Construction and Realization of University Student Information Management System Based on Big Data Technology

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Abstract. One of the important features of the "new information age" is "big data". In the age of big data, with the introduction of student information management systems, colleges and universities are increasingly paying attention to systematically managing student information management and improving their efficiency, effective management of student information and innovative development to build a new model of management system. In studying the evolution of student information management, big data technologies emerging in the information age play an important role. By leveraging big data to improve systematic management of student information, colleges and universities can manage student information faster and more efficiently and make new contributions to the advancement of student information management. In this article, information management is considered as the theoretical basis for research, big data technology is used as the main search algorithm, and its important content is combined to analyze and study the possibilities of the student information management system. In this article, an information management system for university students is used as a research object, which is optimized and improved through big data technologies. Big Data technology can be seen as a kind of algorithm for analyzing and processing data. Therefore, it can be used to create a student information management strategy. The experimental results show that this research has a better impact on the creation and implementation of an information management system for students using Big Data technology and the application of Big Data technology in the information management system for students.

Keywords: Big Data Technology, College Students, Information Management System, Data Analysis

1. Introduction
Currently, the development trend of an international information management system for university students is mainly reflected in the following points: First, the amount of content continues to grow. For example, from managing student achievement to other managers, from managing academic goals to managing student demand, making preliminary decisions and systematically reviewing the overall performance of a student information management system (including the implementation and
finalization of the plan) [1]. At the same time, the information management system for students is constantly being improved. The theory and methods of the information management system for students have also been developed and improved in accordance with the management requirements. Computer network information systems technology can already support the rapid improvement of the business management platform. While developing student information management systems in colleges and universities across the country, many colleges and universities have already begun to develop and use academic student information management systems for student management [2]. Today, almost all Chinese colleges and universities have started using the student information management system to manage student information [3]. However, due to the limitations of various conditions of use, the existing student computer control system is too chaotic in terms of student computer control and cannot and cannot fully obtain the necessary information. In a student information management system, any data exchange in information management for classrooms, colleges, schools and students will face difficulties and the emergence of big data technology could solve this problem [4].

In order to significantly improve the impact of the application of an information management system on students in the isodata era, consideration should be given to seeking and processing information directly related to student retention. Depending on the requirements of the corresponding phases of the big data mining phase, the effective integration of the big data network and big data mining means that appropriate tools can be used for security reasons to collect relevant data [5]. From a mechanical point of view, the use of relevant keywords can effectively control the data processing rules as the type and amount of data increases daily when using computers with big data technology. And that relevant information is stored timely and accurately information about the data to facilitate further analysis. Then evaluations are performed to achieve the goal of improving data management. [6] The efficient use of the online information system makes it possible to detect illegal activities and timely record and correct inaccurate information, thereby making the information network, especially in colleges and universities, more secure in handling complex student data [7].

Building an information management system for students in a big data environment is a very important task. Current information and content is becoming increasingly complex and extensive. As global economic integration deepens and broadens, communication between schools and faculties becomes more frequent and concise, and the complexity of data management for students naturally increases [8]. If you want to realize high-quality information management in the student information management system in a large information network, it is better to use the information management system in large information networks and then install a new information management system for students [9]. The second most important point is to improve and update the information management system for students. In the meantime, thanks to constant updates and optimization of network technologies, big data technology has spread to numerous important areas. Intelligence in student management and building an IT management system for students. The main challenges for colleges and universities in the field of information management are the creation and implementation of an innovative and advanced information management system for students who use the technologies of large-scale information in the construction of online information systems. Development and implementation research has provided theoretical support for its development and innovation [10].

2. Apriori Algorithm
The Apriori algorithm uses an iterative search technique, layer by layer, to find common object groups. Here, k object groups are used to find (k + 1) object groups and to consider all common object groups in the dataset. The core of this research is big data technology to set up an information management system for students. It is more important to use and analyze big data. Being an extremely important part of the information development of colleges and universities, the information management system for students has a certain analogy, a certain microcosm and a certain immutability.
The economic development variables of network information systems using big data can be expressed as follows:

\[ X = (\mathbf{w}_1 \cdot \mathbf{w}_2 \cdots \mathbf{w}_k) \]  
(1)

\[ \mathbf{w}_k = \{x^{(k,1)}, x^{(k,2)}, \cdots, x^{(k,N)}\} \]  
(2)

\[ X^{(i,j)} = (x_1^{(k,i)}, x_2^{(k,i)}, \cdots, x_d^{(k,i)})^T \]  
(3)

In the above formula, the inter-class divergence matrix is defined by the sample, and then the Apriori algorithm is selected for the association analysis, and the hidden associations and laws are mined from the big data. Define the inter-class divergence matrix as:

\[ S_i = \sum_{m=1}^{N_i} m \left| m_i - m \right|^T \Phi_i \]  
(4)

By defining the inter-class divergence matrix, when the discriminant criterion reaches the maximum, the variable transformation is carried out. After the product of the overall defined inter-class divergence matrix reaches the maximum value, it is proved \[ X^{(i,j)} = (x_1^{(k,i)}, x_2^{(k,i)}, \cdots, x_d^{(k,i)})^T \]. It can correspond to the eigenvector of the first d largest eigenvalues of the matrix. Under the analysis of big data, the minimum value of the error function is obtained by analyzing the sample data, and the weights and thresholds are adjusted iteratively to improve the calculation accuracy.

3. Model Establishment

When performing data mining, the Apriori algorithm model first needs to use an iterative method to query frequent data sets in the database. This process mainly calculates that the support is not lower than the threshold set by the user; mining is performed according to the minimum confidence decision provided by the user. Construct its transformation coefficient model:

\[ a = \frac{(k - 1) f(x)_{\text{avg}}}{f(x)_{\text{max}} - f(x)_{\text{avg}}} \]  
(5)

\[ f(x)_{\text{max}} = P(x|o) = \frac{e^{-x^2}}{a} \]  
(6)

\[ f(x)_{\text{avg}} = \sum_{z \in X} P(x|c(z),o)P(c(z)|o) \]  
(7)

The following is an example analysis of Apriori algorithm model. Assume that the data set is stored in the database as shown in Table 1.

| Table 1. Database data set |
|---------------------------|
| **Numble** | **Single data set** |
| 1 | 1,2,3,4,6,7 |
| 2 | 2,5,6,9 |
| 3 | 2,4,5 |
| 4 | 1,3,7 |
| 5 | 1,2,6 |
| 6 | 2,3,6,7 |

Multiple data sets integrate these data sets together to form an item set. If the number of data sets is m, it is called m itemsets. Assuming that the support of one item in the data set is higher than the set minimum support threshold min, all frequent item sets are combined to form a new frequent item set, which is represented by the symbol L:
\[ L_{\omega} = -\frac{1}{N_{\omega}} \sum \log p(x) p(y) + (1 - p(x))(1 - p(y)) \]

(8)

From the above analysis, it can be seen that the core idea of the Apriori algorithm uses each layer of search plus iteration to acquire frequent data sets, and at the same time, find the association between each data set according to the mining technology method for frequent data sets:

\[ P(x|c(z), o) = h^c(z-x) \]

(9)

\[ PR(p) = (1-\alpha) + \frac{\sum_{i=1}^{n} PR(T_i) \times W(T_i)}{C(T)} \]

(10)

In order to evaluate whether the data analysis is reasonable, a fitness method is proposed to evaluate the individual quality. Perform coding first, and then calculate the fitness value according to the coding according to the set fitness method. Establish fitness function calculation:

\[ f(\omega) = \min \frac{1}{2} \| p \|^2 + \frac{1}{m} \sum l(p, (x,y)) \]

(11)

4. Evaluation Results

4.1. The Current Situation of My Country's College Information Management is Worrying

42.60%

21.00%

23.50%

12.90%

Course management

Miscellaneous Management

Student Information Management

other

Figure 1. Investigate the degree of application of information management for college students in domestic universities

The data shown in Figure 1 from the data shown in the figure can understand that the most relevant application of colleges and universities in student information management is "program management" which is 42.6% while they are in "student information management" is "learning", and "students" of "information management" represent 44.5% of the total. The networked information systems should have an absolute advantage in student information management systems, but there are still many universities that do not use student data management systems due to various factors. This shows that there are still many challenges in the way colleges and universities deal with automation. The Chinese economy and big data technology, the development of an information management system for students steadily. According to the survey, setting up an information management system for students in a big data environment has produced very efficient and satisfactory results in managing various information services, but this business process still has many problems and shortcomings. These problems are directly related the student information management system. Regarding the reliability, there are many negative consequences that result in poor efficiency. Second, the division of labor is unclear and the creation and improvement of information management systems for students can be well controlled. Research has shown that the reasons for this phenomenon of under-utilization of information management systems in licensing programs are more complex. More importantly, colleges and
universities do not have standardized information management practices for all participating student information management systems

4.2. Improve the Rationality of the Information Management System for College Students

![Figure 2](image.png)

Figure 2. Comparison of the use of information management by college students

Figure 2 shows that the "graduates" and "undergraduates" of current university students in my country use different levels of information management. The information management system for students using Big Data technology is less affected by various factors. However, due to the lack of information management, the system and standardization of students via the student information system has a negative influence on their own development. It depends on the student information management system and also shows the shortcomings of the existing student information system. Today's modern universities need to reinforce the widespread use of big data technologies in student information management by creating a student information management system and providing basic knowledge to guide the university. At the same time, the university's information management staff must collect information from students' computers and databases, make full use of online information, and constantly improve the university's management system. The integration of large-scale data technologies into the information and development process of universities not only enables universities to adapt student leadership to the changing situation, but also helps to improve and strengthen leadership. Colleges and universities can gather suggestions and advice for big data students through a student information management system, continuously adapt the student information management system to the needs of students and academic value chains, and can bring enormous benefits to universities for leadership.

5. Conclusion

In the age of big data, the automation of information management systems for students, use the existing information management system as a framework and introduce new ones. big data technologies for structural innovation and its development, and clarify the meaning of structure. information management systems for students. For the existing information management system, information management in the age of big data is part of a higher system management process that can continuously increase the level of management information and innovate the management. At the same time, based on the status quo and high efficiency, big data technology is combined, used and coordinated with the proprietary system to create a student information management system suitable for the university and has great advantages for the development of the university. Overall, in the age of big data, it offers several opportunities for future development. Therefore, it is necessary to improve
university management for students, use big data to innovate student information management practices, and actively change traditional business models. It plays an important role in the development of effective and continuing education in universities.

Acknowledgments
This work was financially supported by The Philosophy and Social Science Planning Fund Project of Guangxi, The Project of Guangxi Co-building Marxism College & Marxism Theory Research and Construction Engineering Base and The Project of the 19th CPC National Congress Spirit in GUET.

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