

## Design and Implementation of Student Grade Analysis System Based on Spring Boot Microservice Framework

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### Abstract

In recent years, many senior students find that they can't graduate smoothly because they haven't completed enough credits before graduation, which has caused certain losses in the aspects of students' personal development and resource waste. In order to minimize the overall loss, it is a trend to build a system to analyze students' grade and intelligent supervision and reminder. Therefore, we will build a "Student Achievement Information Analysis System" through SpringBook microservice framework, SSM framework, MySQL, LayUI and other technologies. After obtaining student information, we will effectively integrate and analyze it, and notify the supervisor through various channels to help students solve the problem of "insufficient credit" and graduate successfully.

### Keywords

Spring Boot, SSM framework, MySQL, student grade analysis.

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### 1. Introduction

With the development of Internet technology, the management of students in Colleges and universities needs to adapt to the development of modern information network. As a whole, the management systems have basic requirements and have been put into a large number of use. In the course of using, we find that most of the student management functions are provided by various systems, but the function of credit detection and reminder for quasi-graduates is neglected. In recent years, many prospective graduates find that their credits are not enough before graduation, which leads to delays in graduation and unnecessary losses. In order to solve this problem, we have developed a set of "Student Achievement Information Analysis System" based on SpringBook microservice framework, SSM framework, MySQL, LayUI and other technologies to realize students' achievement. Performance analysis, screening display and multi-channel supervision and reminder.

Considering that students' information is numerous and miscellaneous, we need to make full use of and explore the advantages of Web pages and computers, manage students' information quickly, efficiently and accurately, optimize labor time, and increase the accuracy and convenience of information. This paper summarizes the data of personal information of test students, integrates SSM framework with Spring Boot micro-service framework, adopts MySQL database technology, and completes the design of student achievement information analysis system with front-end pages. The project uses Java+Html+CSS+JavaScript+MySQL to build system Web pages. The application and updating are based on Windows server. The platform has the characteristics of simple and easy-to-understand graphical interface, professional technical team support and more attention to the operation of functions. It is more convenient to analyze students' information.

## 2. System Design

### 2.1 Functional Design

The Student Grade Information Analysis System is a system based on SpringBook microservice framework, SSM framework, MySQL, LayUI and other technologies to achieve student performance analysis, screening and display, and multi-channel supervision and reminder as the main purpose.

In this system, the user enters the system after successfully logging in to the authentication information. The system adopts dynamic import of Excel file for information entry, and can add, delete and modify data. In the home page, the original data can be emptied and new data can be imported. Here, the data refers to the teaching plan excel file and the student achievement excel file. The import of data we use is a method of importing dynamic Excel files. According to the student's student number and the uniqueness of each corresponding teaching plan number, if the same data exists, the system will automatically update when the import is repeated.

After importing the teaching plan file and student achievement data, the user can get the relevant result information analysis results in the query part. The query part is mainly divided into two majors according to all subjects and according to the university English 4 results. In all subject inquiry sections, we can analyze The results of the final credits are calculated for each student's grades, and in the College English 4 section we only analyze whether or not the College English 4 passes. Among them, the two major sections are divided into three categories: student general status, class inquiry and professional inquiry, and the number of students who pass the data in each page can be obtained in College English 4. The notification methods provided by the system include printing files, exporting Excel forms, SMS reminders and email reminders. The operation is convenient, the pages are simple and easy to understand.

The significance of the development of the system lies in the use of intelligent analysis of software and multi-mode reminders instead of student self-examination of credits and manual analysis and reminders of teachers, which can quickly filter data and conduct corresponding analysis and reminders, thereby improving efficiency and graduation rate.

### 2.2 Feasibility analysis

#### 2.2.1 Technical feasibility

The system is based on the popular back-end Spring Boot microservices framework and the front-end LayUI framework. In the front-end page development, HTML5 is used for content architecture construction, supplemented by CSS style beautification, JavaScript for page dynamic effect display and data interaction, and LayUI is generally used as the front-end page framework. In the background business development, Java is used as the development language, MySQL database storage, ajax for data interaction processing, and the Spring Boot framework is used to develop the SSM framework.

#### 2.2.2 Economic feasibility

Estimate the cost-benefit analysis of the new system, including estimating the cost of project development, development costs and future operating and maintenance costs, estimating the benefits that the new system will receive, and estimating whether the development costs are higher than the project's expected total. Also, analyze whether system development will have an impact on other products.

#### 2.2.3 Operational feasibility

After the system is developed, the user interface is familiar with the principle of simple and easy to understand, so that users who are familiar with the computer can quickly master the basic operations.

## 3. Key technologies for system implementation

### 3.1 Introduction to Spring Boot

Spring Boot is a new lightweight new framework for Java EE programming provided by the Pivotal team in 2013. It is based on Spring.

Designed in version 4.0, it carries the excellent genes of the original Spring framework and is designed to simplify the initial setup and development of new Spring applications. The framework is configured in a specific way so that developers are no longer required to define the configuration of the template. Spring Boot greatly simplifies the development model and all the common frameworks you want to integrate, with corresponding component support. It is currently being used extensively to develop a new generation of Spring Framework-based applications quickly and flexibly.

Spring is mainly applied to the model business layer in the three-tier architecture. The main advantage is the layered architecture application system, which improves the cohesion between high-level modules and low-level modules, and reduces the coupling between high- and low-level modules. The goal of Spring Boot is not to provide a new solution to the problem, but to implement a new development experience free of XML configuration. At its most basic level, Spring Boot is a collection of libraries. The framework in the framework can be used by any project's build system as long as the corresponding dependencies are imported.

Microservices architecture through Spring Boot is a good choice for distributed components that make deployment, management, and service delivery easier.

### 3.2 Introduction to SSM Frame

#### 3.2.1 Spring

Spring is a lightweight, open source Java technology framework based on the JavaEE standard. The framework USES the Inversion of Control (IOC) feature to support Dependency Injection (DI), enabling programmers to program only to interfaces, avoiding the excessive program coupling that could come with hard coding in the past. This makes software project development easier and more convenient. It only needs to focus on the application at the top of the project, and there is no need to do too much writing of requirement code such as low-level property file parsing and single-instance pattern class. Secondly, Spring framework has strong aspect-oriented Programming and AOP (Aspect Oriented Programming) Programming support ability, which can better solve the very complex functional implementation of business logic in traditional object-oriented Programming. Spring then advocates test-driven development, providing various types of Mock objects to aid in unit testing during the development of software projects. Finally, Spring not only coexists with excellent open source frameworks such as MyBatis, but also helps to improve the usability of the coexistence framework and provides auxiliary support for the learning and use of other coexistence frameworks. In addition, the Spring framework encapsulates the JavaEE API, making it easier to use things like JDBC, remote calls, and so on. Spring's ingenuity and good source code design make it an ideal practice for Java technology.

#### 3.2.2 Spring MVC

SpringMVC is a Java-based request-driven type of lightweight web framework that implements the Web MVC design pattern, decouples the Web tier from responsibility, and uses a request-response model to greatly simplify the development process. The framework is easy to use and flexible to configure. The core idea of MVC is to separate the business logic and business data presentation, so that the program is layered and divided into cooperation, which are independent of each other and cooperate to achieve high cohesion and low coupling effect. among them:

M (Model): Description of business logic and information representation of business data, generally a simple JavaBean, its role is to share data. Usually, a data table corresponds to a JavaBean, and a record corresponds to an object.

V (View): A page that presents data to the user and displays the data in the model.

C (Controller): Call the business logic of the model layer to generate the appropriate data model, and pass the data model to the view layer to present to the user.

The approximate workflow is that after the user makes a request to the view View, the controller Controller manipulates the corresponding model Model data. After the manipulation is completed,

the model Model makes a request to the view View, and the view View learns that the data has been updated, and then the view is in the view. Display the data after the update.

### 3.2.3 MyBatis

MyBatis is an excellent persistence layer framework that supports customized SQL, stored procedures, and advanced mapping. MyBatis avoids most of the JDBC code, manual setting of parameters, and obtaining result sets. MyBatis USES simple XML or annotations to configure and map native types, interfaces, and plain old Java objects as records in a database. It supports custom SQL statements and is more flexible than other persistence layer frameworks such as Hibernate.

MyBatis framework is mainly composed of two components: DAO component and SQLMapper component. The primary function of the former is to abstract the data persistence layer of the application in the Web system. The main role of the latter is to configure different types of statements by properly configuring XML or annotating them, and then to map AOP through Java to form the SQL statements that ultimately execute. Finally, the MyBatis framework executes the SQL statement, maps it to a Java object and returns it successfully.

## 3.3 Introduction to MySQL

MySQL is a product of Oracle and is a relational database management system developed by MySQL AB of Sweden. The most popular relational database management system in the market belongs to MySQL. MySQL is the best relational database management software in the field of Web applications. The MySQL database used in this system carries on data interaction to realize data addition, deletion and change. In the MyBatis source code, the MyBatis framework first creates a SQL session factory instance, which acts as a database connection pool, and then the SQL session factory gets a SQL session through the configured xml file. The methods required to execute the SQL statement are included in the SQL session, so the underlying operation of the database is completed by using the SQL session, and the transaction is submitted and rolled back. After the use is completed, the database connection and the session closing function need to be released.

## 3.4 Introduction to LayUI

Layui is a front-end UI framework written by its own module specification, which follows the writing and organization form of native HTML/CSS/JS, and has rich components to choose from. It is different from the underlying UI framework based on MVVM, and it also provides background system framework to meet the functional requirements of the system. In addition to supporting the full backend system, Layui provides a variety of useful plug-ins, such as tables, pop-ups, time pickers, and so on. With the Layui framework, we don't have to worry too much about the front-end implementation, so we can spend more time on complex data processing and logical analysis.

## 4. Conclusion

Aiming at the problem that the current graduation credits neglect the delay of graduation, this paper proposes a student performance analysis system based on the Spring Boot micro-service framework, and integrates the SSM framework through the micro-service framework to improve the development efficiency. Enhance, reduce redundant configuration, and enhance usability. Relevant personnel can use the system to import data into teaching plans and student information, and then the system automatically analyzes the relevant results and returns, and provides various ways to help students realize the problem and solve it in time. By adopting the hybrid method in the incremental test, that is, the top-down test method is used for the upper layer in the software structure, and the bottom-up method is used for the lower layer of the software structure, and the two are combined to obtain: function The performance is consistent with the user requirements and the software development is successful.

## Acknowledgments

This work was financially supported by National Innovation and Entrepreneurship Training Program for College Student fund. Project number: 201910054225.

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