



A Platform for Intelligent Funding Information Management System for Colleges and Universities Based on Random Forest Algorithm

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Abstract. As for the financial aid information management for students with financial difficulties, due to the wide range of financial aid and subsidy objects, various subsidy types, inconsistent time and complicated subsidy review and approval processes, the work of subsidy information management staff are very headache, and it is difficult to improve work efficiency. With the increasing complexity and difficulty of poverty aid work in colleges and universities (CAU), the advantages of informatization are used to integrate poverty aid work into the management of CAU. The random forest algorithm screens and organizes data, realizes intelligent information management, and enhances precise funding for poor college students. This paper uses the B/S structure to build the platform architecture of the funding information management system, and sets up multiple functional modules for the system. After the system design is completed, the CPU, memory and disk usage of the system are tested. It is found that with the increase of concurrent users, its the share has also increased. In the system, the informatization of financial aid application and poverty identification management has been realized, the identification work can be completed more concisely and efficiently, and the update of student poverty information is also very convenient.

Keywords: Random Forest Algorithm · Poverty Funding · Funding Information Management · B/S Structure

1 Introduction

With the development of “Internet + ” and technology, emerging technologies represented by computers are rapidly iterating, and we have felt significant changes in all areas of our economic and social life. The arrival of the information age is no longer dependent on our will. Promoting the management informatization in the field of financial aid for poor students is an important component of education informatization, which is not only conducive to improving the level of school subsidy management, but also an important means to use informatization to improve students with financial difficulties to have a greater sense of gain.

Research on the construction of funding information management systems has received extensive attention. Informatization is one of the key directions of college management work, and student financial aid is also an important task of college student management. The quality of its informatization construction directly affects the reform of college management models and the improvement of office efficiency. Therefore, many CAU attach great importance to the process of student financial aid information management [1]. A school has built a student information management platform for poor college students, which can help counselors and financial aid staff to collect and organize college students' information, clean, store, query, modify and share the information, and store the data in the database. Greatly improving the management efficiency of student financial aid is also one of the important measures to scientifically and standardize financial aid management [2]. The management of financial aid for students in difficulties in a technical college has always been the focus of the school. However, due to historical reasons, the existing work of students in difficulties is completely done by hand., affecting the progress of student loans and subsidies for difficulties. On the other hand, manual operations are not in line with the construction of information-based universities. Therefore, the school proposes to abstract and improve the financial aid management system for difficult students. Provide a complete software engineering design [3]. Although many schools have established financial aid information management systems to solve the problem of low management efficiency, the functions of these systems are not perfect and need to be improved.

This paper first introduces the concept and algorithm model of the random forest algorithm, then builds the funding information management system architecture based on the B/S model, analyzes the functions of the system modules, and then tests the concurrent performance of the system to verify whether the system performance meets the operating requirements. This paper implements a systematic funding application process and poverty identification management process.

2 Random Forest Algorithm

Random forest is a classifier containing multiple decision trees. It judges the input features through multiple decision trees, outputs the results respectively, and then obtains the final result of the random forest according to the results of all sub-classifiers. Its output is jointly determined according to the output of all decision trees it contains [4].

Random forest is composed of multiple decision trees, and hundreds of decision trees form a "forest", which is also the main embodiment of the essential integration idea of random forest. The process from a single tree to a forest is solved. The problem of overfitting of a single decision tree increases the noise tolerance of the model [5]. There is also a big feature in the random forest algorithm - the Bagging method. Bagging algorithm is a method of combining weak learners in random forest algorithm. It mainly acts on the sampling of sample set and the aggregation strategy of weak classifiers. It is the basis of random forest algorithm and is a typical representative of ensemble learning. The ensemble learning includes multiple individual learners. Individual learners in ensemble learning are sometimes the same, for example, individual learners in random forests are decision trees; individual learners in ensemble learning can also be different. For

example, the combination of support vector machine and decision tree to solve the problem [6, 7].

$$\bar{D}(x) = \frac{1}{S} \sum_{i=1}^1 H \quad (1)$$

$$H = \{h(x, \theta_t)\} \quad (2)$$

Among them, H is multiple decision trees in the random forest model, and $h(x, \theta_t)$, $t = 1, 2, \dots, T$, θ_t represents a random variable that obeys an independent distribution, x is an independent variable, and T is a decision A tree of subtrees.

In the Bagging algorithm, the training set is randomly generated. The algorithm puts the selected samples back and re-selects the same number of samples as the training set of another individual learner. Each individual learner does not affect each other and is parallel to each other. Random selection forms the random forest algorithm [8].

3 System Design

3.1 System Structure Design

The overall structure of the subsidy management system for poor students adopts the B/S structure: it is composed of the front-end computer browser, the back-end management server and the system database server [9]. Figure 1 describes the composition of the B/S architecture. B/S includes two kinds of structural servers: Web server and database server. The functions of the two servers are divided. The former is responsible for storing static or dynamic executable applications output in the form of web pages, and the latter is responsible for storing important system data. When the user issues an access instruction, the application program stored in the Web server will be called, and the system will also add, delete, and check the data in the database server [10]. The user does not need to know the operation of the server, as long as he uses his own computer browser to enter the corresponding network address, the system will execute the corresponding program, and then, the running result of the application program will be sent to the user's browser, and the user can browse directly. You can see the result of the operation on the device.

In the application system of B/S structure, the general maintenance responsibilities such as software installation, program code modification and system are implemented by the server side. Corresponding users can execute server-side applications only through browsers, and do not need to install special client-side software on their computers. These features of the B/S structure make it easier to upgrade the system, which provides a lot of convenience for the expansion and upgrade of the subsidy management system, thereby reducing the work pressure of the system administrator [11, 12]. This is also the main reason why the system adopts B/S structure.

3.2 Functional Module Design

In order to realize the management function in the funding process, the system needs to realize the collection and management of student information of poor students, and the

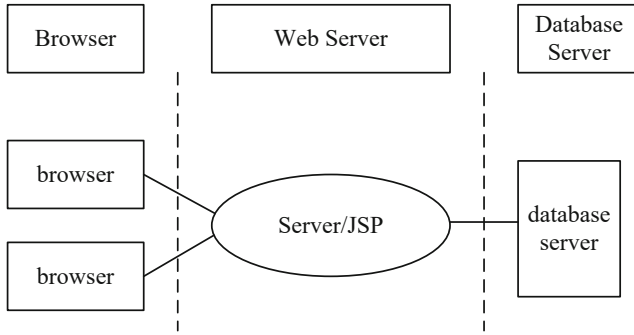


Fig. 1. System Architecture

development of functions according to different user identities. Therefore, the modules that the funding information system needs to implement functionally are shown in Fig. 2.

1) Basic information management of students

In the process of financial aid in CAU, it is necessary to collect a large amount of student information, such as the basic information of students, family information, financial aid policies, etc., and then organize, summarize, and analyze these data and establish a poor student file for each poor college student. The actual situation of the family will be accurately funded and reported to the relevant management department for confirmation and filing.

The users involved in the basic information management include the staff of the Student Management Section, the student users and the head teacher. Staff and users of the Student Management Section can create a new student basic information table and a student poverty information table in the system, and import the template to create and archive the student personal file of the student information table reviewed and approved by the head teacher; student users can use the information management function module, Complete the query entry, update, filter, delete duplicate or invalid information, and modify the personal information of the system; the head teacher inquires the students

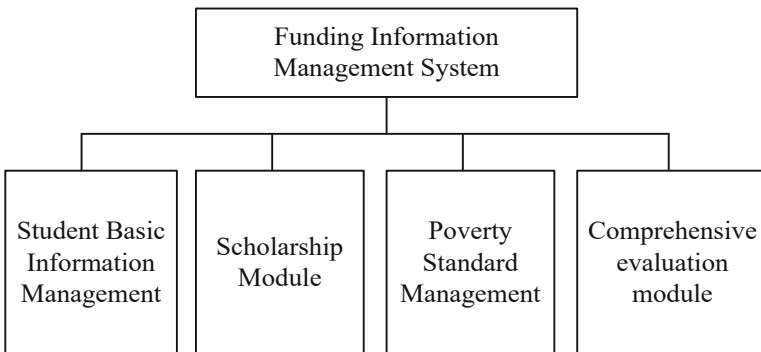


Fig. 2. Functional Module

to fill in the submitted information template for review, and completes the operation of student information review.

2) Scholarship Module

The scholarship module is used by the school to coordinate various tasks in the process of scholarship setting, scholarship allocation, and student application. It is the main processing platform for information collection, processing, and coordination in the process of scholarship evaluation. The scholarship module in the funding information system realizes various workflows in the scholarship application and evaluation process. It turns offline into an online paperless and automated office, and at the same time greatly improves the labor consumption in the scholarship evaluation process, increasing its transparency and fairness in the evaluation process, and makes the evaluation results more credible and convincing.

3) Poverty Standard Management

The users involved in the management of poverty standards include the staff of the Aid Management Section, the head of the student division, and the staff of the Party and Government Office. Users of the Funding Management Section can draft the poverty standards in the system, submit them to their superiors for approval, and make revisions according to their superiors' revision opinions, so as to complete the release and archiving of the official poverty standards. The head of the student office can use the poverty standard approval function module to complete the approval of the first draft of the poverty standard and submit it to the superior for approval; the personnel of the Party and Government Office can enter the approval result of the poverty standard and complete the school-level approval. The funding information management system uses the random forest algorithm to classify the poor students according to the poverty standard.

4) Comprehensive evaluation module

Student comprehensive evaluation and financial aid evaluation are the necessary basis for various awards and excellent evaluations in CAU. The evaluation process comprehensively assesses the overall level of students' development in all aspects. It is one of the business modules of the student financial aid system and supports schools in the evaluation process of comprehensive student evaluation. The index system and scoring rules configuration, comprehensive evaluation process management, time node and publicity management are carried out freely in China. Usually, different majors will have different comprehensive evaluation indicators according to different student training programs. The results of the comprehensive evaluation can also be applied to scholarship evaluation and precise funding.

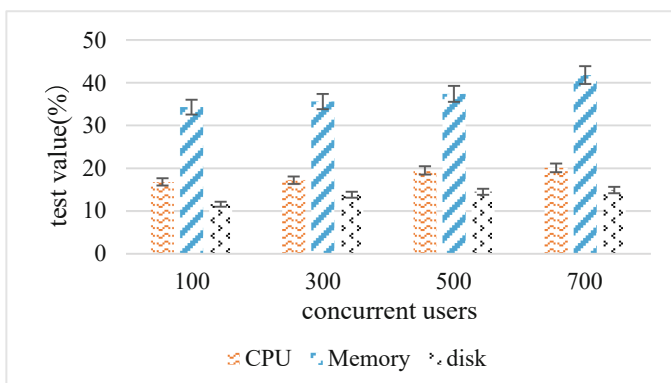
4 System Testing and Implementation

4.1 System Test

The concurrency capability test is to simulate the maximum load capability of the actual software and hardware system during the user's use. The average usage of system resources under concurrent conditions for the scholarship module of the funding information system is shown in Table 1.

Table 1. System Test Results

	100	300	500	700
CPU	16.8	17.2	19.5	20.1
Memory	34.3	35.6	37.4	41.8
Disk	11.6	13.8	14.5	14.9

**Fig. 3.** Concurrency Condition Test for Grant Management System

As can be seen from Fig. 3, under the condition of 100 concurrent users, the CPU usage rate is 16.8%, the memory usage rate is 34.3%, and the disk usage rate is 11.6%. Rate will increase. Since this stress test is only for the scholarship module, and multiple system modules are not tested at the same time, the CPU usage rate during the test is not high. Considering that the server in the actual deployment and working environment has to respond to many application programs and database access operations, the performance verification of the entire system varies greatly.

4.2 System Implementation

1) Funding application process

Funding applications are provided for five roles: students, teachers of the student office, counselors, head of the student office and teachers of the Ministry of Education. Students can apply for funding through the funding application management, fill in the application form and submit materials through the system. The teachers of the Student Office review the application materials compiled by each college through the funding application management, and submit them to the person in charge of the Student Office for review. The person in charge of the student office reviews the materials submitted by the teachers of the student office for difficult students and makes a final decision. The teachers of the Ministry of Education and Engineering are responsible for issuing financial aid documents, summarizing the information on students with difficulties provided by students and submitting them to the Student Office.

2) Poverty identification management process

This business mainly completes the identification of the poverty situation of students from families with financial difficulties. Passing identification is one of the necessary conditions for applying for various types of grants. In the process of poverty identification, first of all, according to the requirements, students submit an application for poverty identification (mainly stating family situation, application reasons, etc.) and attach supporting materials, and the class teacher will lead the class evaluation team to identify and evaluate the applicants. After passing the evaluation of the classmates, submit it to the head teacher for final material review, mainly to check whether the application information filled in by the students in the poverty cause identification list is true, correct and complete. If the application information is true, it will be submitted to the college leaders for approval. After that, submit it to the management of the school financial aid center to file the student's poverty identification information, and finally archive it.

5 Conclusion

Student financial aid is an important way to ensure the realization of fair education for poor college students in my country. Its management is an important part of students' daily education management work and one of the important ways to practice education fairness. Financial aid for students in need is an important task to ensure that students whose families have continuous financial difficulties or sudden difficulties will not affect their studies due to tuition fees. The design and implementation of the college smart funding information system in this paper helps the school funding management center to comprehensively grasp and manage the information of poor college students, and at the same time can greatly improve the accuracy and efficiency of the school's funding and management of poor college students.

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