

AI-Enabled Student Financial Assistance and Scholarship Recommendation System

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Abstract: *The AI-Enabled Student Financial Assistance And Scholarship Recommendation System is an intelligent web-based application designed to simplify and Automate the financial planning process for students. Many students struggle with managing tuition fees and identifying suitable scholarships due to a lack of proper guidance and centralized information. This system addresses that challenge by collecting and analyzing student data such as academic performance, family income, category, and course details to generate personalized scholarship recommendations and structured fee installment plans. The application is developed using Angular for the frontend interface and .NET with C# for backend processing and business logic, ensuring a secure, scalable, and efficient architecture .The system incorporates AI-based rule evaluation to match eligibility criteria accurately and suggest the most appropriate financial support options. This solution is aims to create a smart, reliable and user-friendly Financial Assistance platform for educational institution..*

Keywords: *AI-Enabled Student Financial Assistance*

I. INTRODUCTION

Education plays a vital role in shaping an individual's future, yet managing educational expenses and accessing financial assistance remains a significant challenge for many students. With the increasing cost of higher education, students often struggle to plan their tuition fees efficiently and identify suitable scholarship opportunities that match their eligibility criteria. The absence of a centralized and intelligent system leads to confusion, time consumption, and missed opportunities for financial support. Traditional methods of fee management and scholarship identification are largely manual or rely on basic information systems that lack personalization and automation. Students are required to independently search for scholarship schemes, understand complex eligibility conditions, and manually calculate fee installments. This fragmented approach not only increases the administrative burden but also results in inefficiencies and errors in decision-making. To address these challenges, the proposed system, AI-Based Student Fee and Scholarship Planner, introduces an intelligent web-based platform that integrates fee management with scholarship recommendation. The system collects and analyzes key student data such as academic performance, family income, category, and course details to provide personalized scholarship suggestions and structured fee installment plans. By leveraging AI-based rule evaluation and decision-making techniques, the system enhances the accuracy and efficiency of scholarship matching. Furthermore, the platform ensures secure user authentication, role-based access control, and seamless interaction between frontend and backend systems. It aims to reduce manual effort, improve transparency, and provide a user-friendly interface for both students and administrators.



II. RELATED WORK

In recent years, several systems and studies have focused on improving educational financial management and scholarship accessibility through digital platforms. Traditional student information systems primarily handle academic records and basic fee management but lack intelligent decision-making capabilities for personalized financial planning. Various scholarship management systems have been developed to provide centralized information about available scholarships. These systems allow students to browse and apply for scholarships; however, they often require manual filtering and do not provide personalized recommendations based on individual eligibility criteria.

As a result, students may miss suitable opportunities due to a lack of awareness or difficulty in understanding complex eligibility conditions. Research has also explored the application of artificial intelligence in the education domain, particularly in recommendation systems. AI-based recommendation models have been used to suggest courses, career paths, and learning resources. Some studies have applied machine learning techniques to predict student performance and identify financial needs. However, limited work has been done in integrating AI with fee planning and scholarship recommendation within a single unified platform. Additionally, existing fee management systems in educational institutions focus mainly on payment tracking and billing. These systems do not provide dynamic installment planning or financial guidance tailored to a student's economic background. The absence of predictive and advisory features reduces their effectiveness in assisting students with financial decision-making. system addresses

III. LITERATURE REVIEW

1. AI-Based Scholarship Recommendation System Using Machine Learning

Authors: S. Kumar, R. Sharma, P Verma , A. Singh

Explanation:

This system utilizes machine learning algorithms to analyze student data such as academic performance, family income, and category to recommend suitable scholarships. The model improves accuracy by applying classification techniques and reduces manual effort in searching for scholarships. It enhances decision-making by providing personalized suggestions based on eligibility criteria.

Additional Issues:

Requires integration with real-time institutional databases and improved transparency in recommendation logic.

2. Web-Based Student Financial Planning and Scholarship Management System

Authors: R. Sharma, K. Mehta, V. Joshi, P. Kulkarni

Explanation:

This system combines student fee management with scholarship analysis using a web-based platform. It applies multi-criteria decision-making techniques to evaluate student eligibility and provides structured financial planning. The system improves efficiency by centralizing fee and scholarship data, making it easier for students to manage their financial activities.

Additional Issues:

Lacks advanced AI-based automation and secure authentication mechanisms such as token-based security.

3. Secure Student Financial Assistance Platform with Role- Based Access Control

Authors: A. Patel, N. Shah, M. Desai, R. Trivedi

Explanation:

This platform focuses on secure management of student financial data using role-based access control (RBAC). It integrates scholarship recommendation, fee tracking, and administrative dashboards. The system ensures data privacy and efficient handling of financial records through secure authentication and structured database design.



Additional Issues:

Needs enhancement in intelligent recommendation systems and real-time analytics for better decision support.

4. AI-Powered Personal Finance Assistant for Students

Authors: V. Agarwal, R. Ray, N. Varghese, S. Gupta Explanation:

This system applies artificial intelligence to analyze user financial behavior and provide personalized budgeting and financial recommendations. It helps users manage expenses, track payments, and receive proactive financial insights

Additional Issues:

Does not specifically address educational fee structures and lacks integration with scholarship recommendation systems. needs implementation for easier access in emergencies.

IV. PROBLEM STATEMENT

Managing educational expenses and accessing suitable financial assistance is a major challenge for students. In most institutions, fee management and scholarship information are handled through separate and often manual systems, making the process time-consuming and inefficient. Students are required to search for scholarships on different platforms, understand complex eligibility criteria, and manually determine whether they qualify. At the same time, there is no proper guidance for planning fee payments, leading to confusion, missed deadlines, and financial stress. This lack of a centralized and intelligent system results in reduced accessibility to financial support and increases the chances of students missing valuable opportunities.

Existing systems mainly focus on basic record management and do not provide personalized recommendations or decision support. They lack the ability to analyze student-specific data such as academic performance, family income, and category to suggest suitable scholarships or create structured fee installment plans. Additionally, the absence of automation and integration between fee management and scholarship systems leads to inefficiency and increased administrative workload. Therefore, there is a need for an intelligent, secure, and user-friendly platform that can integrate fee planning and scholarship recommendation, providing personalized financial guidance to students and improving overall efficiency in educational financial management.

In addition to the challenges faced by students, educational institutions also struggle with managing large volumes of financial and scholarship-related data efficiently. Manual handling of records increases the chances of errors, data redundancy, and delays in processing student applications. Administrators find it difficult to track fee payments, verify scholarship eligibility, and generate meaningful reports for decision-making. Furthermore, the absence of a unified system reduces transparency and accountability in financial operations. Hence, there is a strong need for an integrated solution that not only assists students in financial planning but also supports institutions in managing data effectively, ensuring accuracy, security, and improved overall system performance.

V. SYSTEM ARCHITECTURE

The AI-Based Student Fee and Scholarship Planner is a web-based application designed to assist students in managing their educational expenses and identifying suitable scholarship opportunities. The system integrates students, administrators, and financial data into a single platform. Its primary objective is to automate fee planning, provide personalized scholarship recommendations using AI-based logic, and ensure secure data handling through a structured backend architecture.

1. Modules

1.1 User Authentication Module

In this module, users (students and administrators) can register and securely log into the system using their credentials. The system ensures secure authentication using encrypted passwords and token-based authentication



(JWT). Role-based access control is implemented so that each user can access only authorized features within the system.

1.2 Student Module

Students can create and manage their profiles by entering personal, academic, and financial details such as marks, category, course, and family income. This data is used by the system to analyze eligibility for scholarships and generate personalized fee plans. Students can also view their profile details, update information, and track their financial status.

1.3 Scholarship Module

Students can explore and apply for various scholarships through this module. The system analyzes student data such as academic performance, family income, category, and course details to determine eligibility for different scholarships. Students can upload the required documents (such as income certificates, mark sheets, and identity proofs) in PDF format for verification.

1.4 Fee Management Module

The fee module helps students manage their educational expenses by generating structured installment plans. Based on total fees and financial conditions, the system divides the amount into manageable installments and provides due dates. Students can track their fee payments and monitor pending balances.

2. Backend Architecture (Firebase Integration)

The system uses ASP.NET Core services to manage authentication, data processing, and database operations efficiently:

- **JWT Authentication:** Ensures secure login and identity verification for all users (students and administrators) using token-based authentication.
- **SQL Server Database:** Stores structured data related to students, scholarships, fee details, payment records, and user roles in a secure and organized manner.
- **Repository Layer:** Handles all database operations using interfaces and implementations, ensuring clean code structure and easy maintainability.
- **Service Layer:** Contains business logic such as scholarship eligibility calculation, fee installment planning, and payment processing.
- **API Controllers:** Manage communication between frontend (Angular) and backend by handling HTTP requests and responses.

3. Workflow (AI-Based Recommendation and Fee Management)

The student registers in the system and provides personal, academic, and financial details.

- The student uploads required documents (such as mark sheets, income certificates, and identity proof) for scholarship verification.
- The system processes the entered data using AI-based logic to evaluate eligibility for available scholarships.
- Administrators review the submitted documents and verify the accuracy of the information.
- Based on eligibility criteria and verification results, the system approves or rejects the scholarship application.
- Notifications are generated to inform students about the status of their application (approved or rejected).
- The system updates all records in the database and displays the latest status to both students and administrators.
- Additionally, the system generates a structured fee

installment plan based on the student's financial condition and approved scholarships.4.Implementation Details



The implementation of the proposed AI-Based Student Fee and Scholarship Planner consists of four main steps: User Registration and Data Input, Scholarship Eligibility Analysis, Fee Planning and Payment Processing, and Notifications and System Updates.

User Registration and Data Input

In this step, students and administrators register and log into the system using secure authentication. Students provide essential details such as personal information, academic performance, category, and family income. This data is stored in the database and used for further processing. Proper validation is applied to ensure accuracy and completeness of the information.

Scholarship Eligibility Analysis

The system processes the student's data using AI-based rule evaluation to determine eligibility for various scholarships. Based on predefined criteria such as marks, income, and category, the system identifies and recommends suitable scholarships. The results are displayed to the student in an organized manner, making it easier to understand available opportunities.

Fee Planning and Payment Processing

In this step, the system generates a structured fee installment plan based on the student's financial condition. Students can view total fees, installment breakdowns, and due dates. The payment module allows students to make payments and track their transaction history. All payment details are securely stored and updated in real time. Notifications and Updates

Notifications and System Updates

The system continuously updates student records, scholarship results, and payment statuses. Notifications are provided to inform users about successful registration, eligibility results, payment confirmations, and updates in scholarship data. Administrators can also monitor and update system records, ensuring smooth operation and data consistency.

History and Reusability

In the proposed system, all student fee details, scholarship records, and previous transactions are stored for future reference. This helps in maintaining a complete history of each student's financial data. Students and administrators can easily view past fee payments, pending dues, and scholarship approvals. This makes it easier to understand previous records and plan future payments effectively. The system also uses this stored data to improve decision-making. Based on past records, it can help students manage their fees better and apply for suitable scholarships on time.



SYSTEM AECHITECTURE

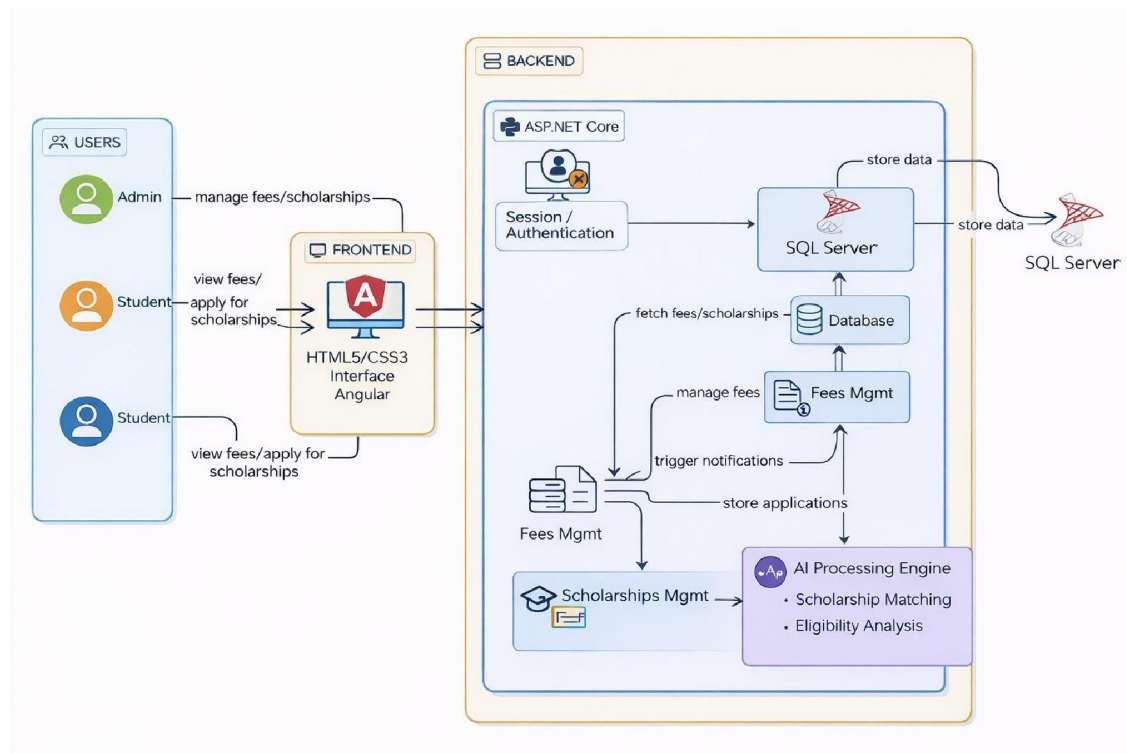


Figure 1: System architecture

VI. PROPOSED SYSTEM

System Architecture :

System Architecture is shown in Figure1.

Our proposed system will function in following steps:

Step 1: User Registration

Students register in the system by providing their personal, academic, and financial details.

Step 2: Login & Authentication

The system verifies users through secure login and authentication to ensure data privacy.

Step 3: Fee Details Entry

Students or administrators enter fee structure details such as tuition fees, due dates, and payment history.

Step 4: Scholarship Data Input

The system collects information about available scholarships, eligibility criteria, and application deadlines.

Step 5: AI-Based Analysis

The system analyzes student data (income, academic performance, category, etc.) and suggests suitable scholarships and fee planning strategies.

Step 6: Fee Planning & Recommendation

Based on Analysis the system provides personalized fee payment plans and scholarship recommendations.



VII. ANALYSIS OF PROPOSED SYSTEM

Better Efficiency and Fast Updates::

The system makes managing student fees and scholarships much easier and faster. Instead of doing everything manually, all information is available in one place. Students can quickly see their fee details, pending payments, and scholarship updates without any delay.

Smart AI-Based Suggestions:

The system uses AI to understand student details like marks, income, and eligibility. Based on this, it suggests the best scholarships and helps students plan their fees properly. This reduces confusion and helps students make better decisions.

Secure Access for Users:

The system is designed in such a way that only authorized users can access the data. Students and admins have different access levels, which keeps the information safe and private.

Easy Data Management:

All records like fee details, payment history, and scholarship information are stored in one system. This makes it very easy to manage, update, and track data whenever needed. Overall, the system enhances organ donation efficiency, reduces waiting times for patients, and provides a secure, scalable, and user-friendly solution.

MODULES

The proposed AI-Enabled Student Fee and Scholarship Recommendation System is divided into six main modules: User Authentication, Student, Scholarship, Fee Management, Payment, and Admin. Each module is designed to handle specific functionalities and ensure smooth operation of the system.

1. User Authentication Module

This module manages user registration and login functionality for both students and administrators. It ensures secure access using authentication mechanisms such as encrypted passwords and token-based verification. The module also handles role-based access control, allowing users to access only authorized features within the system.

2. Student Module

The Student Module stores and manages student-related information such as personal details, academic performance, category, and family income. Students can update their profiles and view their information at any time. This data is used by the system to analyze scholarship eligibility and generate fee plans.

3. Scholarship Module

This module provides information about available scholarships and performs eligibility analysis using AI-based logic. It matches student data with predefined criteria and recommends suitable scholarships. Students can view scholarship details and understand their eligibility status through this module.

4. Admin Module

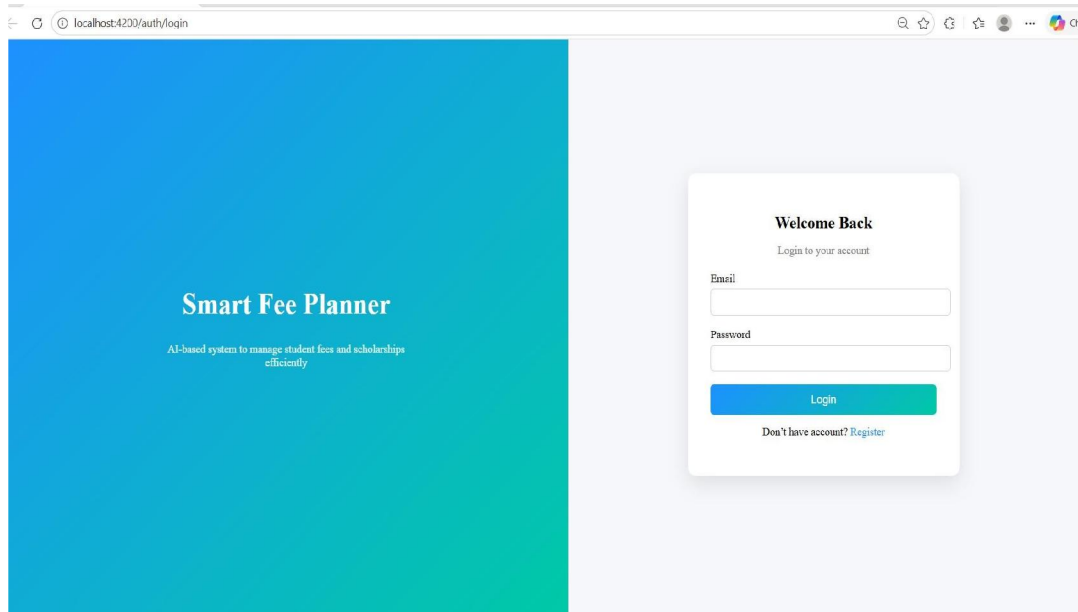
The Admin Module manages the overall system, including student data, scholarships, and fee structures. Administrators can add, update, or delete records, monitor system activities, and generate reports. This module ensures data accuracy, security, and smooth system operation.



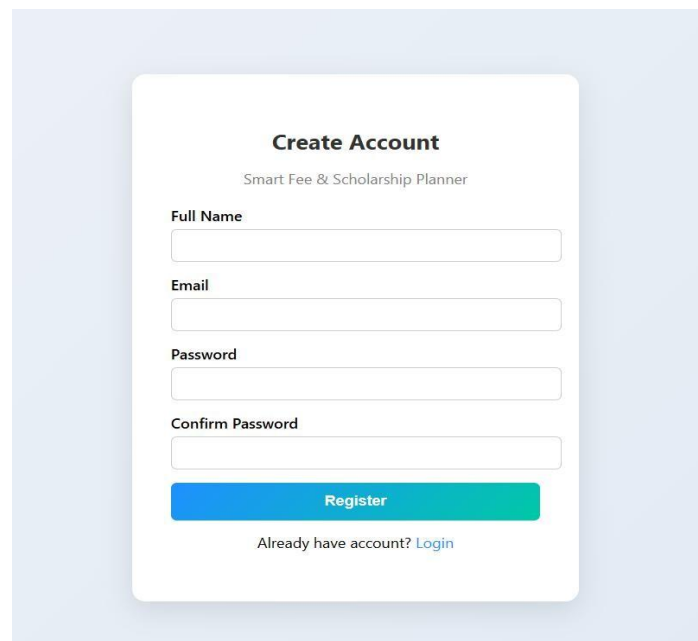
5. Payment Module

This module handles fee payment processing and maintains transaction records. Students can make payments and view their payment history. The system updates payment status automatically and ensures accurate tracking of all financial transactions.

RESULTS

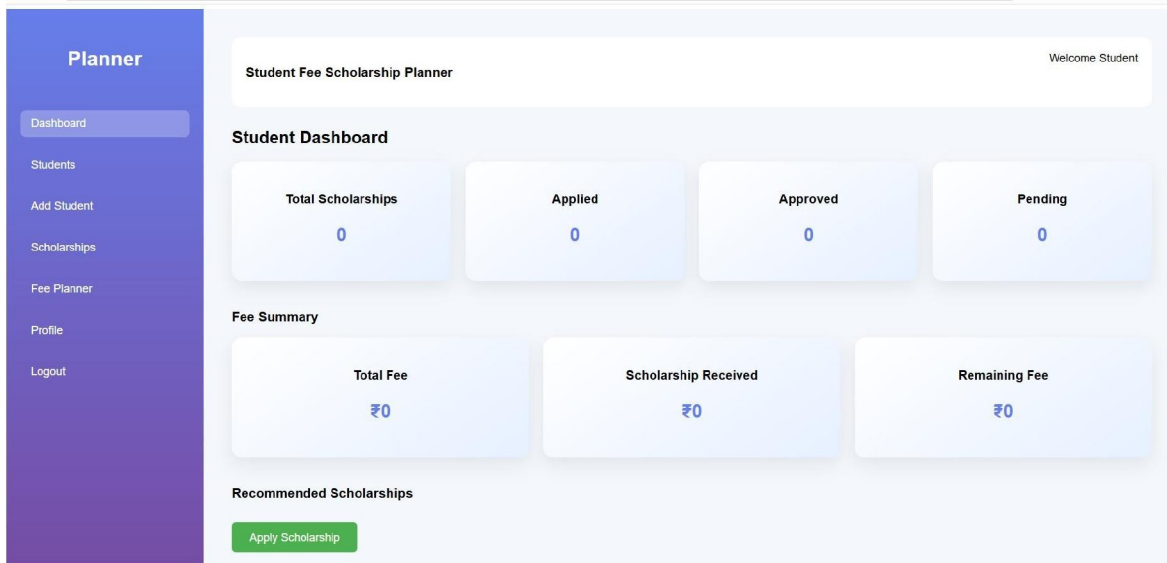


LOGIN PORTAL & USER LOGINS



REGISTRATION PAGE





STUDENT DASHBOARD

IX. CONCLUSION

The AI-Enabled Financial Student Financial Assistance & Scholarship Recommendation System provides an efficient and reliable solution for managing student financial activities within a single platform. By integrating student data, scholarship information, and fee management, the system simplifies the process of identifying suitable scholarships and planning educational expenses. It reduces the need for manual searching and calculation, making the entire process faster and more convenient for students.

The use of AI-based eligibility analysis helps in recommending scholarships based on individual student profiles, improving accuracy and decision-making. Additionally, features such as structured fee installment planning, secure authentication, and real-time updates enhance transparency and usability. Overall, the system supports students in better financial planning, reduces administrative workload, and contributes to a more organized and accessible approach to managing education-related expenses.

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