Research on the Application of Big Data Technology in Student Education Management

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Abstract. With the development of information technology, colleges and universities have widely applied computer technology in educational management. Many modern campuses have begun to build smart campuses, trying to use computer technology to manage students. There are many middle school students in colleges and universities, and the amount of data generated by students is huge, updated quickly, and there are many types of data. Under this premise, the establishment of a smart campus needs to rely on big data technology to collect, clean and organize data, and mine valuable information from a large amount of data. Big data technology can help college administrators and teachers to discover abnormal data of students in time, understand students' psychological state and behavioral characteristics, and help teachers to carry out further targeted education. This paper deeply analyzes the application direction of big data in student education management, and builds a student management platform based on big data technology.

Keywords: Big Data Technology · Student Management · Management System

1 Introduction

With the changes of the times, today's college students' psychological state and physiological state are also very different from before. Under the background of the popularization of the Internet, the social environment faced by college students is more complex and changeable [3], and their psychological state will be affected by many factors. In order to prevent problems in students' psychological state, teachers should keep abreast of students' living conditions. Many colleges and universities now require students to use campus cards to consume or cards. Campus data has the characteristics of large scale, wide variety, strong authenticity and low density. Colleges and universities can understand the living conditions of students by mining and analyzing these data. Some colleges and universities will know whether the student's living expenses are sufficient through the consumption of the student's campus card. After collecting students' campus card consumption [10], a university will issue bursaries to every student whose monthly consumption does not exceed 200 yuan and each meal in the campus cafeteria does not exceed 3 yuan. This measure of the school can help students with poor living conditions, which is of great significance to the students of higher education and management.

2 The Theoretical Basis of the Big Data Student Management Platform

2.1 User Portrait

User portrait is a set of tags that the computer depicts based on the basic statistical infor-mation, social information, consumption behavior, preference habits and other multi-dimensional information of a specific group of people [17]. Enterprises can push different information to different users based on these tags to achieve personalized push. User personas are virtual representations of real users. User portraits are built on a series of real data, and a target user model is constructed based on real data. Giving people judgment labels is the core of building user portraits. A series of labels can be obtained from the user's original data. If the system wants to learn more in-depth information, it needs to be mined through a series of algorithm steps and rules (Fig. 1).

User portrait construction needs to go through three steps: basic data collection [10], behavior modeling, and building portraits. In the basic data collection, various types of
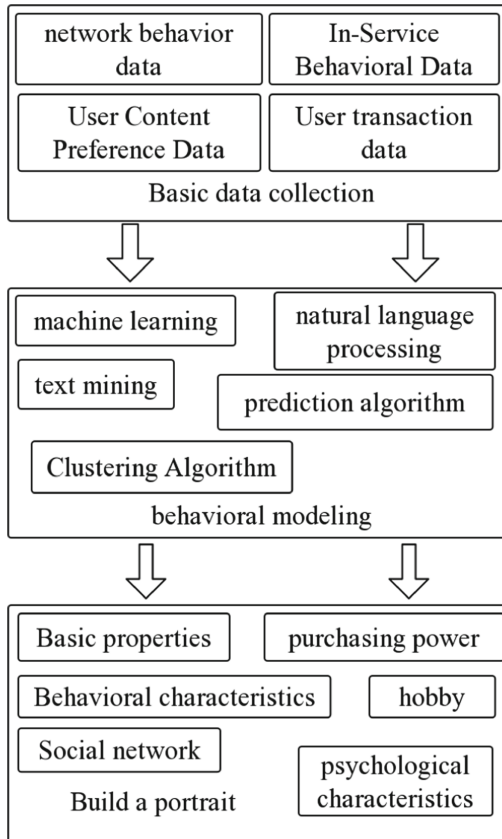

Fig. 1. User portrait construction process

data need to be preprocessed and integrated. During the behavioral modeling phase, the computer processes the data through a variety of algorithms. During this stage, the main focus of the computer is the high probability event, and the accidental event and the user's accidental behavior will be screened out by the computer. Accidental events do not reflect user preferences and habits. In the stage of constructing the portrait [10], the computer will visualize the obtained user tags. In order to make the user's image more intuitive, the computer will perform visualization processing and use images or word clouds to describe the user's characteristics.

2.2 Data Mining

The development and popularization of computer technology makes the generation and dissemination of data very convenient. Data collection and storage technologies are developing rapidly, and the world is generating data all the time. Reasonable application of data has become a problem that should be considered in many fields [17]. Data mining can mine valuable information from a large amount of data. Data mining generally includes the exploration, processing, analysis and modeling of data. Generally speaking, to convert data into useful value, it is necessary to convert information into data, then data into knowledge, and finally knowledge into value. Data mining is the step in which data is transformed into knowledge [6] (Fig. 2).

The application methods of data mining can be roughly divided into three categories, namely correlation analysis, cluster analysis, classification and regression prediction.
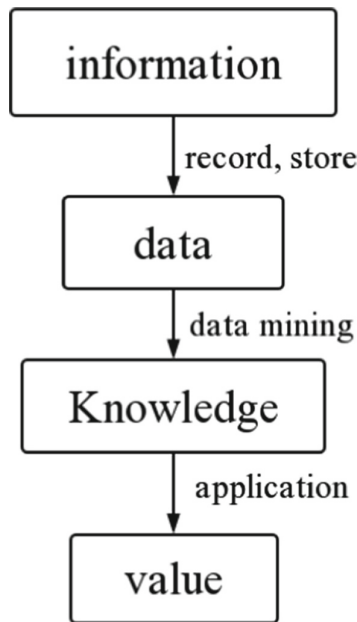

Fig. 2. Data mining process

Correlation analysis refers to the analysis of the relationship between different character-istic data, mining the mutual correlation of these characteristics [9], and finally finding out the key influencing factors of the research target. By analyzing data correlations, predictions can also be made against research objectives. Common correlation analysis methods include graph correlation analysis, covariance calculation, regression analysis, information entropy and mutual information calculation [15], and correlation coeffi-cient calculation. Cluster Analyst A form of unsupervised classification. Cluster analysis mainly classifies data into different classes or clusters by determining whether objects are similar. Cluster analysis algorithms include clustering, decomposition, dynamic clus-tering, fuzzy clustering, ordered sample clustering [8], etc. Classification and regression prediction is to use the category or label value of a batch of data to learn, thereby pre-dicting the category or label value of new data. There is a certain difference between classification prediction and regression prediction. The target attribute of classification prediction is discrete, and the target attribute of regression prediction is continuous [16].

3   Construction of Student Information Management Platform

There are four main steps to build a college student information management platform. First of all, integrate heterogeneous data on campus to avoid the phenomenon of infor-mation islands in each data platform. Establish a university database to lay a research foundation for subsequent research goals such as student behavior analysis and por-trait construction. The second step is to format and preprocess the multidimensional data in the database [7]. After preprocessing, corresponding feature engineering is made according to the research goal, such as constructing student features, extracting student features, and so on. In this step, the system also builds a four-layer portrait label system, and calculates various indicators required in the system [14]. The third step is to clarify the goals of each module of the student information management platform. Use data mining technology and traditional statistical analysis methods to study the determina-tion of family economic difficulties, the construction of student portraits, and the early warning and supervision of precise management. The fourth step is to visualize the pre-vious analysis results and display the results of data mining on the platform page, which is helpful for teachers to apply the data to actual campus management [2] (Fig. 3).
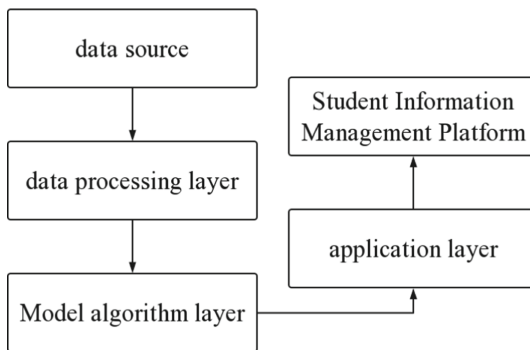

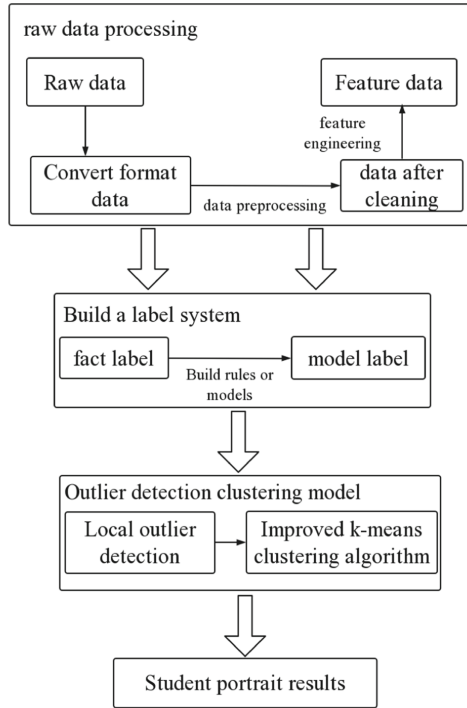**Fig. 3.** Construction plan of student information management platform

Fig. 4. Student portrait construction process

The portrait construction process of the student information management platform is the key to platform development [13]. The system makes use of the local advantage group factor algorithm to find outliers, and proposes advantage group students from the student group. Then use the k-meas clustering algorithm to separate the student groups with different characteristics, and lock the student groups that need attention in certain aspects and the student groups with excellent performance. The process of constructing a student portrait is shown in Fig. 4.

4   Conclusion

This paper builds a student information management platform based on the student data in colleges and universities. Teachers can use this platform to understand the living conditions of students [4], and realize accurate funding for students and research on three-dimensional portraits of students. The next step of this research is to obtain more diverse student data resources, build a model for students' personality and psychological characteristics, and improve the student management work in colleges and universities [11].

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