

Unified Campus Service Hub

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Abstract - The Unified Campus Service Hub is a mobile application designed to simplify and centralize campus service management in educational institutions. In many colleges, services such as complaint registration, leave approval, lab equipment booking, event registration, hostel requests, and notice announcements are handled through manual processes or separate systems, leading to delays, lack of transparency, and difficulty in tracking requests. The proposed system provides a unified digital platform where students can submit service requests and track their status through a mobile application. Staff members can review, approve, or reject requests, while administrators monitor overall activities using dashboards and reports. The system is developed using Flutter for the mobile interface and Firebase for authentication and cloud database management. A machine learning model integrated through Flask is used to automatically classify complaint priority levels. The platform improves efficiency, transparency, and communication between students, staff, and administrators while reducing manual administrative workload.

Keywords: Campus Service Management, Complaint Management System, Leave Request System, Mobile Application, Machine Learning, Firebase, Flutter

I. INTRODUCTION

Educational institutions manage a variety of campus services such as complaint registration, leave approval, laboratory equipment booking, event registration, hostel service requests, and notice announcements. Traditionally, these services are handled through manual processes such as paper forms, physical registers, or different standalone applications maintained by separate departments.

These traditional approaches often create several operational challenges. Manual record keeping can lead to data loss, delays in approvals, and difficulty in maintaining accurate records. Students may find it difficult to know the status of their submitted requests, and staff members must spend additional time verifying and processing each request manually.

Another major issue is the lack of a centralized communication system between students, staff, and administrators. Notices and important announcements are often distributed through notice boards or messaging platforms, which may not always reach every student on time. This leads to poor communication and inefficient service management within the campus environment.

In addition, service requests such as complaints or maintenance issues may remain unresolved for long periods due to the absence of a proper tracking system. Without a digital monitoring mechanism, administrators find it difficult to analyze which departments receive the most complaints or which issues require urgent attention.

With the rapid growth of digital technologies, mobile applications have become an effective solution for improving service accessibility and communication in educational institutions. A well-designed mobile platform can provide a centralized system where multiple campus services can be managed efficiently in a single application.

A unified digital platform allows students to submit service requests directly from their mobile devices and track the status of their requests in real time. Such a system can also help staff members to review requests quickly and update their status without relying on manual documentation.

Modern cloud technologies further enhance the efficiency of such systems by providing real-time data synchronization and secure data storage. Platforms such as Firebase offer scalable cloud-based services that support authentication, database management, and real-time updates, making them suitable for mobile application development.

Mobile development frameworks like Flutter enable developers to build responsive and user-friendly applications that can run on multiple devices with high performance. This allows educational institutions to deploy a single mobile

solution that can be accessed by students, staff, and administrators.

Another emerging technology that can improve service management is machine learning. By analyzing complaint descriptions submitted by students, machine learning models can automatically classify the priority level of issues. This helps staff members identify urgent problems and address them faster.

In the proposed system, a machine learning model integrated using the Flask framework analyzes complaint text and predicts priority levels such as low, medium, or high. High-priority complaints can trigger alerts for staff members, ensuring faster response to critical problems.

Therefore, the proposed system, Unified Campus Service Hub, aims to provide a centralized mobile application that integrates multiple campus services into a single platform. The system improves transparency, reduces administrative workload, enhances communication, and ensures efficient campus service management.

II. METHODOLOGY

The proposed system, Unified Campus Service Hub, is designed to provide a centralized platform for managing various campus services efficiently. The system integrates mobile application technology, cloud database services, and machine learning techniques to simplify the process of submitting, managing, and tracking service requests within the campus environment.

A. Requirement Analysis and System Design

The first stage of the project involved analyzing the requirements of campus service management within educational institutions. Several common services such as complaint registration, leave applications, equipment booking, event registration, hostel requests, and notice communication were identified as essential components of the system. Based on these requirements, the system architecture was designed to provide a centralized mobile platform where students, staff, and administrators can interact efficiently. The system design ensures proper data flow between the mobile application, cloud database, and machine learning model.

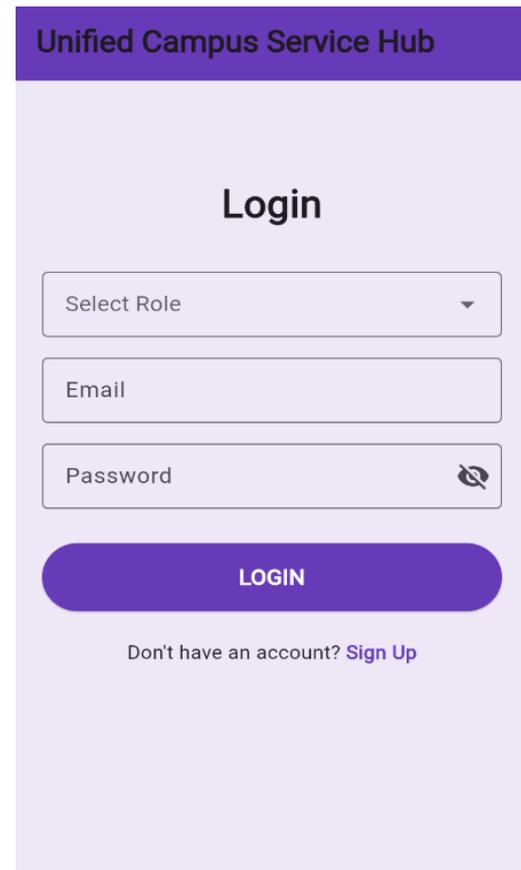


Figure 1: User Authentication Interface of the Unified Campus Service Hub

B. Frontend Development Using Flutter

The frontend of the Unified Campus Service Hub was developed using Flutter, a modern mobile application development framework. Flutter allows the development of responsive and visually appealing user interfaces that run smoothly on mobile devices. The application includes multiple user screens such as login, complaint submission, leave application, equipment booking, event registration, hostel requests, and notice viewing. The user interface was designed to be simple and intuitive so that students can easily access different campus services.

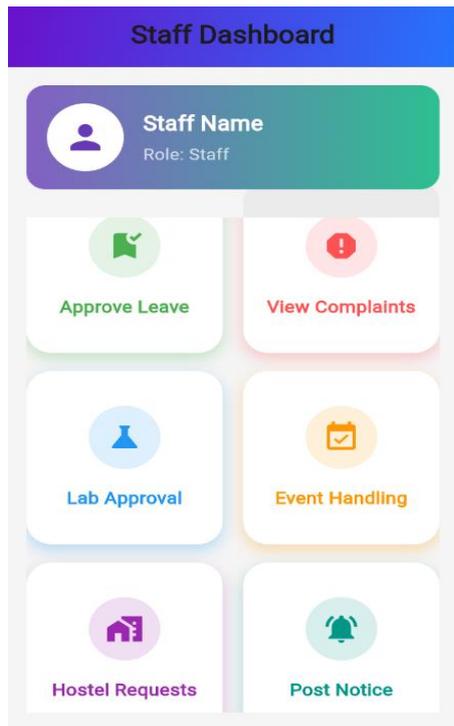


Figure 2: Staff Dashboard

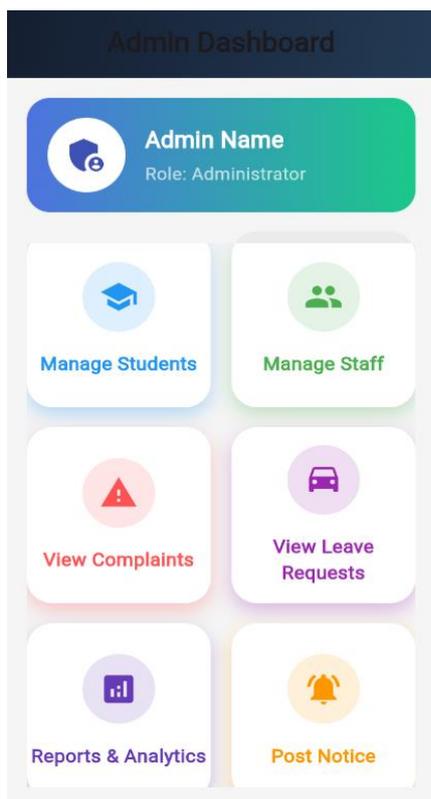


Figure 3: Admin Dashboard

C. Backend and Database Management Using Firebase

The backend of the system uses Firebase services for authentication and cloud data storage. Firebase Authentication ensures secure login access for students, staff

members, and administrators. All service requests such as complaints, leave requests, bookings, and event registrations are stored in Firebase Cloud Firestore. The cloud database enables real-time data synchronization, allowing staff members to instantly view and process requests submitted by students.

D. Machine Learning Integration Using Flask

To improve the complaint management process, a machine learning model is integrated into the system. When a student submits a complaint, the complaint text is sent to a backend API developed using Flask. The machine learning model analyzes the text and predicts the priority level of the complaint such as low, medium, or high. This automated classification helps staff members identify urgent issues quickly and respond to them efficiently.

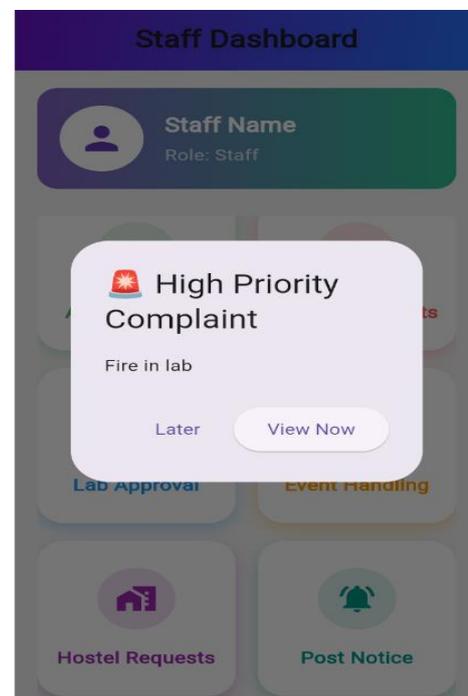


Figure 4: Complaint Priority Prediction using ML

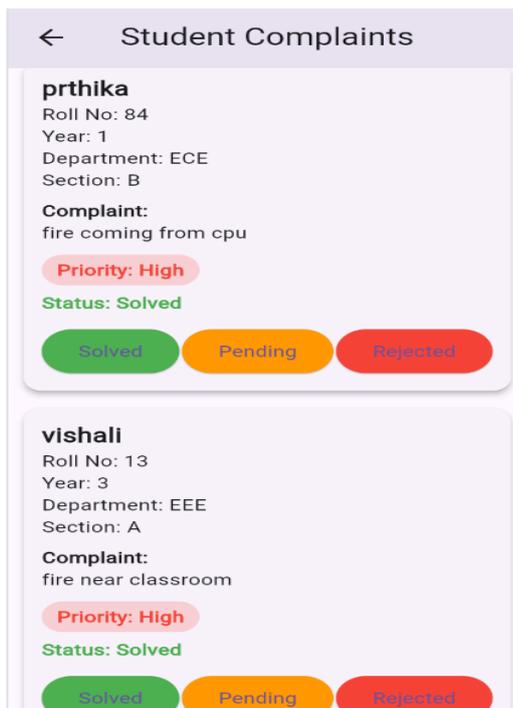


Figure 5: Student Complaints With Priority

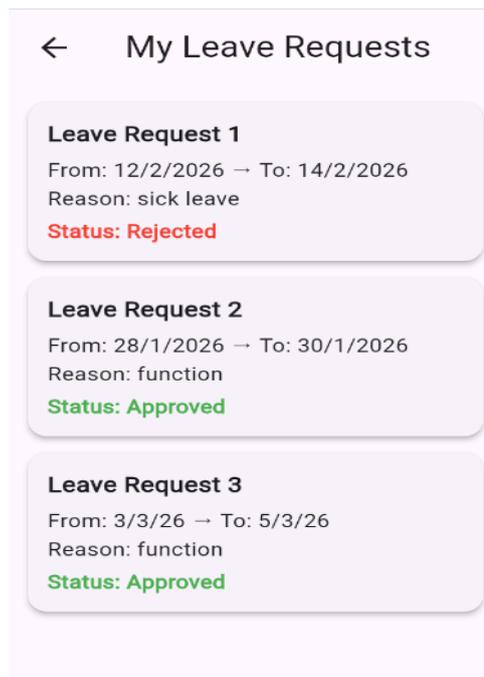


Figure 7: Leave Request Status Tracking In Student Dashboard

E. Request Management and Status Tracking

The system allows staff members to review all submitted requests. Staff members can update the request status as pending, in progress, or resolved. Students can track the status of their submitted requests through the mobile application. This feature improves transparency and keeps students informed about the progress of their service requests



Figure 6: Leave Request Management and Review in Staff Dashboard

F. Testing and Deployment

The developed system was tested to ensure that all modules function correctly and meet the required system objectives. Functional testing was carried out on major features such as user authentication, complaint submission, leave application, lab equipment booking, event registration, and hostel request processing. Each module was verified to ensure that data entered by users was correctly stored and retrieved from the cloud database. The machine learning complaint classification module was also tested to ensure proper prediction of complaint priority levels. After successful testing, the application was deployed for practical use within the campus environment.

III. SYSTEM ARCHITECTURE

The system architecture of the Unified Campus Service Hub is designed to integrate multiple campus services into a single digital platform that can be accessed through a mobile application. The architecture consists of a frontend mobile interface, backend processing layer, cloud database, and machine learning module. The backend services process these requests and store the information in a cloud-based database. Administrators and staff members can access the system to review requests, update status, and manage campus services. The integration of machine learning helps in identifying high-priority complaints and improving service response efficiency.

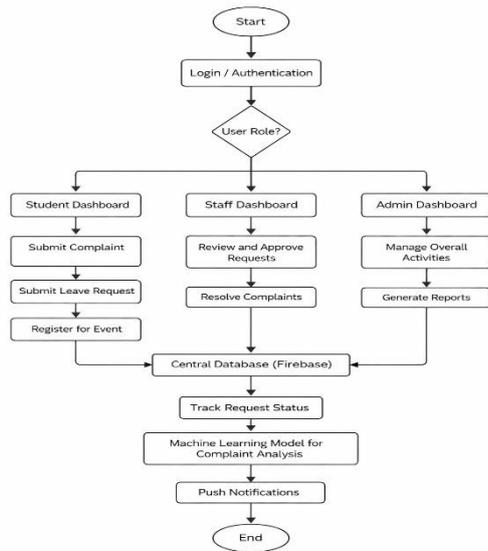


Figure 8: Overall System Architecture and Process Flow

A. Mobile Application Layer

The mobile application layer acts as the user interface for students, staff members, and administrators. It allows users to log in, submit requests, track complaint status, apply for leave, register for events, and access notices posted by the administration. The application is developed using Flutter to provide a responsive and user-friendly interface. The mobile interface communicates with backend services to send and retrieve data from the cloud database.

B. Backend Processing Layer

The backend layer handles the business logic of the system. It processes user requests, manages complaint data, handles approvals and rejections, and integrates the machine learning module for complaint priority prediction. This layer ensures secure communication between the mobile application and the database while managing different roles such as students, staff members, and administrators.

C. Cloud Database Layer

The cloud database layer stores all the system data, including user details, complaints, leave applications, equipment bookings, event registrations, hostel requests, and notices. The system uses Firebase Cloud Firestore to store and manage data in real time. Firebase Authentication is used to provide secure login access and role-based authentication for different users.

D. Machine Learning Module

The machine learning module is integrated into the system to analyze complaint descriptions and predict their priority levels. By analyzing complaint text and related information, the model identifies whether the issue requires immediate attention. This helps staff members respond quickly to critical complaints and improves overall campus service efficiency.

IV. RESULT AND DISCUSSION

The Unified Campus Service Hub application was implemented and tested to evaluate its functionality, performance, usability, and system reliability. The system successfully integrates multiple campus services such as complaint registration, leave application, event registration, and equipment booking into a single mobile platform. The application enables real-time data management and improves communication between students, staff members, and administrators. The results obtained during testing indicate that the system effectively reduces manual work, improves request tracking, and enhances transparency in campus service management.

A. Functional Testing Results

Functional testing was conducted to verify that all system modules operate according to the specified requirements. Major features such as user login, complaint submission, leave request processing, event registration, lab equipment booking, and hostel request management were tested successfully. The complaint classification feature correctly analyzed complaint descriptions and predicted priority levels using the integrated machine learning module. Staff members were able to view and update request statuses, while administrators could monitor system activities through dashboards. The results confirm that the system performs all intended functions correctly.

B. Performance Evaluation

The system performance was evaluated based on response time and data processing efficiency. The mobile application communicates with the cloud database and backend services to retrieve and update information in real time. The response time for submitting requests and retrieving records was found to be fast and reliable during testing. The integration of backend processing and cloud storage ensures smooth data flow between different system components. The system is capable of handling multiple user requests simultaneously without significant delay.

C. Usability Analysis

Usability analysis was conducted to evaluate the ease of use and user satisfaction with the mobile application. The interface was designed to be simple, intuitive, and easy to navigate for students, staff members, and administrators. Users were able to submit service requests, track complaint status, and access notices without difficulty. The organized menu structure and clear interface elements improve the overall user experience. Feedback from users indicates that the system simplifies campus service management and reduces the complexity of traditional manual processes.

D. System Reliability and Security

The system ensures reliable data storage and secure access to information through cloud-based services. User authentication mechanisms are implemented to ensure that only authorized users can access the system. Different roles such as students, staff members, and administrators are assigned appropriate permissions to maintain system security. Data stored in the cloud database is protected and can be retrieved whenever required. These measures improve system reliability and protect sensitive information from unauthorized access.

V. PERFORMANCE ENHANCEMENT

The performance of the Unified Campus Service Hub system is improved through the integration of modern mobile development technologies and cloud-based services. The mobile application developed using Flutter provides a responsive and efficient interface that allows students and staff members to access campus services easily. The structured design of the application ensures smooth navigation between different modules such as complaints, leave applications, equipment booking, and event registration.

The use of cloud-based database services through Firebase enhances system performance by enabling real-time data synchronization and secure storage of information. This ensures that service requests submitted by students are instantly available to staff members and administrators for processing. The cloud infrastructure also helps the system handle multiple user requests efficiently without performance delays.

In addition, the integration of a machine learning module improves the efficiency of the complaint management process. The machine learning model enhances the system by automatically classifying complaints based on urgency, which helps in faster decision-making and efficient resource allocation.

VI. CONCLUSION

The Unified Campus Service Hub system provides an efficient digital solution for managing various campus services through a single mobile platform. The application integrates multiple functionalities such as complaint management, leave applications, event registration, lab equipment booking, hostel service requests, and notice communication. By combining these services in one system, the platform simplifies the interaction between students, staff members, and administrators.

The mobile application developed using Flutter ensures a responsive and user-friendly interface, while the cloud-based backend using Firebase provides secure and real-time data management. Overall, the proposed system reduces manual administrative workload, improves transparency in service management, and enhances communication within the campus environment. The implementation of this system demonstrates how modern mobile technologies and intelligent data processing can improve the effectiveness of campus service operations.

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