



Recommender System in Educational Portal Using Machine Learning

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ABSTRACT

The School Management System with a built-in Recommender System utilizing Machine Learning is a sophisticated and all-encompassing software solution tailored to optimize administrative and academic procedures in higher education institutions. By harnessing advanced machine learning algorithms, the system not only effectively handles student records, faculty details, and course schedules but also integrates an advanced recommender system. This recommender system assesses students' academic backgrounds, interests, and choices to provide tailored suggestions for courses and programs, facilitating well-informed decision-making for both students and academic advisors.

Keywords: Machine Learning, Recommender System, Data Analysis, Recommendation Algorithm, Responsive Design

1. INTRODUCTION

The evolution of technology has brought about a transformation in the education sector, with school management systems becoming an integral part of educational administration. These systems are designed to help schools and higher education institutions efficiently handle their daily operations. An ideal school management system should offer an intuitive and user-friendly interface, enabling administrators to seamlessly oversee all aspects of their activities, from admissions to online report card generation. This paper introduces a School Management System designed to consolidate key school functionalities within a unified platform. This platform is intended to offer students, parents, faculty members, and administrators a complete suite of tools to handle various daily operations, including exam administration, fee payments, note management, assignment uploads, attendance tracking, and an extensive grading system. The envisioned system aims to enhance the efficiency of the management process by simplifying and expediting tasks, thereby minimizing paperwork and optimizing administrative procedures.

Beyond these fundamental capabilities, the envisioned system will leverage machine learning algorithms to offer insights into students' grades, recommend courses aligned with their interests, analyze trends in courses, project the future or next-year viability of a course, assess student performance, and predict job opportunities based on current trends. By incorporating web scraping and web mining, the system will gather pertinent data for input into the machine learning algorithms, ensuring precise predictions. This functionality empowers educational institutions to make well-informed decisions and implement necessary measures to foster academic success for their students.

1.1 SUPER ADMIN

The Super Admin module in the School Management System project serves as the highest administrative authority, possessing comprehensive control over the entire system. This role entails managing user access, and system configurations, and overseeing the overall functionality of the platform, ensuring seamless integration and operation.

1.2 PRINCIPAL

The principal module is tailored for school principals, offering tools for strategic decision-making and overall school management. Principals can access and analyze vital information related to academics, attendance, and staff, facilitating efficient decision-making to enhance the Institute overall performance.

1.3 VICE PRINCIPAL

The Vice Principal module provides a designated interface for vice principals, streamlining their responsibilities in supporting the principal's initiatives. This module typically includes features for academic oversight, disciplinary actions, and student welfare, allowing vice principals to contribute significantly to the Institute smooth operation.

1.4 TEACHERS

The Teachers module caters to the instructional staff, offering resources for lesson planning, grade submission, and communication with students and parents. It serves as a central hub for educators to manage their classes, share educational materials, and monitor student progress.

1.5 CLASS TEACHERS

Specifically designed for class teachers, this module focuses on classroom-specific activities. Class teachers can record attendance, manage grades, communicate with parents, and monitor the overall academic and behavioral progress of their assigned students.

1.6 STUDENTS

The student's module provides a personalized interface for students, giving them access to academic information, class schedules, assignments, and examination results. It serves as a virtual gateway for students to engage with educational content and track their academic journey.

1.7 PARENTS

The Parents module is designed to keep parents informed about their child's academic performance, attendance, and school-related activities. It acts as a communication channel between parents and teachers, fostering collaboration for the holistic development of the student.

1.8 OFFICE

The Office module centralizes administrative tasks related to admissions, fee management, and general office procedures. It simplifies the workflow for administrative staff, ensuring efficient handling of paperwork, financial transactions, and communication within the school administrative office.

2. LITERATURE REVIEW

Incorporating Machine Learning-driven Recommender Systems into the Educational Portal represents a transformative and burgeoning area of research within educational technology. These specialized systems are developed to offer personalized course recommendations by considering students' career interests [4]. A review of existing literature underscores the rapid evolution and dynamic shifts in this field [7]. The fundamental objective of these systems is to craft tailored pathways for students, assisting them in aligning their educational pursuits with their career aspirations. The literature emphasizes important topics deserving attention. In recent times, there has been significant interest in Content Management Systems (CMS) within the education domain, leading to extensive research exploring their potential benefits [1]. As suggested by the literature, the primary goal of CMS is to boost the efficiency of school operations, providing enhanced services to students, teachers, and administrative staff. A key advantage associated with CMS is its capacity to simplify complex administrative tasks, encompassing functions such as admissions, enrolment, attendance monitoring, scheduling, and examination management.

Research conducted by Elanchezhian Ramalingam (2016) illustrated that Content Management Systems (CMS) play a vital part in altogether lessening the time and exertion used on different exercises, permitting chairmen to redirect their focus toward more basic tasks, especially upgrading the quality of education[1]. CMS serves as a stage for cultivating viable communication among understudies, instructors, and regulatory staff. The CMS encourages online discussion gatherings, feedback mechanisms, and informing systems, subsequently improving communication among partners, cultivating moved-forward collaboration, and guaranteeing more noteworthy straightforwardness in instructive processes[9,10]. Another outstanding advantage of CMS lies in its capacity to promote the standard of instruction by giving instructors apparatuses to oversee courses, make and share course materials, and screen understudy advances.

Academic Support and Performance Prediction

In addition to suggesting courses, the utilization of Machine Learning for personalized academic assistance has become increasingly popular. Proactively predicting a student's performance in a missed exam by analyzing their prior achievements is a proactive approach aimed at fostering student success[6].

Machine Learning for Educational Data Analytics

This advancement is part of a larger movement that harnesses machine learning for educational data analytics. Through the analysis of patterns in students' academic histories, Machine Learning models discern connections between exam scores and various factors, facilitating the creation of predictive models for forecasting future academic performance[7].

Predictive Modelling Techniques

Utilized for predicting performance, Machine Learning algorithms encompass regression models, time series analysis, and neural networks. These models take into account diverse features, including previous exam results, attendance records, completion of coursework, and other pertinent data, to generate precise predictions[6].

3. RELATED WORKS

The current system is capable of overseeing student records, encompassing personal details and academic performance, along with functionalities for monitoring attendance and students' academic assignments. In terms of staff management, the system can be structured to handle teacher records, covering personal information, employment history, and attendance. However, there is a lack of an online portal for admission applications, checking application status, and completing the registration process. Regarding course management, the system is equipped to handle course registration and scheduling. For billing and finance, it can be employed to oversee student billing, payment records, and financial aspects associated with school operations. In terms of communication, the system has the potential to integrate features facilitating interactions among students, staff, and faculty, including online forums and messaging systems.

4. PROPOSED METHODOLOGY

The suggested approach for creating a School Management System involves a systematic method to guarantee the system's efficiency, effectiveness, and alignment with the Institute requirements. This methodology encompasses various phases, such as gathering requirements, analysing and designing the system, development, testing, and deployment. Each stage holds significance in ensuring that the system is not only user-friendly but also secure and capable of scalability to accommodate the Institute expanding demands. Adhering to this methodology enables the development team to deliver a final product that fulfills the Institute specifications and offers a smooth experience for all stakeholders involved.

SL. No	FEATURES
1.	Registration and Admission System
2.	Course and Curriculum Management System
3.	Faculty and Staff Management System
4.	Student Information Management System
5.	Financial Management System
6.	Examination Management System
7.	Placement and Career Services System
8.	Communication and Collaboration System
9.	Incorporating forecasting and prediction
10.	Alumni Management System

- **Registration and Admission System:** The system is crafted to manage student admissions and registration procedures, incorporating functionalities like the submission of online applications, notification of admission status, and the verification and approval of admissions.
- **Course and Curriculum Management System:** The system is developed for the administration of the Institute curriculum and courses, encompassing features like the creation, modification, and removal of courses, as well as course scheduling and establishing prerequisites for individual courses.
- **Faculty and Staff Management System:** The system is structured to oversee the faculty and staff members of the school, comprising functionalities such as the recruitment of staff, management of employee records, payroll processing, and scheduling.
- **Student Information Management System:** The system is tailored for the administration of student records and details, incorporating functionalities such as tracking student attendance, recording grades, managing class schedules, and maintaining various academic records.
- **Financial Management System:** The system is created to oversee the financial records and transactions of the school, encompassing functionalities like billing and invoicing, management of fees, accounting processes, and budgeting.
- **Examination Management System:** This system is designed to manage the Institute examination processes. It should include features such as exam scheduling, grading, and result management.
- **Incorporating forecasting and prediction:** By incorporating forecasting and prediction into the Institute portal, the system can leverage data analytics to provide insights and recommendations to stakeholders. For example, the examination module can use predictive analytics to predict the missing exam scores and also the placement module will suggest courses to crack the interview based on their dream job designation.

5. SYSTEM DESIGN AND ARCHITECTURE

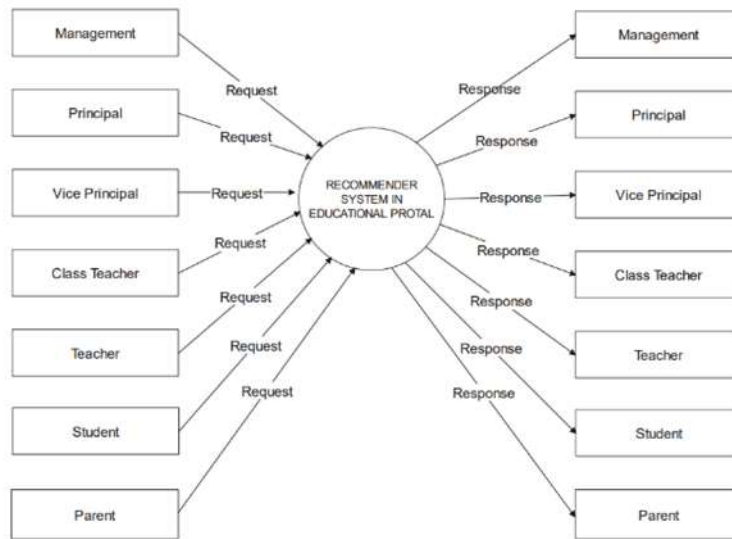


Fig: 5.1 Architecture Diagram

The diagram comprises four modules, each assigned a specific role within the system, supplemented by two additional modules dedicated to analysis and prediction. All modules are interconnected with a central database, functioning as the primary repository for system data. The Analysis and Prediction modules are tasked with conducting data analysis and forecasting trends and outcomes based on the information stored in the database. These modules maintain a connection to the database, enabling them to retrieve and manipulate the stored data. This architectural representation illustrates a sophisticated system where multiple modules collaborate to oversee both the academic and financial facets of an educational institution. The database Educational Portal acts as the central hub, managing and facilitating access to data for various modules as required.

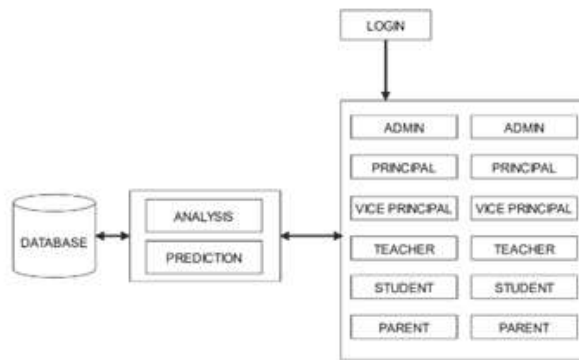


Fig 5.2 Content Flow Diagram

The context flow diagram shows the various modules that are a part of the Educational Portal. The central circle represents the system that connects all the modules. The four modules, namely Admin, Principal, Vice Principal, Teacher, Student, and Parent are connected to the system through a request arrow, indicating that they send requests to the system. The system processes these requests and responds to the respective module through a response arrow, which connects the same four modules to the system but in the opposite direction. This diagram implies that the Educational Portal is a central entity that handles all the requests and responses from these modules. The contextual flow diagram illustrates the modules integrated into the Educational Portal. The central circle symbolizes the system, acting as a hub connecting all the modules. Four modules—Admin, Principal, Professor, and Student—are linked to the system through request arrows, indicating their capacity to send requests to the system. The system processes these requests and issues responses back to the respective modules via response arrows, connecting the same four modules to the system but in the opposite direction. This depiction implies that the Educational Portal functions as a central entity managing all incoming requests and providing responses to these modules.

6. CONCLUSION

The incorporation of a Machine Learning-powered Recommender System into a School Management System, specifically geared towards suggesting courses based on students' selected job preferences, marks a notable advancement in higher education technology. This innovative approach highlights the potential to revolutionize the educational journey by customizing learning paths, aligning academic choices with career goals, and fostering student success. Utilizing collaborative filtering, content-based filtering, and deep learning techniques, these systems can offer students personalized and pertinent course recommendations, empowering them to make well-informed decisions about their education. This not only enhances academic engagement and satisfaction but also better prepares students for their future careers.

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