Design of University Students' Behavior Analysis Platform Based on Data Mining

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Abstract: It is of great significance to use big data analysis method to explore the potential laws of college students, provide scientific decision-making basis for school teaching and management, and improve the education management and service quality of college students. Based on the data of college students' study, consumption, interest, sports, socialization, surfing the Internet and borrowing, this paper makes intelligent analysis and research on students' behavior by using the collection, processing and mining methods of big data, and builds a student behavior analysis and early warning system on the basis of Django architecture, so as to analyze, predict and early warn students' behavior and lay the foundation for refined education and teaching.

Keywords: smart campus cloud platform; data mining; college student education management

1 Introduction

The rapid development of computer and Internet technology has driven the development of the era of big data, and "big data" has become a new trend of world economic development. Under the background of informatization, the scale of students' data is also increasing, and a large number of students' data are entered into the management system, and the application of information technology constitutes a big data ecology on campus. Therefore, studying students' learning and life behaviors is a key link to strengthen students' information management. The big data environment of universities refers to the transformation from a single university management mode to the opening and sharing of university data, and the data of students' learning activities are preserved by digital means. However, at present, the management of university data is still facing problems such as various types of data, unclear division, lack of high integration. It is difficult to effectively construct the relationship between various data and lack of systematic processing of student behavior data. Therefore, in the study of students' learning, the data are not accurate and comprehensive enough. Based on the theory of intelligent decision-making, this paper constructs a big data processing system for college students' learning behavior, and makes an in-depth study on college students' learning and campus life in the future.

2 Hardware design of university students' behavior big data analysis platform for intelligent decision-making

When designing the power circuit of the platform, we should pay attention to the fact that the maximum current that the circuit can carry is more than the actual circuit value, choose a chip that can provide more than 10 A power supply capacity, and consider choosing a power chip that can automatically adjust the voltage value through signal feedback. In this paper, two chips with stable performance are selected, and the matching working voltage can realize 5-15 V power supply. According to the adjustment of core voltage under different working conditions, there are mainly four pins, and the detailed power supply circuit is shown in Figure 1.
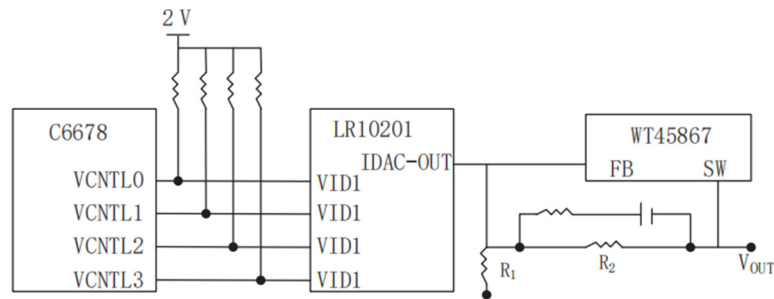

Figure 1 Design drawing of power supply circuit

As shown in Figure 1, VCNTL3 has an open drain and the resistance of the circuit is 2Ω. The LR10201 chip generates a corresponding current value based on the corresponding signal value, and transmits the current value to the pin of WT45867, and adjusts its output voltage to obtain a voltage of 1.2 V [1]. Assuming that the resistance of resistor R1 is 8 KΩ, the resistance of R2 is about 5.33 KΩ. Each VID code and the corresponding current and voltage values are shown in Table 1.

Table 1 VID codes and corresponding current and voltage values

VID code	Current value/μA	Voltage value/V
00000b	59.87	0.845
00010b	56.26	0.972
...	...	...
11110b	1.22	1.100
11111b	0.00	1.108

As can be seen from Table 1, the bit width of the signal adjusted between the data acquisition module and the LR10201 is 8 bits, and the LR10201 can calculate the corresponding output current based on the received data.

3 Design of big data analysis platform software for college students' behavior

(1) Establish a smart decision-making big data center

The construction of intelligent decision data center can effectively solve the problems existing in information exchange and resource sharing between different decision makers, resulting in the phenomenon of information islands caused by improper handling. Intelligent decision-making centers need strict organization. They should make overall plans according to the purpose of behavior analysis, set management decisions of data centers, access methods of data disclosure, and information security of databases, students and schools cannot be guaranteed, which will limit the normal operation of intelligent businesses, and big data is the basis of intelligent decision-making, so the quality of data is very important [2]. In the process of data collection, different behaviors need to be comprehensively collected from multiple angles, so that decision makers can obtain more complete behavior information. The purpose of intelligent decision-making data collection is to realize the life and study of college students through mobile terminals and sensors based on the needs of decision-makers. After defining the scope of collection, the intelligent decision-making body will review the collected data, judge their compatibility, and find out the incompatibility of some data to ensure that the collected data can be used correctly.

(2) Dynamic monitoring of students' behavior

The focus of dynamic monitoring is to dynamically monitor students' learning behavior and life behavior. Based on the activity track at school, we get the relevant data of the school's access control system, campus network, course selection system and library information system, and make a comprehensive analysis of them to classify students with different characteristics. In the obtained data, a lot of useless data are collected, and these data will deviate from the information after being analyzed by the platform. Therefore, the obtained data must be revised to eliminate those defective and repeated data [3]. In order to ensure the standardization and rationality of data, it is necessary to record students' behaviors effectively. By updating and uploading the monthly learning situation to the intelligent decision-making big data center in real time, and by analyzing and mining the big data, all the materials related to students are imported into the database and deeply integrated with the data of the big data analysis platform, so as to conduct in-depth research on students' behavior. Through the investigation of the places frequented by college students, the behavior characteristics and interests of college students are studied.

(3) Construct the student behavior portrait module

The student behavior model is based on students' characteristics and behavior data. After obtaining the relevant data of students, it constructs an independent dimension behavior data model of each student, and integrates all aspects, so as to show the students in the whole school comprehensively. This model can not only show students' learning performance separately, but also provide analysis basis for other big data models and process the data of other modules. Students' learning materials should include basic student identity and admission materials. In the data of students' academic performance, it includes the data of curriculum arrangement and achievement ranking. The data of students' life behavior include

consumption places and habits, consumption amount, online behavior and so on. Investigate and classify students' study and life performance.

4 Design of data mining process of college students' behavior

According to the characteristics of college students' behavior data and the needs of problems to be studied, this paper puts forward a data mining process based on five steps: data collection, data preprocessing, behavior data mining, pattern evaluation and representation. Figure 2 shows the low chart of data mining of college students' behavior.
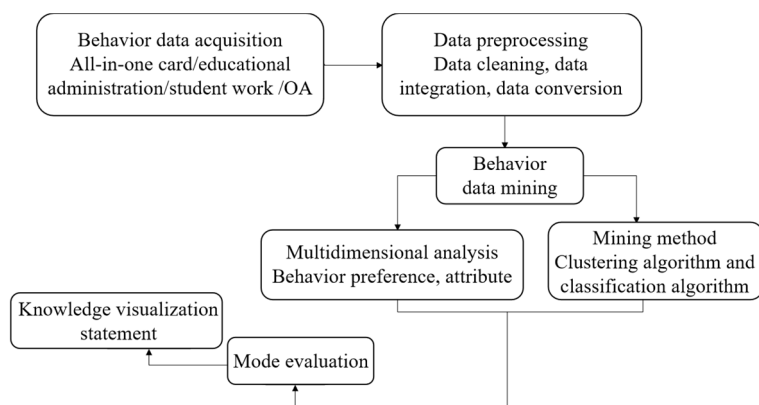

Figure 2 Flow chart of data mining of college students' behavior

(1) Investigate the learning situation of the research object. Students' learning behavior data can be obtained through the associated school card log data, educational administration management system, student management system and office automation system (OA).

(2) Data preprocessing. Data preprocessing mainly includes data purification, integration, transformation and specification. This paper intends to preprocess multi-source data, eliminate data irrelevant to the research object, reduce data duplication, ensure the standardization and consistency of data forms, and lay a theoretical foundation for the next data mining work.

(3) Behavior-based data analysis. In this paper, academic early warning, consumption ability prediction and emotional trend prediction are the research objects, and the hidden laws and trends are mined from the existing data by constructing mathematical modeling methods, and a new method based on cluster analysis is proposed [4].

(4) Pattern evaluation. The knowledge, patterns or laws contained in massive big data often do not meet the real needs of students, so it is necessary to evaluate their patterns, eliminate redundant or irrelevant patterns, and extract valuable and easy-to-understand patterns from them.

(5) Intuitive representation of knowledge. Discovered knowledge, patterns or laws are often expressed in the form of a set of data, which must be presented in a visual way for users to understand.

5 Platform design

(1) Overall structure

The overall architecture of the university student behavior analysis platform based on data mining can be divided into: data acquisition layer, data processing and storage layer, data analysis layer, data service layer and data application layer from bottom to top (as shown in Table 2).

Table 2 Platform architecture diagram

Data application layer	Academic management, abnormal behavior analysis, ideological education, campus public opinion monitoring, life management, employment management, campus safety control
Data service layer	Authority interface, learning behavior theme library, visual expression, prediction and early warning, life behavior theme library, information push, psychological behavior theme library
Data analysis layer	Clustering algorithm, algorithm model, classification algorithm, model evaluation, association algorithm, regression algorithm
Data processing and storage layer	Data cleaning, structured data, data integration, unstructured data, data conversion, data specification
Data acquisition layer	All-in-one card system, access control system, educational administration system, student system, book lending system, online learning platform, logistics service system and campus network management system

Data acquisition layer. It collects real-time data of students' daily study and life on the basis of all-in-one card system, educational administration system, book borrowing system and student work system, which lays the foundation for subsequent data analysis and excavation.

Data processing and storage layer. According to the research purpose, the learning data from multiple data sources are purified, integrated, transformed and standardized, and these data are stored in the data warehouse according to the logic of the protocol, so as to facilitate learning and life by using data algorithms. On this basis, a modeling platform for data mining is constructed.

Data analysis layer. The function of data analysis stage is to select appropriate data mining algorithms, explore and analyze the internal relations between data and establish relevant prediction models based on the data structure obtained after data preprocessing.

Data service layer. The results of data mining are applied to the interfaces of various departments and users in the school to realize visual expression, prediction and early warning, intelligent push, and databases of various behavior topics.

Data application layer. All parts of the campus use the network and the "Smart Campus" APP, and use the data service layer to realize accurate campus management for students' academic early warning, mental health prediction, abnormal behavior analysis, poor students screening, employment guidance, campus public opinion monitoring and other functions[5].

(2) Platform function design

The analysis platform of college students' behavior data is to study students' learning, consumption, trajectory and social behavior, so as to infer students' life rules, study habits, consumption ability and mental state. The functions of the system include: functional data

management, behavior analysis, forecast and early warning, information release, platform management and user login. Figure 3 shows the structure diagram of the platform module.
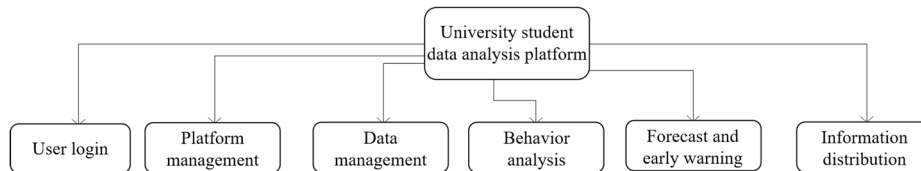

Figure 3 Structure diagram of the platform module

Data processing. Data processing includes data acquisition, processing, analysis and monitoring. Firstly, the collected data is preprocessed and stored in the database; Secondly, through the methods of cluster analysis, correlation analysis and regression analysis, the characteristics of students' learning behavior which are consistent with the real situation are discovered and stored in the database. The data monitoring function is mainly used to monitor the real-time data in the system. If any abnormal phenomenon is found, managers should be immediately reminded to deal with it.

Action analysis. Students' behaviors in learning, consuming, borrowing books, living and socializing. According to the data of academic performance, access rights, campus track, book borrowing and consumption, this paper makes a multi-dimensional analysis of behavior preference, behavior attributes and behavior order, and outlines their personal characteristics, learning status, life rules, consumption ability, hobbies and making friends.

Predictive alarm. Early warning is to analyze big data by mining it, judge whether it has bad behavior, give early warning to some possible problems, and give corresponding early warning information, so as to inform the school to intervene and dispose accordingly. For example, students' academic performance can be inferred through their study habits and usual performance, and students can be given academic early warning. And appropriate methods should be selected for specific objects. For example, learning warning based on XGboost regression, poor students screening based on K-means, psychological warning based on Apriori.

Information distribution. Information distribution refers to the management of the content published by the platform. According to the information provided, it is configured accordingly and divided into four types, namely, schools, colleges, teachers and students, and reviewed before release.

Platform management. System management includes user management, role management, log management, parameter setting. In this system, users at four levels: students, teachers, colleges and universities are managed systematically. Because the system is connected with the campus public authentication platform, the system does not need to manage its basic data, but only needs to set its corresponding role [6]. In the system, everyone has his own unique identity, and each identity has its own information and functions. There are five main types: administrators, schools, colleges, teachers and students. Log management is a detailed record to record all users' login and actions on the platform. Among them, parameter setting is mainly to set various parameters used in the system, including the threshold values of action, forecast and alarm.

6 Platform implementation

The system is based on network, B/S architecture and Windows. On this basis, this paper proposes a Django architecture based on MVC, which is based on MySQL, with JavaScript and Python as programming languages, and programmed with builder and PyCharm programming environment. Django is an open source network application software based on Python language, which can show users an intuitive HTML feedback Web page, so as to develop high-performance and easy-to-maintain web applications conveniently and quickly.

During the development of this platform, many typical extension libraries in Python are used, such as NumPy, Matplotlib and Pyechart. NumPy is an important mathematical operation tool in Python. NumPy is used to complete some data mining algorithms, such as K-Means, Apriori, ID3 and XG Boost. Matplotlib is a Python graphic library, which can be used with NumPy to visualize data. PyEcharts is a powerful data visualization software developed by Python and Echarts. It is not only diverse in graphic forms, beautiful in graphics and good in interactive effect, but also can be easily integrated with Django platform to realize webpage embedding.

7 Conclusions

Based on intelligent decision-making, this paper builds a big data center to monitor students' learning and living habits in real time, and on this basis, puts forward a set of new methods to improve college students' learning and living habits. However, due to the influence of time and space, environment and other factors, there are still many defects in this study, which need to be improved in the future. We will combine the massive data contained in this platform, carry out a wide range of experiments, and apply it widely to the education management of college students, and focus on those students who are abnormal, and make predictions, so as to analyze their behavior changes more accurately and provide help for colleges and universities to do a better job in the education management of college students.

References

[1]Rezvan Nazempour,Houshang Darabi. Personalized Learning in Virtual Learning Environments Using Students'Behavior Analysis[J].Education Sciences,2023,13(5).

[2]Chen F.,Jing C.,Zhang H.,Lv X. WIFI LOG-BASED STUDENT BEHAVIOR ANALYSIS AND VISUALIZATION SYSTEM[J].The International Archives of the Photogrammetry,Remote Sensing and Spatial Information Sciences,2022,XLIII-B4-2022, 493-499.

[3]Wang Po. Student Behavior Analysis and Management System for Data Mining on Cloud Platform[J]. Information Technology,2022,(02):36-40+47.

[4]Hong Haibing, Liu Xing. Analysis of College Students' Behavior Based on Big Data Technology[J]. Electronic Components and Information Technology,2021,5(11):131-132.

[5]Li Zhi, Xiao Liqun. Design of University Students' Behavior Big Data Analysis Platform for Intelligent Decision-making[J]. Information and Computer (Theoretical Edition), 2021, 33(20): 94-97.

[6]Qian Hongbing, Zhao Wenguang, Li Yanli, Zhang Rui. Design and Implementation of College Students' Behavior Early Warning Platform Based on Hadoop Ecology[J]. Electronic Design Engineering,2020,28(05):66-70.