Design of Information Teaching Management System Integrating Association Rule Mining Algorithm

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Abstract. Teaching management informatization is an important part of campus informatization construction. How to use advanced network information technology to implement scientific and effective management of teaching and students' learning and make it give full play to its maximum benefits is an important topic of teaching management in Colleges and universities. In order to improve the level and efficiency of teaching management in Colleges and universities, this paper designs an information-based teaching management system based on association rule mining algorithm to improve the efficiency and management level of teaching management in Colleges and universities, so as to lay the foundation for scientific and comprehensive management of teaching in Colleges and universities.

Keywords: Merging association rules · Promotion of information technology · Teaching system

1 Introduction

Teaching management informatization is to use information management theory and information management methods, take modern information technology as the core, fully consider external variables and information, organize and allocate teaching information resources, and carry out information-based teaching management activities, so as to achieve the established teaching objectives efficiently. Teaching management information system is not only the most important part of teaching management information, but also the basis of education information. Its connotation includes teaching plan management, organization and management of teaching process, teaching quality management, teaching administration, teaching equipment management, laboratory management, discipline construction, specialty construction, curriculum construction, teaching material construction, faculty construction, student status management, scholarship management, management system construction, etc. [1]. Use information technology, network technology, multimedia technology and other information means to carry out teaching management activities. The basic characteristics of teaching management informatization are digitization, networking, multimedia and intelligence.

M. A. Jan and F. Khan (Eds.): BigIoT-EDU 2022, LNICST 465, pp. 439–445, 2023.
https://doi.org/10.1007/978-3-031-23950-2_48

2 Association Rule Mining in Data Mining

Mining association rules is the process of discovering interesting associations or related relationships between itemsets in a large amount of data. It is an important topic in data mining. In recent years, it has been publicly studied by the industry, has become a hot spot and is widely used in a variety of applications. At first, the research of association rules was only to help find the relationship between different commodities (items) in the transaction database and find out the customer purchase behavior pattern, such as the impact of buying a certain commodity on buying other commodities. The analysis results can be applied to commodity shelf layout, inventory arrangement and user classification according to purchase mode. At present, it has been widely used in various fields. As the world's largest "database" - network, association rule mining technology is also integrated into it.

Agrawal and others first proposed the problem of mining association rules between itemsets in customer transaction database in 1993 [2]. After that, many researchers have done a lot of research on the problem of mining association rules. Their work includes optimizing the original algorithm, such as introducing the idea of random sampling and parallelism, so as to improve the efficiency of algorithm mining rules and promote the application of mining association rules.

2.1 Simple Definition and Application of Association Rule Mining

At present, in the research of data mining, the research on association rule mining is more active and in-depth. The mathematical model given below is used to describe the discovery of association rules.

Let $I = \{I_1, L_2,\ldots, L_m\}$ be a set of items, where each transaction t is a set of items, obviously t L. Let X be a group of items. If and only if $x \subseteq T$, transaction t contains X. An association rule is an implication in the following form: $X \rightarrow y$, where $X \subseteq I$, $Y \subseteq L$ and $X \cap y = \varphi$. If s% of the transactions in D contain xuy, the support (xuy) = s of rule $X \rightarrow Y$ on transaction set D. The confidence level is C. if C = support (xuy) * 100/support (x), it means that C% of the transactions containing x in D also contain y. Credibility indicates the strength of implication, while support indicates the frequency of patterns in rules. Rules with high reliability and strong support are called "strong rules". The essence of association rule discovery task is to find strong association rules in database. Using these association rules, we can understand the behavior of customers, which is very helpful to improve the decision-making of business activities such as retail. For example, it can help to improve the placement of goods (placing goods that customers often buy at the same time together), help how to plan the market (purchase goods with each other), etc. In the research field of data mining, the research on association analysis is relatively in-depth. People have proposed a variety of association rule mining algorithms, such as apriori, FP growth, AIS, DHP and so on.

2.2 Process of Association Rule Mining

As one of the most important tools in data mining, association rules have a wide application prospect. Generally, it can be divided into two parts:

(1) Mining frequent sets: find frequent sets that meet a given degree of support. Frequent sets: sets of items that meet the minimum degree of support.

K-frequent sets; Refers to a frequent set containing K items.

[property 1]: subsets of frequent sets must also be frequent.

For example, if {AB} is a frequent set, then {a} {B} must also be a frequent set

(2) Generate association rules with the obtained frequent sets

The basic idea is: if ABCD and ab are large itemsets, we can determine whether the rule ab-cd is established by calculating the reliability, that is, conf = support (ABCD) 1 support (AB), and conf $\geq$ miniconf (because ABCD is a large itemset, the rule must have the minimum support). The second step is actually a simple statistics and calculation, so the mining of association rules mainly focuses on the key step of mining frequent sets. Many data mining researchers focus on the algorithm of mining and bundling frequent itemsets, so there are many excellent algorithms for generating frequent itemsets. This paper also focuses on this problem.

3 Demand Analysis of Teaching Management Information System

(1) Demand analysis of educational administration subsystem. Educational administration is the center of school work, the premise of the normal operation of school teaching, and the guarantee of standardizing teaching order and improving teaching quality. Its contents include training objectives, enrollment objects and school system, ability structure, quality structure and knowledge structure, curriculum and content requirements, teaching organization and implementation, etc. The term teaching plan is the overall design and arrangement of the course by the teacher, including the class hour arrangement of the course, the description of the teaching content and method, the teaching schedule, etc. it is the basis for the teaching management department to check the teaching situation, teaching content and progress. The management of teachers by the teaching management department mainly includes teachers' basic information, teaching qualification, business learning, teachers' performance, annual assessment, etc., and submits the main information to the personnel department for archiving, or the content of teachers' management is directly carried out by the personnel department. Teacher management is not only an important indicator of teacher work assessment, but also a sensitive issue involving teachers' vital interests. At the same time, due to the large statistical workload and imperfect data accumulation, errors often occur, resulting in adverse effects.

(2) Demand analysis of student management subsystem. Student management is an important part of teaching management and an important part of cultivating comprehensive quality and comprehensive professional ability. Under the realistic situation of large number of students, wide professional coverage and few full-time staff, it is particularly important to adopt network and information management. Its management contents include: admission and registration, class management, student status management, etc. After electronic registration, freshmen will generate a sequence number according to each student in the class, which is the order of the list of students in the class, the basis for relevant departments to print attendance

sheets and transcripts, and it is also convenient for teachers to record their grades [3]. Class management is to form classes according to the predetermined number of students. In the database, class information includes specialty, class name, head teacher's name and contact information, class number, number of male and female students, classroom location, dormitory distribution, etc. at the same time, a class reward and punishment database is established.

(3) Demand analysis of student status management subsystem. Student status management is a complex and tedious task. Under the condition of manual management, the workload is huge, which often leads to the lack of some data. Supported by a powerful database system, the teaching management system directly links the registration of freshmen, the registration of teachers' achievements in the scholarship list and the formulation of make-up examination rewards and punishments with the student database. In case of class transfer and suspension, the student number remains unchanged. All records can truly record the overall situation of the student's study in school without conversion. When students graduate, according to the corresponding printing function, the student's personal transcript, rewards and punishments and other related contents will be printed directly. After being signed and sealed by the school, they will be put on file. The work is very simple.

(4) System management subsystem requirements analysis. System management is an important part of the teaching management clearing system. The security of the whole system depends on whether the design of the system management subsystem is scientific or not. It mainly involves user management, password management, data backup, data deletion and so on. The teaching management information system should set up a very flexible interface for the permissions of users at all levels. Therefore, the system management subsystem should set user permissions, password complexity, database backup mechanism, data deletion management mechanism and so on according to the different working characteristics of various users.

4 Information Teaching Management System Integrating Association Rule Mining Algorithm

4.1 System Architecture

The architecture of management information system mainly includes client 1 server (is) mode and browser 1 server (BS) mode. CIS mode divides the processing tasks of the system between the client and the server to optimize the overall performance. Under this architecture, the server is successively installed with multi-user or multi task operating system, network communication software and sqldbms, and the data processing part is shared by the client and server, which makes the performance of the system qualitatively improved compared with the previous structure. The disadvantage is that the development cost is high and there are many components of the system, so the possibility of failure increases. Moreover, it is difficult to locate the fault and maintain it. BIS mode is a new MIS system platform mode based on Web technology. Remote data service realizes the logical separation and independent encapsulation of user interface logical rules and data services. It can be reused, easy to manage and upgrade, and cross platform. Therefore, the teaching management information system should adopt browser server (B/S) mode, As shown in Fig. 1.

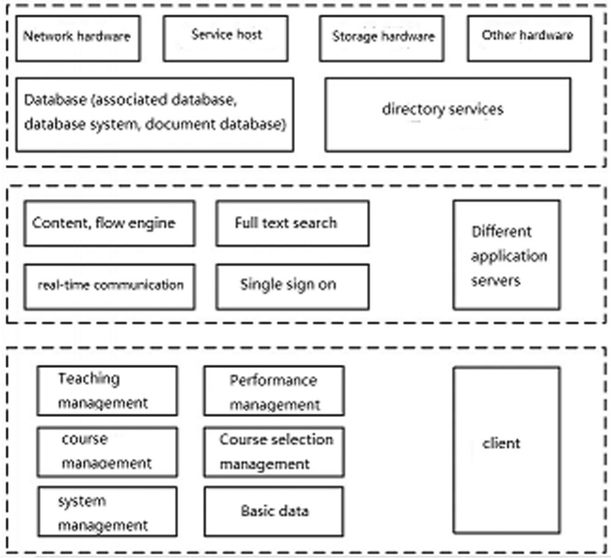

Fig. 1. System overall structure

4.2 Database Management System

Database management system. Database management system (DBMS) is a software system that manages data. It is the core of database system. It is closely related to all parts of database system. All operations on the database are completed under the control of the database management system. The main purpose of database management system is to make data as a controllable and manageable resource, so as to be shared by various users, improve the security, integrity and availability of data, and improve the independence of data. It is also a bridge between user's application and physical database [4]. SQL language has simple structure, powerful function and easy to learn. It is a general and powerful relational database standard language. Through the analysis and comparison of the above database management systems, according to the specific characteristics and requirements of the teaching management information system, the system adopts the relational database management system SQL, As shown in Fig. 2.

The appriori algorithm is improved, the association rules based on the constraints are acquired, the set of n different items is set to J = $\{j_1, j_2, \ldots, j_n\}$, the management set for J is B, the JV including the plurality of items is managed every time, and Ji and related rules are as follows.

$$E \cap Q_e \Rightarrow F \cap Q_f \tag{1}$$

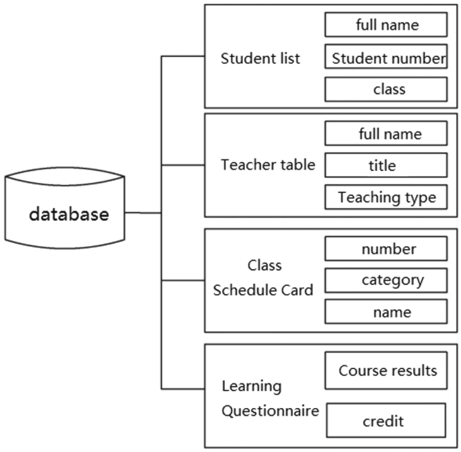

Fig. 2. Data model diagram

Food: Q1 and Q2 represent constraints. E and f represent a set of projects. E μ,μ In management, e and f represent a constraint relation when the set of e terms that conform to the Q1 constraint and the set of F terms conforming to the Q2 constraint are included.

The relevant rule mining algorithm is applied to the computerized education management system, the educational information of each field of the user is excavated, and the management is carried out according to the related information excavated, and the management performance of the system is improved.

5 Conclusion

In order to ensure system safety and stable operation, the system design process is very important to the safety of the system. This system has been designed and developed from three aspects of safety and database safety of cyber security data storage. The process segment management is designed, the shared hub is completely replaced with the exchange, the algorithm is excavated through the related rules, the molecular network is built in the national network, the firewall is installed between the host and the LAN, and the safety barrier is constructed Set filtering rules. Scientific settings monitor data packets in real time for workstations and prevent illegal data filtering. In this method, information necessary for education and management is extracted from the database. We verify the performance of this system's query process, client compatibility, and data mining.

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