it can be divided into data cleaning, data integration, data selection, data reduction, data transformation, and data discretization. In practice, it is usually found that the workload of data preprocessing accounts for about 80% of the workload of the whole data mining project. Therefore, data preprocessing is a very important step in the whole process of data mining, which determines the upper limit of data mining effect. Moreover, many works in the field of data mining are based on high-quality data, and the data collected in real life often has missing or abnormal data, which needs to be cleaned to get high-quality data. Data integration, as the name

suggests, because data is often stored in multiple files, databases, or other storage systems, and the data is gathered together to facilitate processing. Data selection involves selecting the required data from many types of data according to the mining target. Data transformation makes the mined patterns easier to understand by people. At the same time, it also enables the mining process to learn the patterns in the data more effectively. For example, when the data distribution presents the characteristics of a long and short tail effect, the logarithmic transformation is used to transform its distribution into a normal distribution, so that the regression algorithm can obtain a better prediction effect. Data discretization, which is also a way of data transformation, divides continuous attributes into multiple intervals, or carries out box division and layered operation.

(2) Data mining: Data mining stage is a key link in the whole process of data mining. After preprocessing the original data, according to the task and purpose of data mining, select appropriate intelligent methods to extract knowledge and discover data patterns. Among them, intelligent methods mainly include frequent pattern mining, association rule analysis, correlation mining, classification and regression algorithms, cluster analysis, outlier analysis, and time series analysis.

(3) Result analysis and representation: After a series of data preprocessing and data mining, the knowledge, patterns, or laws extracted from a large amount of data need pattern evaluation. The main purpose of pattern evaluation is to identify the really interesting patterns. Because the data mining results contain a large number of non-user purpose patterns or a few worthless patterns below the interest threshold, it is necessary to filter and extract data patterns from these mining analysis results. Finally, the obtained data pattern is compared with the user's purpose, and the mined knowledge is presented to the user by using visualization and knowledge representation technology.

2.2. Overall system design

The new generation of educational administration management system designed in this paper is essentially an extended information management system, which stores a large amount of information. The most important information includes student information, faculty information, course information, achievement, and teacher evaluation. For this data information, the generation process is as follows:

After the school starts, the school counselors will input the basic information of students in the designated major into the teacher management system. The basic information of students includes students' names, labels, majors, places of origin, admission results, and so on. Teachers will distribute course information according to the training plan in the educational administration management system, and then students log in to the system as students to choose courses. Counselors can add and modify a lot of information for students, and students can also view their own relevant information. At the end of the semester, the teacher will publish the test results to the educational administration management system. Students can view their results and evaluate the teacher at the same time. A large amount of data information is generated every day, which serves for the data mining subsystem. Although there is a lot of data, not all the information is useful for data mining. For example, the student's name can be directly replaced by the student's label.

The educational administration management system designed in this paper adopts the widely used C/S mode system, which can give full play to all the functions of the two subsystems. C/S mode naturally has many advantages: first, the system is simple. The system assigns corresponding tasks to the server and client, which can give full play to the respective advantages of the server and client. Second, the system adapts to a variety of system layouts and meets the requirements of most systems. Third, the system stores a large amount of data, which is safe and effective. The architecture of the educational administration management system designed in

this paper is shown in **Figure 1**.

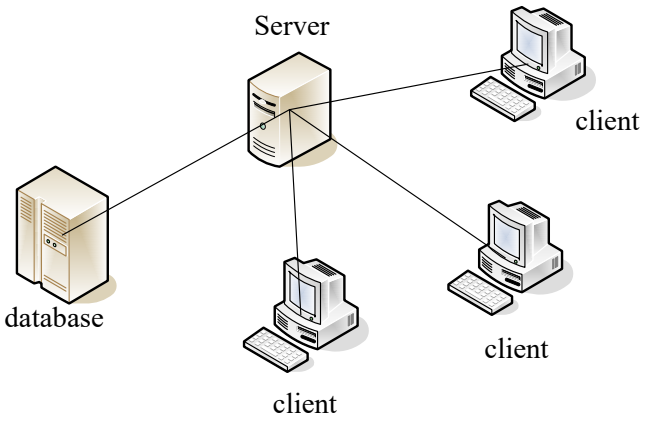

Figure 1. Architecture of educational administration management system

Based on the above analysis, the functional modules of the system can be divided into two categories: the first is the functional module of the daily affairs and educational administration subsystem, and the second is the functional module of the data mining subsystem. The daily educational administration subsystem has five functional modules, and the data mining subsystem also has four functional modules.

The five modules of the daily educational administration subsystem are: student curriculum management, student achievement management, teacher information management, student information management and system setting.

The data mining subsystem is divided into two modules: system setting and data mining. Among them, the data mining module includes data preprocessing, advanced analysis, data statistics, data warehouse, and other functions. The data preprocessing function mainly carries out the operations of data concept stratification, data sample sampling, data digitization, data cleaning, data discretization, and so on.

3. Optimization of data mining algorithm in educational administration system

3.1. Data preprocessing

Before data mining, we first preprocess the data. In the pretreatment stage, our primary purpose is to minimize errors and errors, especially those caused by human factors. Then we sort out the data and delete the errors and redundant data found in the sorting. Thirdly, we fuse the data. After preprocessing, it can minimize the pressure on the database during subsequent operations.

3.2. Optimized association rule mining algorithm

Association rules are defined as assuming that formula (1) is a collection of items

$$I = \{i_1, i_2, ..., i_m\} \tag{1}$$

The set related to all items is:

$$D = \{t_1, t_2, ..., t_m\} \tag{2}$$

Association rules are the implication of a $\Rightarrow$ B, where a, B $\in$ I and a $\cap$ B are not equal to $\varnothing$. A and B are called the forerunner and successor of association rules, respectively. The interesting relationship between items

is measured by support and reliability. The so-called support refers to the percentage of one or more items in the item set, that is, probability p (a ∪ b). Credibility refers to the percentage of one item including another, that is, probability p (B | a).

The main problem in the operation of association rules is the generation of candidate frequent itemsets. Based on this property, we can do the following optimization:

(1) Transaction compression: Since the Apriori algorithm needs to scan the database frequently, in order to reduce the size of frequent itemsets of future scanned transactions.

(2) Frequent sampling: We can reduce the consumption of the algorithm by sacrificing the accuracy of the algorithm and reducing the frequency of sampling.

4. Analysis and comparison of data before and after optimization of association rule algorithm

In this paper, the classical Apriori algorithm and the improved Apriori algorithm are used to analyze and compare the score database of our school. The classical Apriori algorithm and the improved Apriori algorithm are used to change the data size of the database under the same support. The data volume is 3000, 5000, 20000, 30000, respectively. The test results are shown in **Table 1**.

Table 1. Execution time of different data volumes with the same support

	3000	5000	10000	20000	30000
Classic APRIORI	47	52	59	75	97
Improved APRIORI	39	41	47	64	89

As shown in **Figure 2**, under the same minimum support, the execution time also changes with the change of the data capacity of the database, but the execution time of the improved Apriori algorithm is always short.

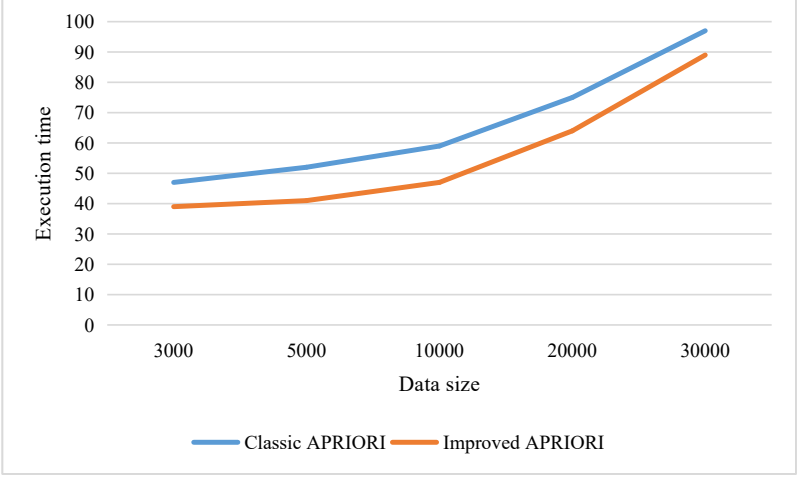

Figure 2. Execution time of different data volumes with the same support

5. Conclusion

This paper designs and shows an educational administration management system in line with the new situation and technology. This paper makes a detailed demand analysis and research on the functional modules of the

university educational administration management system, uses the system to standardize the operation process between the various businesses of the educational administration management, improves the transparency of the educational administration management information, and strengthens the exchange and sharing of information among various departments of the university and departments, so that all departments of the university can quickly and conveniently obtain the teaching operation, teaching quality, and talent training of the school. Because of the limited ability, there are many places that need to be further studied and improved in both system analysis and system framework design: we can combine mobile Internet technology to strengthen the development and application of the educational administration system on mobile Internet, so as to provide a convenient use experience for teachers and students.

Disclosure statement

The author declares no conflict of interest.

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