Design of College Students Management Information System Based on Data Mining Technology

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Abstract. The design of student information management system is a process of defining the overall architecture of information infrastructure. It describes how an organization will use and manage its information resources (e.g., data, applications, databases) to support the decision-making process, improve service to users, and reduce costs to achieve specific goals. Essentially, it is a blueprint that defines what "infrastructure" will be built at the beginning of the project. A good example of this is Microsoft Office or Adobe Acrobat Reader, which are designed by one person or team, but millions of people use them every day since they came out. The data mining technology is applied to the teaching information management module to analyze students' test scores, and determine the correlation between students' usual performance and final exam scores. The paper elaborates the design scheme, functional characteristics and key technologies of the system, which provides a set of effective methods for scientific and standardized management of colleges and universities.

Keywords: Data mining technology · college student · management information systems

1 Introduction

Colleges and universities have always attached great importance to the first link of various management work for students at each level, as well as the important link of determining whether the school's teaching, teaching aids and logistics management mechanism can operate normally. Before the registration of new students, the school leaders should convene a coordination meeting of enrollment work involving all teaching departments and departments of academic affairs, enrollment, student management, logistics and other departments to make detailed deployment and arrangement. The check-in method of each school is also basically the same: relevant departments set up check-in points in the campus, and freshmen go to each department to handle relevant procedures according to the procedures [1].

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Data mining technology has been applied in many fields, such as commerce, finance, insurance and telecommunications, and has achieved satisfactory results. In the field of university management, with the deepening of the reform of the education system, the competition faced by the university is also increasingly fierce. This requires the school administrators to constantly update the education concept and talent training mode, and constantly make new scientific decisions according to the development of the school. Applying data mining technology to the college enrollment management information system can, on the one hand, coordinate the work of all departments well, facilitate the timely transmission and processing of information, and realize the sharing of information resources among all departments, thus simplifying the registration procedures for new students, saving the school's manpower and material resources, and improving the efficiency of enrollment work. On the other hand, by analyzing the enrollment data over the years and mining effective information, It also helps to provide decision-making reference for candidates' voluntary filling, college enrollment publicity, specialty setting and other aspects, scientifically and effectively assist college administrators to make decisions, and play an important role for colleges and universities to take the initiative in the fierce competition in the future.

With the development of modern management theory and decision-making science and their application in the management of colleges and universities, China's colleges and universities will further change from the past experience based management to scientific management based on modern management theory and methods. In the past, the school education management only emphasized the particularity of the education field, ignored the commonness of education management and general management to a certain extent, overemphasized the particularity of school education, and emphasized the management mode based on experience. For example, colleges and universities generally have not established management information systems (MIS), which is an important modern management tool. In sharp contrast, many colleges and universities themselves are developing various management information systems for governments and enterprises. Many colleges and universities do not realize the importance of management information system in college management. Even though some colleges and universities have designed and used corresponding college management information systems, most of these systems are connected to large databases, in which a large amount of original information is stored, including the staff information of all teachers and students and a large amount of data in the teaching process. These data are seemingly unrelated [2]. In the face of the "mountains" of data sets, traditional data analysis methods are still difficult to cope with, whether in the sense of time or space. Administrators are unable to understand and effectively use these data, resulting in an increasingly serious "data disaster", which forces school leaders to adopt two countermeasures that may lead to "decision-making disaster": one is "poor in coping", the other is "ignoring", In fact, no matter what kind of countermeasure is taken, it is out of a "helpless". Traditional data analysis methods (such as statistics) can only obtain the surface information of these data, but can not obtain the internal relationship and implicit information of data

attributes, nor can they obtain important knowledge. This also leads to the "survival in name only" of the management information system [3].

A set of perfect university management information system developed by using data mining technology is conducive to introducing modern management theories and methods into the actual management of the school, promoting the transformation of school management from empirical management to scientific management, making full use of the human, material, financial and other resources of the school, and more effectively realizing the talent training, scientific research [4]. The function of serving the society and its short-term and long-term development goals.

2 Related Work

2.1 Purpose of Developing Data Mining University Management Information System

At present, the management level of some school information in China is still on the basis of paper media. Such a mechanism can no longer adapt to the development of the times, because it wastes a lot of manpower and material resources. In the information age, this traditional management method will inevitably be replaced by computer-based information management.

The information management system is an indispensable part of an educational unit, and its content is crucial for the decision-makers and administrators of the school. Therefore, the information management system should be able to provide users with sufficient information and quick query means. In recent years, with the continuous expansion of enrollment in colleges and universities, the number of students in school has risen sharply, which has greatly increased the workload of management staff engaged in various aspects of the school [5]. The traditional manual management mode can no longer meet the needs of the current work. This management mode has many shortcomings, such as low efficiency and poor confidentiality. In addition, a large number of files and data will be generated over a long period of time, which brings many difficulties to search, update and maintain.

College students' information management is to use the information scale to comprehensively evaluate management problems, and find management problems in the management evaluation according to multi-dimensional indicators, integrate the evaluation results, and finally determine the causes of management problems. Combining the information scale and using information mining and intelligent algorithms to comprehensively evaluate the results of college students' information management can improve the evaluation level of college students' information management.

Hypothesis 1: The content of the scale is, the result set is y_i, the information standard is $set \sum x_i$, and the judgment function of college students' information management is $f(x_i)$ shown in Eq. (1).

$$f(x_i) = \underline{\underline{\sum x_i | y_i}} \cdot \int \xi \tag{1}$$

Assumption 2: the program selection function q_i is and the weight coefficient is $F(x_i)$, then the choice of information management intervention options for college students is shown in Eq. (2).

$$F(x_i) = z_i \cdot \sqrt{f(x_i|y_i)} \sqrt{\prod q_i \cdot \xi +} \tag{2}$$

In terms of the external environment of university student management, we should pay attention to providing students with good external environment and high-quality logistics services. Colleges and universities attach importance to the combination of professional training of student administrators and guiding services, and pay attention to the treatment of students in a democratic way. Colleges and universities can better serve students by setting up a variety of functional departments. Colleges and universities pay attention to the growth of students in a relaxed and harmonious atmosphere, so as to fully tap their own potential, form good habits, and let students realize that their rights are respected in the process of management, So as to consciously abide by the school system, which is conducive to achieving the training objectives of colleges and universities; Colleges and universities pay attention to providing services for students through a perfect socialization mechanism, and advocate a simple management concept. Social institutions are responsible for the management of students in colleges and universities [6]. As shown in Fig. 1 below, there are bright clusters between blue and red in the student information management set diagram, and each cluster contains 5000 data. If there are outliers in the data, the blue cluster may contain more outliers by visual inspection, because the data points are relatively scattered (Fig. 1).

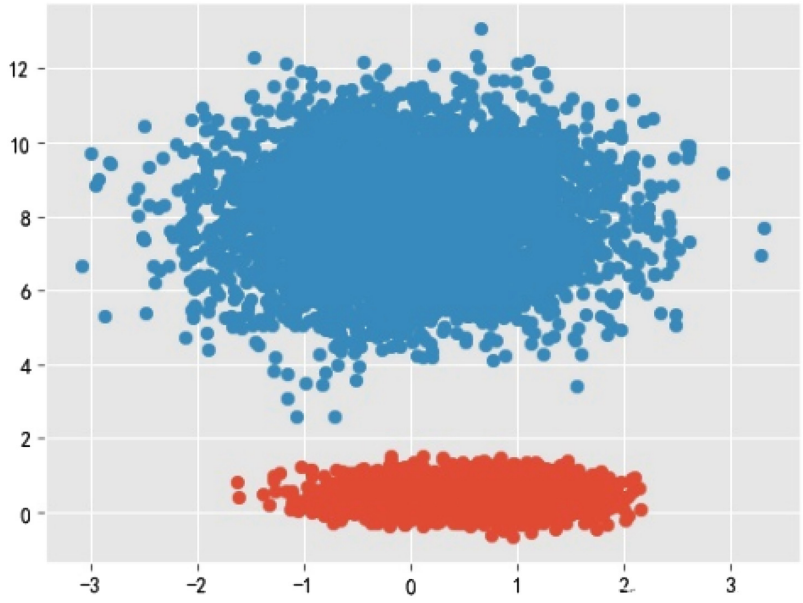

Fig. 1. College student management information system (Color figure online)

The purpose of developing this system is to apply modern information processing technology to school work management, improve work efficiency, and liberate managers from complicated manual operations. Furthermore, in the process of building a high-level university, the construction of information management system is also one of the important links [7]. Therefore, the development of university information management system is an important part of university information construction. At present, there are the following difficulties in collecting and analyzing various existing information in colleges and universities:

(1) Decentralized storage location: all kinds of information in colleges and universities are stored in various departments of colleges and universities, and data consistency is difficult to ensure.
(2) Poor information integrity: departments work independently and lack unified management and coordination on information collection and update, which makes it difficult to ensure the integrity of information.
(3) Poor information accuracy: the information collection point is not unique, the departments lack cooperation, and the data accuracy is difficult to ensure.

The university information management system is a powerful assistant to assist the school leaders and staff in various departments to carry out various work. It is a university management information system that takes the basic information of the school's software and hardware resources as the main body and takes high timeliness and high-quality service as the criterion [8]. It not only conforms to the actual situation of the school, but also has advanced management ideas. This system has noticed the openness and practicability of the system, which is convenient for operation.

2.2 Data Mining Methods

In the process of research and analysis of data mining analysis methods, the commonly used methods are mainly classification, regression analysis, clustering, association rules, deviation analysis, web page mining, etc. [9]. In the process of practical application, data information needs to be mined from different perspectives.

Data classification and mining control need to be controlled from the perspective of data mapping, data prediction and analysis. In the process of extracting and managing important data information, important data can be obtained by mining and extracting multi-data information. In the process of data classification, CLS algorithm, C45 algorithm and other means can be used to control the important data information [10]. On this premise, control the classified data to improve the effectiveness of data mining analysis.

Formally, if there are m unmarked samples in the sample set $D = \{x_\gamma, x_\gamma, x_\alpha\}$, and each sample $x_i = (x_{i1}; x_{i2}; x_{in})$ is an n-dimensional feature vector, then sample D is divided into k disjoint clusters $\{C_t \mid l = 1,2, \ldots, k\}$, C_t, $C_i = \emptyset$ and $D = \prod_{i=1}^{k} \mathbf{C}_l$, by the clustering algorithm,. Correspondingly, $\lambda \in \{1,2, \ldots, \mathrm{k}\}$ to represent the cluster mark of x, that is, $x_j \in C_{\lambda_j}$. In this way, the result of clustering can be expressed as $\lambda = (\lambda_1; \lambda_2; \ldots; \lambda_\mathrm{m})$. According to different needs,

In the process of analyzing the application of clustering algorithm, based on the principle of maximizing intra-class similarity and minimizing inter-class similarity, data mining and control are realized through clustering [11]. The objects within a cluster have

high similarity, and the objects between different clusters have low similarity. In the process of analyzing the practical application of clustering method, the core of network data processing and control is to conduct quantitative analysis of data information change, data collection and other aspects from the perspective of clustering analysis, and then realize the processing and application of data information. At present, combined with the clustering analysis of the database and based on the database technology, the data information is analyzed to improve the data information processing and control effect.

2.3 Design Objectives of Data Mining Information Management System

The university information management system stores a wealth of teaching, scientific research, management and other aspects of information, and the scope is very broad. It should be said that data mining on this basis will have many directions to choose from. However, at the same time, the university information management system is also a very complex large system. If the problem is too big or too vague, it will have a negative impact on the practical significance of mining. Therefore, for this topic, finding a clear goal, that is, the key link to be solved is the primary task [12].

There are many mining algorithms available in the university information management system. This paper mainly uses association rules to mine the existing data according to the characteristics of the data in each module of the system. This paper refers to data mining theory and other mining tools to enable the system to achieve the following functions:

1) Ease of operation. That is, the simplicity of the mining process and the readability of the mining structure.
2) Efficient data processing capability, simple and effective data processing.
3) Provides a simple path to integrate with other tools.

3 Design of University Student Management Information System Based on Data Mining Technology

The research of university management information system mainly includes two levels: management level and technology level. On the management level, the system should meet the application requirements of university resource management; On the technical level, the system shall adopt advanced and applicable software development mode and software development process. Corresponding to these two levels, this paper discusses the university resource management system from the perspectives of system function, development mode and system implementation [13]. The structure of college student management information system is shown in Fig. 2.

The level of information collection and processing is directly related to the overall management level of the unit to a certain extent. Due to the complexity of information management in colleges and universities, it is required to have a reasonable division of labor, clear responsibilities and sound management; The constant expansion of information requires that information management must be accurate and efficient; The openness of management requires multiple staff to contact on the open network with different permissions, interact in real time, and complete their own tasks or common purposes. This

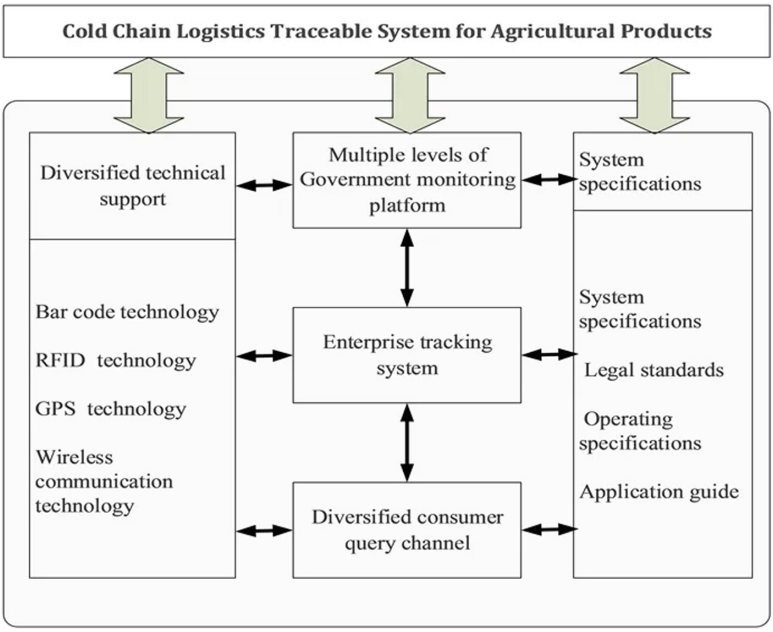

Fig. 2. College student management information system

system should take management needs as the core, and take the relatively perfect and prominent management functions as the main goal [14]. Therefore, the main functional modules of the system should include student information management, teacher information management, teaching information management, book information management, teaching material information management, employment management, training management, system management, etc., which can realize the comprehensive, scientific and standardized management of university resources. Table 1 below shows the management information values of college students.

Table 1. Management information of college students

Scale type	Academic and scientific activities	Construction of campus culture	Social practice	Construction of student work team
Social scales	0.68	2.41	1.11	0.61
Information scale	0.79	1.38	0.66	0.85
Personality scale	1.25	6.2	1.21	0.56

It can be seen from this that when there are different requirements for data clustering, one of them is data clustering.

In data mining, an important task is to find frequent itemsets in large databases. When a large number of patterns exist in databases, finding frequent itemsets becomes a costly task. The algorithm is an association rule mining method that does not generate candidate item sets. As an algorithm for mining frequent item patterns, a given database needs to be scanned many times, so I/O reading and writing has become a big bottleneck. It is to solve this problem that the data structure of a tree is introduced by using the divide-and-conquer strategy. No matter how much data is, only two data sets need to be scanned, thus improving the efficiency of the algorithm.

4 Function Realization of Data Mining Information Management System

In the process of data mining and data information control, the teaching management data analysis system needs to be analyzed from the perspective of data information processing, information dimension, granularity, etc. In the process of establishing information indicators, it needs to be analyzed from the perspective of data analysis, information processing, etc., so as to improve the information processing effect of the teaching management data analysis system [15]. The specific indicators are as follows:

Indicator: It is mainly to adopt and analyze different subjects and different information in the teaching management data analysis system, so as to achieve comprehensive improvement of data evaluation and data information analysis effect.

Dimension: It can be processed with different uploaded evaluation information of different users in the teaching management data analysis system. On the premise of analyzing the data information transmission path and data information processing, the comprehensive improvement of data information processing effect can be achieved.

Granularity: refers to the detailed procedure for describing various teaching management-related information in each indicator dimension of the teaching management data analysis system.

In the process of processing and channel construction of mining data information in the teaching management data analysis system, we need to improve it from the perspectives of data information processing, logical model building and data mining [16]. Moreover, after data mining, we need to control the data transmission channel, and combine the conceptual model application of data mining and the perspective of data analysis to analyze the node relationship of data information From the perspective of information channel design, on the basis of realizing data management and information channel construction, take the snowflake model as the basis of data constraint relationship, and analyze data information transmission and information dimension structure according to data logic relationship, so as to improve the data mining function of the teaching management data analysis system. In the process of designing the information channel, we need to control it from the perspective of information dimension, so as to achieve the comprehensive improvement of data dimension and information transmission control effect [17].

Take the student information management module as an example to introduce its contents and functions.

(1) Content of student information management module

As the student work in colleges and universities is a systematic project with complicated process and content, this paper establishes ten subsystems according to the main content of student work and the actual situation of the student work in our school. According to the basic situation of students, the relevant field names are set according to the requirements and characteristics of each system; At the same time, the student number and name are run through each subsystem, and the field name of "student number" is used to associate different subsystems, so that relevant data can be easily queried when a record is queried [18]. For example, when querying the information of a graduate, you can click the student number to find out the rewards and punishments, military training, etc.

(2) Function analysis of student information management module

The database of student information management module adopts C/S architecture. The backstage is supported by department datasets and global data warehouses. Users use OLAP tools or data mining tools on the front end for data analysis. Its architecture is shown in Fig. 3.

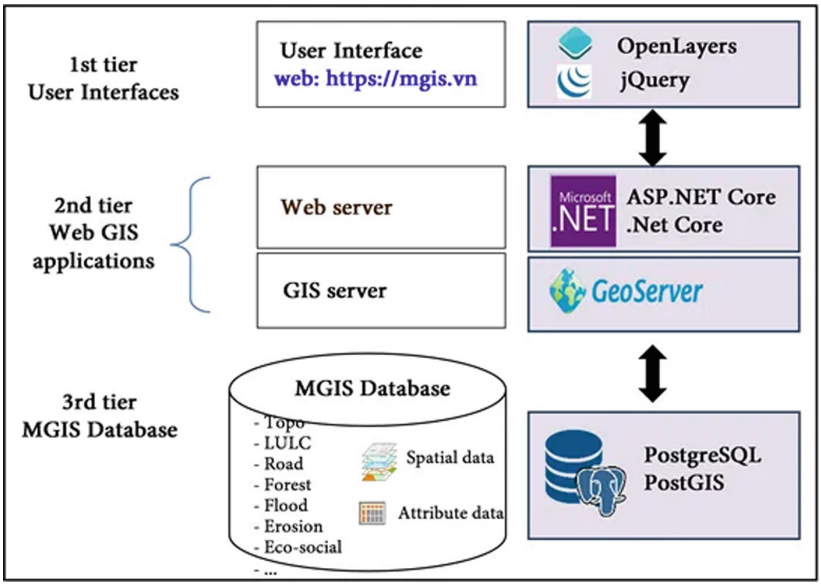

Fig. 3. Database architecture diagram

Because the network provides a direct and fast information feedback environment, and this system provides powerful retrieval and query functions, it can timely collect students' current hot spots and focus issues, understand students' requirements and suggestions, and systematically summarize them [19]. For the hot spots and focus issues collected and sorted out, the good side is to feed them back to the systematic forum for publicity and praise; For students' reasonable opinions on the work of the school, they will be sent to the relevant departments through the network (e-mail), telephone, written

or in person, so as to give solutions or responses as soon as possible, and then feed back to the Internet; Even if the students may not have reasonable opinions, they should also give timely feedback, correct unnecessary students' misconceptions and misunderstandings, and create a harmonious learning and living environment for students [20]. On the one hand, it enhances the students' sense of participation, provides a channel for the student work system and students to communicate with each other, enhances the transparency of the work, and makes the work better accept the suggestions and supervision of teachers and students; On the other hand, by connecting the current news trends at home and abroad, the current main work of the school and other information, we can effectively reflect the requirements of the "Three Represents", occupy the ideological work position of students on the Internet, and make the campus network become another important form of students' ideological and political work.

5 Conclusion

This paper introduces the design and implementation of university management information system in detail. The system designed has practicability: it almost includes all aspects of traditional management information and modern information resource development in colleges and universities, and the system design fully considers practicability. At the same time, due to the modularization of the system, the future system expansion is superimposition rather than replacement. Therefore, with the change, adjustment and expansion of the functions of the management department, any part of the value-added platform can be expanded relatively independently. Progressiveness. The functional design incorporates the latest concepts and research results of higher education research, modern resource management and development, information management systems and other multidisciplinary fields. The system design adopts advanced and mature computer technology, thus ensuring the progressiveness nature of the system and having a longer service life.

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