Automated System for Career Advancements of the Faculties of Higher Education

A PROJECT REPORT

Submitted by,

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Under the guidance of,

Dr. DEBASMITA MISHRA

in partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER ENGINEERING

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PRESIDENCY UNIVERSITY, BENGALURU
APRIL 2025

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CERTIFICATE

This is to certify that the Project report **"Automated System for Career Advancements of the Faculties of Higher Education"** being submitted by ―A P RANJITHKUMAR, JAYANTH JP, TEJVEER A‖ bearing roll number(s) ―20211COM0034, 20211COM0046, 20221LCE0003‖ in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Automated System for Career Advancements of the Faculties of Higher Education** in partial fulfilment for the award of Degree of **Bachelor of Technology** in **Computer Engineering**, is a record of our own investigations carried under the guidance of **Dr. DEBASMITA MISHRA, ASSISTANT PROFESSOR, School of Computer Science Engineering, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

Higher education institutions continuously strive to enhance faculty performance evaluation and career advancement mechanisms. However, conventional manual processes are often inefficient, time-consuming, and prone to inconsistencies. This paper presents , an Automated System for Career Advancements of the Faculties of Higher Education, designed to modernize faculty self-appraisal, improve transparency, and assist administrators in faculty evaluation and resource allocation.The proposed system integrates secure authentication, real-time tracking of research outputs, and a faculty self-appraisal form that captures research publications, conference participation, projects, and lecture contributions. A robust event logging system records updates and modifications to ensure accountability and transparency. The system also provides an admin panel that enables administrators to view, sort, and download faculty submissions as PDF reports, facilitating efficient decision-making processes.Technologically, the project adopts a full-stack web architecture comprising React.js for the frontend, Node.js with Express.js for the backend, and MySQL for the database. JSON Web Tokens (JWT) secure the authentication mechanism, ensuring restricted access to sensitive faculty records. The faculty members can submit, update, and manage their appraisal forms through an intuitive user interface, while administrators can seamlessly evaluate faculty performance through categorized submissions.The automated system significantly reduces administrative burdens by streamlining faculty performance tracking. Additionally, data-driven insights generated from appraisal records assist in policy formulation and faculty development initiatives. The secure and scalable design ensures that higher education institutions can implement the system effectively across multiple departments, accommodating faculty at various career stages.Furthermore, incorporates a role-based access control system, ensuring that faculty members, department heads, and administrators interact with the system based on their privileges. The system facilitates dynamic report generation, allowing institutions to gain insights into faculty performance trends, research output growth, and institutional academic contributions. By integrating real-time notifications and progress tracking, faculty members receive timely updates regarding their submissions and evaluations, promoting a culture of continuous professional development.

The system's modular and extensible architecture allows for seamless scalability, enabling institutions to expand functionalities according to their evolving requirements. By digitizing faculty career tracking, minimizes paperwork, reduces processing delays, and enhances overall institutional efficiency. The implementation of multi-factor authentication strengthens data security, ensuring that faculty records and administrative decisions remain confidential and tamper-proof.Additionally, promotes equity and standardization in faculty evaluations by providing a uniform appraisal framework across departments. The system integrates predefined evaluation criteria, reducing bias and ensuring fair assessments. Administrators can analyze faculty performance using interactive dashboards that present key performance indicators (KPIs) in a structured and visually intuitive manner.By leveraging modern web technologies, enhances the efficiency, fairness, and accuracy of faculty career advancements. The proposed solution aligns with academic evaluation standards while ensuring transparency and objectivity in faculty appraisals. The automation of this process empowers institutions to make data-backed decisions, thereby fostering an environment of continuous professional growth and institutional excellence. The adoption of this technology-driven approach not only benefits faculty members by providing a clear pathway for career progression but also enables institutions to make strategic improvements in research and academic development.Through comprehensive testing and user feedback, the system has been optimized to meet the specific needs of higher education institutions. Future enhancements may include AI-driven analytics for predictive faculty performance evaluation, integration with national research databases, and automated grant tracking for research funding opportunities. As higher education continues to evolve, serves as a transformative tool in academic administration, bridging the gap between faculty aspirations and institutional goals.

Keywords: Faculty Appraisal, Higher Education, Automated Career Advancement, Web-Based System, Research Output Tracking, Secure Authentication, Data-Driven Decision Making, Role-Based Access Control, Institutional Efficiency

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CHAPTER 1
INTRODUCTION

1.1 Background

In recent years, the field of higher education has undergone transformative changes. These changes are driven not only by the rapid advancement of technology but also by evolving societal expectations and institutional objectives. One of the critical elements at the heart of any academic institution is its faculty. Faculty members are entrusted not only with disseminating knowledge through teaching but also with creating new knowledge via research, participating in community development, and contributing to the academic and administrative activities of the institution.

Traditionally, faculty performance was evaluated primarily on the basis of teaching effectiveness. However, the modern academic environment demands that faculty members consistently contribute to multiple areas such as publishing in peer-reviewed journals, attending and organizing academic seminars and workshops, guiding research scholars, acquiring grants for funded projects, and participating in curriculum development initiatives. These diverse responsibilities are directly linked to promotions, recognitions, appraisals, and other career advancement opportunities.

Despite the critical role that faculty performance evaluation plays in shaping the academic environment, most institutions still rely on outdated, paper-based processes for documentation and review. Faculty members often spend an excessive amount of time compiling data on their academic activities, preparing bulky physical files, and manually submitting their work to department heads and academic committees. This manual approach leads to inefficiencies, delays, and errors. More importantly, it hampers transparency and objectivity in the career advancement process.

In response to these issues, educational institutions around the world are turning to digital transformation to streamline internal operations. The use of automated systems and web-based platforms offers a way to eliminate redundant processes and improve accuracy. Digital systems enable faculty to submit their work online, allow administrators to review and approve submissions efficiently, and generate real-time reports for decision-making. Such

systems also help in creating an organized digital archive that can be accessed when needed for audits, rankings, or accreditations.

The development and implementation of an Automated System for Career Advancements of the Faculties of Higher Education aim to address these challenges. This system will empower faculty members to easily record and manage their academic contributions and assist administrators in conducting timely evaluations based on credible data.

1.2 Problem Statement

In higher education institutions, the evaluation and advancement of faculty are crucial tasks that determine not only the professional trajectory of individual faculty members but also the academic growth of the institution as a whole. Despite its importance, the current process of career advancement assessment in many universities and colleges is still carried out using traditional, manual methods.

The existing systems often require faculty members to maintain physical records of their publications, seminars, projects, and other academic activities. These records are compiled periodically into files or portfolios that are submitted for review. This manual documentation method is time-consuming, prone to human errors, and lacks standardization. Verifying the authenticity of the claims made by faculty can also become a cumbersome task for administrators.

Another key issue with the manual approach is the difficulty in managing data at scale. When institutions have hundreds of faculty members submitting performance data, administrators often face challenges in compiling, comparing, and analyzing the information efficiently. The absence of a centralized digital database means that records can get lost, duplicated, or inconsistently updated. Furthermore, during audits, accreditation evaluations, or government reviews, institutions struggle to retrieve accurate data quickly.

Lack of automation also results in delays in promotions, demotivates faculty members, and increases administrative overhead. Furthermore, in the absence of transparency, the process becomes vulnerable to bias and discrepancies. Faculty may feel that their contributions are not being fairly acknowledged, which can negatively affect their morale and productivity.

The need of the hour is a comprehensive digital system that allows faculty to submit, manage, and track their academic accomplishments online. The system should also allow administrators to evaluate faculty performance using consistent criteria, generate PDF reports,

and maintain secure, real-time records. This would not only improve efficiency but also enhance transparency and credibility in faculty career advancement processes.

1.3 Objectives

The primary objective of this project is to design and implement an automated, web-based platform that facilitates the career advancement process for faculty members in higher education institutions. The system will be developed with the goal of enhancing efficiency, reducing administrative load, and increasing transparency in faculty evaluations.

To achieve this overarching objective, the specific goals of the project are as follows:

- To design a user-friendly web interface where faculty members can log in securely and submit details of their academic accomplishments, including research publications, conference participation, project work, workshops, and seminars.
- To develop a robust backend system using Node.js and MySQL that handles the storage, retrieval, and processing of submitted data securely and efficiently.
- To implement administrator functionality that enables authorized users to review submissions, filter and sort data, download reports in PDF format, and approve or reject entries.
- To incorporate a dynamic submission tracker that shows the status of each faculty member's application, providing visibility and real-time updates.
- To ensure data security and integrity by implementing JSON Web Token (JWT) authentication, encryption for sensitive data, and access control mechanisms.
- To allow generation of reports that can be downloaded for use in performance evaluations, promotions, accreditations, and official records.
- To develop a scalable architecture that can support integration with existing HR or ERP systems, making it adaptable for larger institutions.

By fulfilling these objectives, the system aims to reduce the time and effort spent on manual processes, improve the quality and accuracy of performance records, and foster a fairer and more transparent evaluation process.

1.4 Scope of the Project

The scope of the proposed project encompasses the design, development, testing, and deployment of a comprehensive web-based system that automates the career advancement process for faculty members. The system will be tailored to meet the needs of both faculty and administrators within higher education institutions.

Core Functionalities:

- **Faculty Dashboard:** A personal workspace for faculty members to submit and manage their academic activities, including uploading documents, entering text data, and tracking the progress of their submissions.
- **Admin Dashboard:** A control panel for administrators to view all faculty submissions, apply filters (e.g., by department, submission date), download PDFs, and approve or flag entries.
- **PDF Generation:** Automatic generation of well-structured PDF reports from submission data, ensuring ease of printing and digital archiving.
- **Authentication and Role Management:** Use of secure JWT-based login system to differentiate between faculty and admin roles, ensuring data privacy and access control.

Technology Stack:

- Frontend: React.js with Vanilla CSS for clean, responsive UI
- Backend: Node.js with Express framework for API development
- Database: MySQL for structured data management
- PDF Generator: html-pdf-node or similar package for generating downloadable reports

Limitations:

- The system currently does not support plagiarism detection or integration with third-party research databases.
- Notifications and real-time chat features are not part of the current scope.
- Mobile responsiveness is limited to essential views and may require future improvement.
- It does not yet feature analytics dashboards, but the database schema allows for future integration of data visualization tools.

Future Scope:

- Integration with institutional portals and ERP systems

- Support for peer evaluation modules and 360-degree feedback
- AI-driven performance prediction models
- Integration with ORCID, Google Scholar, Scopus for publication tracking

By defining a focused scope, the project ensures that critical needs are met efficiently, providing a solid foundation for future enhancements.

The implementation of aligns with higher education standards, enabling institutions to adopt a data-driven, fair, and structured approach to faculty career advancements. This system is designed to cater to both small and large academic institutions, making it a transformative tool in faculty appraisal and institutional management.

CHAPTER-2
LITERATURE SURVEY

2.1 Introduction

The transition of higher education institutions from conventional paper-based processes to digitized ecosystems has greatly influenced how academic and administrative tasks are performed. Among the most critical of these tasks is the evaluation of faculty members, which plays a key role in career advancement, institutional accreditation, and academic excellence.

Traditionally, faculty self-appraisal involves maintaining and submitting bulky files comprising certificates, publications, event details, and performance records. These documents must be reviewed by administrative bodies, often leading to delays, inconsistencies, and a lack of transparency. The absence of automation also makes it difficult to track yearly progress, benchmark performance, and identify developmental gaps.

With advancements in web technology, machine learning, and database systems, institutions are now exploring the development of integrated platforms that not only collect data but also analyze, store, and present it in actionable formats. This literature review explores the theoretical foundations, current practices, and gaps in existing systems used for faculty appraisal and performance tracking. The review further strengthens the case for a modular, secure, and scalable digital system tailored for Indian higher education institutions.

2.2 Related Work

Over the past decade, researchers and software developers have attempted to streamline academic processes, particularly faculty evaluation. Related work can broadly be classified into five categories:

A. Faculty Appraisal Frameworks

Academic institutions have developed internal frameworks where faculty are evaluated based on Key Performance Indicators (KPIs) such as teaching effectiveness, research output, seminar participation, mentorship, project guidance, administrative roles, and institutional development contributions. For example, NAAC and UGC guidelines in India recommend structured appraisal systems, but they often remain manually enforced and lack digital implementations.

B. Academic ERP Systems

Enterprise Resource Planning (ERP) systems have been used to manage educational processes like attendance, fees, and examinations. However, ERP modules designed for faculty career development are either simplistic or costly. Products like SAP SLCM or Fedena include faculty-related features, but they often lack real-time submission tracking, auto-report generation, or research analytics.

C. Online Research Repositories

Platforms like ResearchGate, Scopus, and Google Scholar allow researchers to showcase their work. ORCID offers persistent digital identifiers, aiding institutions in tracking authorship and collaborations. However, these platforms are not integrated with internal appraisal workflows and do not consider faculty contributions outside research, such as administrative work or student mentorship.

D. Pilot Appraisal Portals

Some institutions have experimented with Google Forms, spreadsheets, or in-house portals for faculty self-appraisal. These systems often fail to meet requirements for scalability, report generation, or cross-departmental comparisons. Additionally, they lack advanced validation, authentication, and user interface features required for real-world deployment.

E. Integration with HR & Decision Systems

Recent efforts have focused on integrating faculty appraisal systems with HR databases for performance-based incentives. However, data fragmentation and poor interoperability with academic systems make such efforts largely ineffective.

The proposed system aims to bridge these gaps by offering a one-stop solution with secure login, role-based dashboards, automated report generation, integrated analytics, and scalable deployment for both private and public universities.

2.3 Existing Work

Table 2.1-Literature Survey

Sl. No.	Title	Author(s)	Year	Remark
1	Faculty Performance Evaluation System	Meenakshi et al.	2018	Proposed a basic online system with weighted metrics
2	Academic ERP Systems: Review	Sharma & Mittal	2017	Reviewed ERP implementations but lacked faculty-specific modules
3	Digital Appraisal in Universities	R. Thomas	2020	Discussed benefits of automation in academic evaluations
4	AI in Faculty Appraisal	Neeraj et al.	2021	Introduced AI models for performance prediction
5	ORCID Integration in Academia	J. Abraham	2019	Emphasized external integration but lacked internal appraisal focus
6	Performance Evaluation System using PHP/MySQL	K. Gupta	2016	Built a prototype using open-source tools
7	Towards Transparent Faculty Promotion	Bose & Chatterjee	2018	Suggested KPI alignment for objectivity
8	Challenges in Faculty Data Management	A. Reddy	2015	Highlighted issues of data loss and redundancy
9	Web-Based Submission System	Priya & Nikhil	2020	Created a submission portal, lacked admin control features
10	Career Advancement using Blockchain	N. Das et al.	2022	Conceptual model using blockchain for record immutability
11	Digital Archiving in Education	M. Fernandes	2019	Focused on secure document archiving in universities
12	Research Impact Metrics	S. Kapoor	2021	Discussed h-index and citation tracking but limited scope
13	Smart University Framework	Khan & Singh	2017	Proposed digitalization of all academic processes
14	Role of ICT in Education	Batra & Jain	2016	Emphasized need for digital systems in academia
15	Teaching-Research Balance	Dr. S. Ghosh	2020	Discussed need for comprehensive appraisal tools
16	Faculty Tracking in ERP	R. Sinha	2018	Limited implementation in private institutions only
17	Online Appraisal Portals	Usha & Rajan	2019	Manual verification still required

18	Predictive Modeling in Academia	S. Roy et al.	2021	Proposed data mining on faculty records
19	Automated Report Generation Tool	Ramesh Kumar	2020	System generated real-time reports from submissions
20	Performance-based Incentive Models	Kaur & Mehta	2022	Integrated faculty performance with HRM systems

2.4 Summary

The survey of existing literature reveals that while numerous efforts have been made toward digitizing the evaluation process of faculty members, most suffer from one or more of the following limitations:

- Fragmentation: Systems focus on either research, teaching, or administrative work — rarely all three in an integrated fashion.
- Manual Interventions: Even in semi-automated systems, manual verification and paperwork continue to slow down the process.
- Lack of Scalability: Many proposed systems are designed for small institutions and are not scalable to larger universities with hundreds or thousands of faculty.
- Security & Data Privacy: Many systems lack encryption, role-based access, and digital signature features, risking sensitive information leaks.
- Usability Issues: Non-intuitive interfaces and poor dashboard designs make the tools less effective in real-world usage.

There is a clear research and implementation gap that the proposed Automated Faculty Career Advancement System (AFCAS) intends to fill. This project will combine features such as:

- Centralized self-appraisal submission
- Secure login and role-based dashboards
- Automated generation of progress reports
- Real-time tracking of research and activities
- Admin panel for document management and approvals

By leveraging React (Frontend), Node.js (Backend), and MySQL (Database), the proposed system aims to set a new standard for digital appraisal platforms in Indian higher education.

CHAPTER-3
RESEARCH GAPS OF EXISTING METHODS

3.1 Introduction

In the context of higher education, the evaluation and appraisal of faculty members play a vital role in ensuring academic quality, transparency, and accountability. Numerous systems and frameworks have been proposed to assist in this evaluation process, yet a close inspection reveals significant limitations and inconsistencies. These shortcomings limit the effectiveness, scalability, and fairness of the appraisal process. This chapter critically examines the deficiencies in current approaches and identifies specific research gaps that warrant attention. By highlighting these voids, it sets the foundation for the development of a more robust, intelligent, and integrated faculty performance management system.

3.2 Lack of End-to-End Automation

Despite the advancement in digital transformation across sectors, most faculty appraisal systems lack **end-to-end automation**. Typically, current systems may allow faculty members to enter data manually, but tasks such as data verification, performance analysis, report generation, and approval workflows remain manual. This manual intervention not only introduces inefficiencies but also increases the risk of errors and manipulation.

For instance, in many cases, faculty members must upload supporting documents for their achievements, which are then manually scrutinized by department heads or committees. The absence of intelligent validation tools makes the process time-consuming and error-prone. Automating these workflows using technologies like OCR (for document reading), rule-based scoring algorithms, and auto-validation mechanisms could revolutionize the faculty appraisal landscape by minimizing human dependency and streamlining outcomes.

3.3 Fragmented Data Ecosystem

Another prevalent issue in existing systems is the **fragmentation of data sources**. Faculty activities span multiple domains, including teaching, research, administration, mentoring, and

community outreach. However, existing platforms are often designed to capture only a subset of these activities, leading to a siloed data structure.

For example, teaching assignments may be recorded in an ERP system, publications may reside in platforms like Scopus or ORCID, and seminar participations are often reported through emails or physical forms. This scattered approach makes it extremely challenging to compile a comprehensive view of faculty performance. Without seamless integration of various data sources, institutions are unable to conduct holistic assessments or generate real-time analytics, thereby compromising strategic planning and resource allocation.

3.4 Insufficient Role-Based Access and Personalization

A critical oversight in most current appraisal platforms is the **absence of robust role-based access and personalized dashboards**. Typically, the same interface is provided to all users—faculty, reviewers, heads of departments, and administrators—despite their vastly different responsibilities and data requirements.

This lack of differentiation leads to confusion, operational inefficiencies, and data overload. For example, while faculty members require interfaces for submission, progress tracking, and document uploads, reviewers need comparison metrics, evaluation tools, and comment sections. A modern, intuitive system must provide user-specific interfaces and role-based functionalities with proper access controls to ensure that each stakeholder receives relevant information and tools tailored to their needs.

3.5 Absence of Real-Time Tracking and Notifications

Timely communication and monitoring are crucial in any workflow-based system. However, current faculty appraisal systems often lack **real-time tracking and notification capabilities**. Faculty members frequently remain unaware of the status of their submissions—whether they have been reviewed, approved, or require resubmission—until they reach out manually.

Without push notifications, reminders, or live dashboards, the likelihood of missed deadlines and incomplete submissions increases. This communication gap reduces trust in the system and creates bottlenecks in the appraisal cycle. Implementing WebSocket-based alerts or real-time dashboards could significantly improve visibility, responsiveness, and engagement.

3.6 Limited Analytics and Insights

While data entry is central to any appraisal system, most current platforms fail to leverage this data for meaningful **analytics and insights**. Stakeholders are left with raw data without actionable intelligence. There is often no mechanism to visualize progress trends, departmental strengths, or institutional benchmarks.

For example, an institution may want to identify the most research-active faculty or those excelling in student mentorship, but without comparative analytics or filtering capabilities, these insights remain buried in data tables. Integrating visualization libraries and machine learning-based trend analysis can unlock the potential of stored data and support data-driven decisions for promotions and grants.

3.7 Weak Security and Data Validation Mechanisms

The **security and validation** of appraisal data is another critical gap. Many systems store sensitive faculty records—including publications, confidential reviews, and personal information—without adequate encryption or access controls. Additionally, input fields are often loosely validated, enabling users to input incorrect or duplicate information, whether intentionally or unintentionally. Such weaknesses pose significant risks, including data breaches, tampering, and unauthorized access. A well-architected system must include JWT-based authentication, role-based authorization, secure REST APIs, and proper form validation mechanisms to ensure data integrity and user trust.

3.8 Lack of Standardization and Flexibility

A key challenge faced by multi-disciplinary institutions is the lack of **standardization and flexibility** in appraisal formats. Faculty members across different departments have distinct criteria for performance measurement. However, current systems often impose rigid templates that fail to reflect this diversity.

For instance, research output may be the prime metric for engineering faculty, while student engagement and community service might weigh more for education faculty. The inability of existing systems to dynamically adjust forms and scoring mechanisms based on departmental policies leads to inaccurate evaluations and user dissatisfaction. There is a pressing need for modular and configurable systems that allow institutions to define custom appraisal policies and metrics.

3.9 Minimal Integration with External Research Platforms

Most faculty appraisal systems do not **integrate with external academic databases** such as Scopus, PubMed, Google Scholar, or ORCID. Consequently, faculty members are forced to manually enter their publications and citations, which leads to outdated records, errors, and unnecessary duplication.

Modern systems should employ APIs to synchronize data from these platforms, providing up-to-date research activity, citation metrics, h-index, and co-author networks. This not only simplifies the process for faculty but also ensures the reliability and accuracy of reported research outputs.

3.10 Inadequate Feedback and Review Mechanisms

Feedback is a cornerstone of any appraisal process, but many current systems **lack built-in channels for constructive feedback** or performance improvement recommendations. Faculty members often remain unaware of evaluation criteria or reviewer comments, which prevents professional development and creates dissatisfaction.

Furthermore, there is often no structured process for disputing evaluation results or seeking clarification. Including anonymous peer review, structured evaluation forms, and feedback dashboards would enhance transparency and foster a culture of continuous improvement.

3.11 Scalability and Performance Bottlenecks

With growing faculty numbers and increasing complexity of academic duties, **scalability** becomes a major concern. Many existing platforms, especially those hosted on institutional servers without cloud integration, face performance issues during peak usage times such as appraisal deadlines or policy review cycles.

These systems are not equipped to handle concurrent logins, real-time data aggregation, or document uploads. The absence of scalability planning leads to system crashes and user frustration. Cloud-native architectures, elastic storage, and container-based deployment models can overcome these challenges.

3.12 Summary of Research Gaps

Gap Area	Details & Implications
End-to-End Automation	Increases administrative load and error rates

Gap Area	Details & Implications
Fragmented Data Sources	Incomplete performance evaluation and duplication of records
Role-based Access	Uniform interface causes inefficiency and confusion
Real-Time Tracking	Poor user engagement and status awareness
Analytics & Insights	Limits strategic planning and recognition of excellence
Security & Validation	Risks of data manipulation and privacy breaches
Standardization & Flexibility	One-size-fits-all approach alienates certain departments
Research Platform Integration	Manual data entry and outdated publication records
Feedback & Review	Lack of transparency and constructive dialogue
Scalability	System crashes during peak appraisal periods

3.13 Conclusion

The comprehensive analysis of existing faculty appraisal systems reveals numerous research gaps that hinder the effective management of academic performance data. From lack of automation and poor user personalization to security vulnerabilities and data fragmentation, the need for a robust, secure, flexible, and intelligent platform is evident. These insights not only highlight the shortcomings of current approaches but also guide the design and development of the proposed system, which aims to resolve these deficiencies and establish a new standard in faculty performance evaluation. The next chapter outlines the proposed methodology, architecture, and key technologies that aim to bridge these identified gaps.

CHAPTER 4
PROPOSED METHODOLOGY

4.1 Introduction

The development of a robust, intelligent, and user-friendly system for managing the career advancement process of faculty members in higher education institutions necessitates a systematic and layered methodology. The proposed system addresses key research gaps identified in Chapter 3 and offers a holistic solution that is secure, modular, scalable, and equipped with real-time monitoring and analytics.

This chapter outlines the methodology adopted for building the **"Automated System for Career Advancements of the Faculties of Higher Education"**. The methodology includes detailed discussions on system architecture, functional components, data flow, front-end and back-end integration, database schema, technology stack, and workflow logic. The aim is to ensure transparency, reduce manual effort, and enhance administrative decision-making through intelligent automation.

4.2 System Architecture Overview

The proposed system is based on a **three-tier web application architecture**, ensuring separation of concerns and better scalability:

1. **Presentation Layer (Frontend)**: Developed using React.js with Vanilla CSS, the front-end serves as the interface between the system and its users—faculty, admins, and reviewers. It provides dynamic, role-based dashboards and seamless navigation.
2. **Application Layer (Backend)**: The core business logic resides in a Node.js (Express) server, which handles authentication, authorization, CRUD operations, form validation, and integration with the database.
3. **Data Layer (Database)**: A MySQL relational database is used to store faculty details, appraisal submissions, document metadata, event logs, and admin actions. It supports normalized, indexed, and secure data structures.

This layered architecture ensures easy maintainability, better performance, and scope for future enhancements.

4.3 System Architecture Diagram

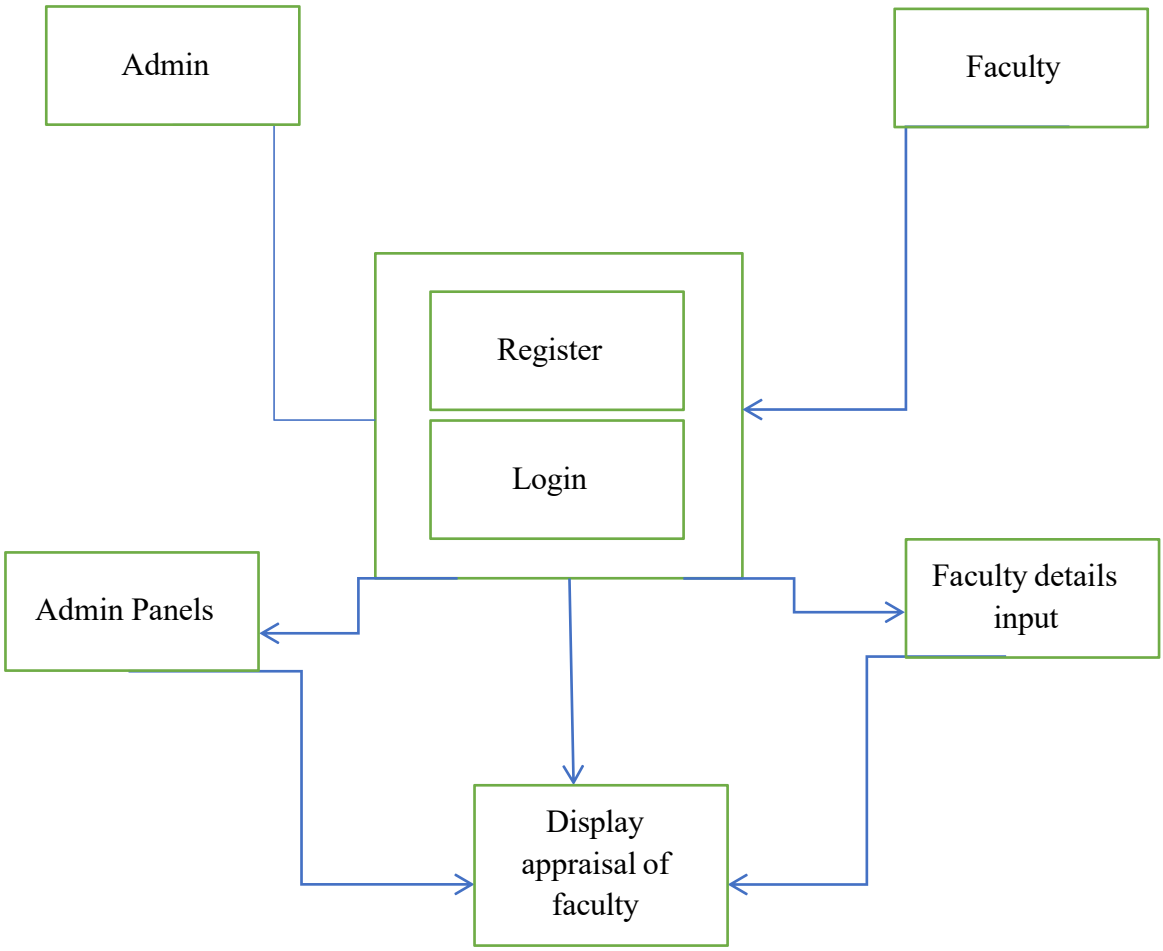
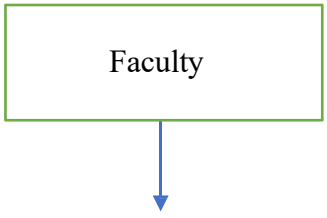


Fig 4.1 System Architecture

4.4 Data Flow Diagram (DFD)

Level 0 DFD – Context-Level Diagram



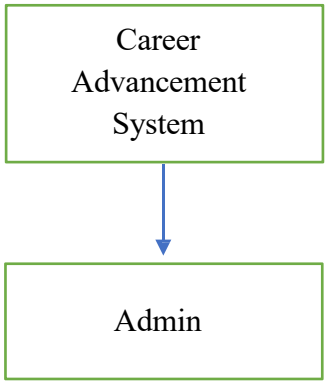


Fig 4.2 Level 0 DFD – Context-Level Diagram

The Context-Level Diagram, or Level 0 DFD, is the highest abstraction of the system. It shows the entire system as a single process (usually labeled Process 0) and outlines the major external entities that interact with it. It also shows the flow of information between the system and these external entities.

Purpose:

- To provide a high-level overview of how the system interacts with users and external systems.
- To define system boundaries and primary data exchanges.

Entities:

1. **Faculty Member**
    - Inputs self-appraisal data.
    - Receives notifications, status updates, and admin feedback.
2. **Administrator**
    - Reviews submissions.
    - Approves, rejects, or requests changes.
    - Downloads reports.
3. **Database**
    - Stores user credentials, submissions, logs, documents, and review status.

Process (Process 0):

- **"Career Advancement System"**: The core system handling user submissions, admin reviews, validations, and report generation.

Data Flows:

- Faculty → Submission Data → System
- System → Feedback/Status → Faculty
- Admin → Review Actions → System
- System → Reports/Notifications → Admin
- System ↔ Database: Data storage/retrieval

Level 1 DFD – Subsystem Interactions

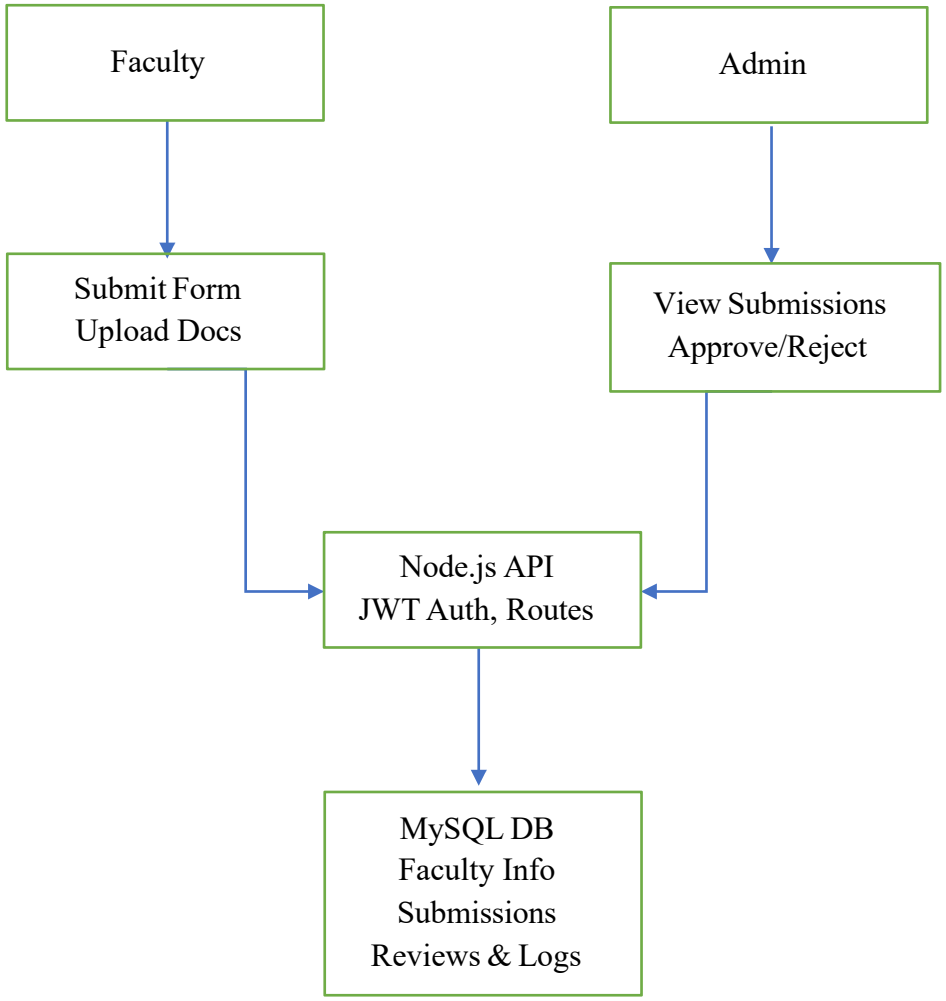


Fig 4.3 Level 1 DFD – Subsystem Interactions

The Level 1 DFD breaks down Process 0 into its key subsystems or modules, showing internal processes, data stores, and interactions in more detail.

Subsystems:

1. **User Management (1.1)**
    - Handles registration, login, role authentication.
    - Interacts with the database for user credentials and tokens.
2. **Form Management (1.2)**
    - Collects and validates self-appraisal forms.
    - Performs client and server-side validation.
3. **Review & Feedback Module (1.3)**
    - Admin reviews submissions.
    - Adds comments, marks for revision, or approves.
    - Sends feedback to faculty.
4. **Notification & Status Tracking (1.4)**
    - Notifies users about review status, feedback, and updates.
    - Manages system alerts and status transitions.
5. **Reporting & Export (1.5)**
    - Generates downloadable reports.
    - Converts submissions into PDFs for archival.
6. **Audit Logging & Event Tracker (1.6)**
    - Records all user actions and system events.
    - Supports traceability and transparency.

Data Stores:

- D1: User Database
- D2: Submission Forms Database
- D3: Review Logs
- D4: Audit Trail

Data Flows:

- Faculty sends data to Form Management → stored in D2.Admin actions flow through Review Module → updated in D2 and D3.
- Notifications pushed through Notification Module.
- Reports accessed via Reporting Module.
- All activities logged via the Audit Module into D4.

4.5 Front-End Architecture

The front-end of the proposed system has been developed using **React.js**, a modern JavaScript library known for building responsive and scalable user interfaces. The component-based architecture of React ensures reusability, modularity, and maintainability. CSS is handled using **Vanilla CSS**, ensuring a lightweight and customized user interface that is aligned with the aesthetic of a typical Indian government portal but adapted for a user-friendly experience.

Key UI Components:

- Login Component: Handles user authentication with input fields for email and password.
- Role-Based Dashboards: Displays different UI based on the user's role (faculty, admin).
- Submission Form: Allows faculty to submit self-appraisal entries including research, seminars, lectures, and uploaded documents.
- Submission Table: Enables both faculty and admin to view submission history in a tabular format.
- Admin Panel: Offers filtering, status update, and download capabilities for submission reviews.

Routing & Navigation:

Routing is handled using React Router, allowing seamless navigation between pages such as:

- /login – Login page
- /faculty – Faculty dashboard
- /submissions – Faculty submission display
- /admin – Admin dashboard
- /admin/submissions – Admin view of all faculty submissions

4.6 Back-End Architecture

The backend is developed using Node.js with Express.js, offering a fast, scalable server-side framework that supports RESTful API design.

Key Functional Modules:

1. **Authentication & Authorization**:
    - JWT (JSON Web Token) is used to secure API endpoints.
    - Middleware functions enforce role-based access

2. **API Routes**:
    - POST /api/login – Handles user login and token issuance.
    - POST /api/faculty/submit – For faculty to submit data.
    - GET /api/faculty/submissions – Fetch faculty's own submissions.
    - GET /api/admin/submissions – Admin access to all submissions.
    - PUT /api/admin/update-status/:id – Admin updates submission status.
3. **File Handling**:
    - Appraisal documents are uploaded through Multer, stored on the server or cloud (as per setup).
4. **Error Handling**:
    - Custom middleware handles 404 errors, server issues, and token validation errors.

4.7 Database Schema and Tables

The MySQL database has been carefully designed using relational principles, with foreign key relationships to maintain data integrity.

Primary Tables:

- **Users**
    - id, name, email, password, role (faculty/admin)
- **Submissions**
    - id, user_id, title, type, description, date, status
- **Documents**
    - id, submission_id, file_path, uploaded_at
- **Logs**
    - id, admin_id, submission_id, action, timestamp

Relationships:

- One user can have many submissions.
- One submission can have multiple documents.
- Admin actions are logged against submissions for traceability.

4.8 Detailed Methodology

The methodology follows an iterative development process, ensuring constant feedback and refinement. The core stages are:

1. Requirement Analysis

- Detailed discussions with academic stakeholders to gather key functional and non-functional requirements.

2. System Design

- Use case diagrams, DFDs, and ER models were created to finalize system flow.
- Database schema design followed normalization principles to reduce redundancy.

3. Development

- Modular approach for frontend and backend components.
- REST APIs for interaction between layers.
- JWT-based auth for secure access control.

4. Testing

- Unit testing of individual components.
- Integration testing for end-to-end scenarios (e.g., faculty submits → admin reviews).
- Cross-browser and mobile responsiveness tests.

5. Deployment and Feedback

- Deployed on a local server with test faculty and admin accounts.
- Feedback loop initiated with early users for UI/UX improvements.

4.9 Workflow Logic (Faculty ↔ Admin Interaction)

The interaction workflow between faculty members and administrators is designed for seamless, secure, and transparent processing of career advancement applications. The system supports a dynamic yet structured flow that ensures completeness of data, traceability of actions, and clarity in communication.

Step-by-Step Workflow:

1. **Faculty Registration & Login:**
    - Faculty members register with institutional credentials.
    - JWT-based login provides secure session management.
2. **Self-Appraisal Form Submission:**

- Faculty enters academic and professional data: research papers, conferences, lectures, projects, etc.
- The form has real-time validation and auto-save features.
- Once completed, the form can be submitted for review.

3. **Initial Admin Review:**
   - Admin is notified of new submissions via dashboard alerts.
   - Admin reviews the data and validates supporting documents.
   - Admin can accept, request revisions, or reject submissions.
4. **Faculty Feedback Loop:**
   - If revisions are requested, faculty receive notifications with specific comments.
   - Faculty updates and resubmits the form.
5. **Final Approval:**
   - Upon satisfactory review, Admin marks the submission as ―Approved.‖
   - The system locks further edits and logs the approval timestamp.
6. **Reporting & Documentation:**
   - Approved submissions can be exported as PDFs for archiving or reporting.
   - Submissions are added to the faculty's profile for future reference.
7. **Audit Trail & Logs:**
   - All actions are logged with timestamps and user IDs for transparency.

4.10 Security, Validation & Scalability Strategy

Security Strategy:

- **Authentication & Authorization:**
  - JWT tokens for secure authentication.
  - Role-based access control to ensure only authorized actions (Faculty/Admin).
- **Data Encryption:**
  - Sensitive data (e.g., login credentials) is encrypted using hashing (e.g., bcrypt).
  - HTTPS ensures end-to-end encryption of data in transit.
- **Input Validation & Sanitization:**
  - All form inputs undergo validation both client-side and server-side.
  - Sanitization prevents XSS, SQL injection, and CSRF attacks.
- **Session Management:**

- Tokens expire after inactivity or set durations.
- Refresh tokens can be implemented for prolonged sessions.

Validation Strategy:

- **Form-Level Validations:**
  - Required fields, regex-based validation, file type/size checks.
  - Inline feedback for missing or incorrect fields.
- **Admin Review Validations:**
  - Admins can view uploaded documents and system-generated alerts for missing sections.

Scalability Strategy:

- **Modular Architecture:**
  - Backend APIs are modular and scalable independently.
  - Frontend components are lazy-loaded for performance.
- **Database Optimization:**
  - Indexed fields for faster query access.
  - Pagination for handling large datasets in dashboard views.
- **Load Balancing & Caching (Future Scope):**
  - Designed for integration with load balancers and Redis for caching.
  - Cloud deployment-ready using Docker and Kubernetes for horizontal scaling.
- **Future-Proofing:**
  - Easily extendable to accommodate additional roles (e.g., reviewers, department heads).
  - Designed with microservices compatibility in mind.

This chapter presented the complete methodology and architectural strategies behind the PSCS_321 system. The **workflow logic** illustrates a clear, traceable interaction between faculty and admin users. A strong emphasis is placed on **security** with layered validation and authorization mechanisms. Additionally, the system is built with future growth in mind, ensuring **scalability and adaptability**.

With a user-centric design, robust backend infrastructure, and focus on academic integrity and administrative transparency, the PSCS_321 platform aims to transform how faculty career advancements are managed, tracked, and validated across higher education institutions.

CHAPTER 5
OBJECTIVES

In the context of higher education, faculty members are pivotal to academic excellence, research innovation, and institutional reputation. Their career advancement is not only a matter of personal growth but also an institutional metric of progress and achievement. However, the current systems used by many educational institutions for tracking, evaluating, and promoting faculty members are often fragmented, outdated, and inefficient.

Manual paperwork, inconsistent appraisal formats, lack of data centralization, and delays in evaluation make the existing processes cumbersome and non-transparent. In response to these limitations, the proposed system— **Automated System for Career Advancements of the Faculties of Higher Education**—seeks to provide a comprehensive, digital-first platform that modernizes and streamlines every stage of the appraisal and promotion workflow.

This chapter outlines the **core, supporting, and visionary objectives** of the system. These objectives are categorized as **Primary**, **Secondary**, and **Strategic/Long-Term** to reflect the system's immediate goals and future evolution potential.

5.2 Primary Objectives

5.2.1 End-to-End Digitization of Faculty Self-Appraisal

One of the fundamental goals is to completely digitize the self-appraisal process. Faculty members will no longer rely on printed forms or spreadsheets to document their achievements. Instead, the system will offer a structured, intuitive digital interface where they can log various activities including research publications, conference presentations, workshops conducted, courses taught, projects undertaken, and administrative responsibilities.

This digitization ensures consistency in data capture, reduces errors, and facilitates easy storage and retrieval. Furthermore, it removes the dependency on physical documents, reducing ecological impact and administrative burdens.

5.2.2 Transparent and Auditable Evaluation by Admin

The system provides an integrated platform for department heads and administrative reviewers to evaluate faculty submissions in a step-by-step manner. Each review is timestamped and recorded in the system, ensuring full transparency in how evaluations are conducted. Faculty members can view feedback and progress, promoting trust in the process.

By embedding accountability and real-time visibility, the system resolves the prevalent issue of unclear or biased evaluations. It also serves as a preventive measure against favoritism or manual tampering.

5.2.3 Centralized Data Repository for Academic Records

All data entries made by faculty members are stored in a centralized and normalized database. This eliminates data duplication and provides a single source of truth for institutional audits, UGC/AICTE/NAAC compliance, internal reviews, and research statistics.

Having a central repository also supports cross-departmental data analysis, enables faster report generation, and ensures that no vital academic activity is overlooked or lost due to decentralization.

5.2.4 Real-Time Notifications and Tracking Mechanism

To enhance system usability, the platform includes a notification and tracking mechanism. Faculty and admin users will be alerted about pending tasks, upcoming deadlines, review statuses, or changes in evaluation parameters. This feature ensures that no step in the appraisal workflow is missed and facilitates timely decision-making.

By replacing email or verbal communication loops with systematic alerts, the process becomes more organized, efficient, and responsive.

5.3 Secondary Objectives

5.3.1 Automatic Report Generation in Standardized Formats

The system supports auto-generation of structured reports and PDFs, which are essential for formal reviews, archival, and presentation before promotion committees. These reports are generated based on user inputs and predefined templates aligned with institutional norms.

This feature minimizes manual formatting, ensures uniform presentation of data, and significantly reduces the administrative load during appraisal seasons.

5.3.2 Role-Based Access Control (RBAC)

Security and confidentiality are maintained through role-based access protocols. Each user—whether faculty, reviewer, or admin—is assigned a specific role with appropriate permissions. For instance, faculty can only view and edit their own data, whereas administrators can review, approve, or reject submissions within their department or institution.

RBAC ensures data integrity, protects personal information, and aligns with institutional privacy policies and legal requirements like the IT Act or University-specific guidelines.

5.3.3 Integrated Audit Trail System

To promote accountability, every interaction with the system—such as data submission, editing, login time, review actions—is logged in an immutable audit trail. This allows administrators to trace all system activities and resolve conflicts, disputes, or inconsistencies if they arise.

Audit trails are essential for internal audits, quality assurance processes, and for providing legal evidence if disputes occur regarding faculty evaluations.

5.3.4 Modular and Scalable Architecture

The backend and frontend of the platform are built using modular components. This makes it possible to replicate and deploy the system in other departments, universities, or states with minimal customization. It also allows future modules—such as Research Grant Management or Leave Tracking—to be integrated without disrupting existing functionalities.

Scalability ensures that the system remains robust and efficient even as the number of users grows exponentially over time.

5.4 Long-Term Strategic Objectives

5.4.1 Promote Data-Driven Decision Making

With continuous data entry over multiple academic years, the system becomes a rich source of institutional intelligence. Stakeholders can analyze trends such as publication rates, faculty workload distribution, student engagement, and interdisciplinary collaborations.

5.4.2 Standardize Appraisal and Promotion Frameworks

A major long-term goal is to bring uniformity to faculty assessment practices. Currently, criteria and formats vary significantly across institutions and even departments. This system aims to enforce a common structure while allowing minor customizations, thereby bringing standardization to the evaluation process.

Such standardization is vital for national ranking frameworks, inter-institutional comparisons, and ensuring fairness in career advancement decisions.

5.4.3 Foster Institutional Collaboration and Benchmarking

By deploying this system across multiple institutions, it becomes possible to benchmark faculty performance across universities, collaborate on joint research, and share best practices. Data sharing agreements and anonymized comparative analytics can help raise academic standards collectively.

Additionally, collaborative tools such as shared dashboards or inter-university evaluation panels can be incorporated into future versions.

5.4.4 Enable API-Level Integration with External Systems

The architecture is designed with future integration in mind. Whether it's linking with Google Scholar, Scopus, ORCID, institutional ERP systems, or national academic databases like Shodhganga, the system can support APIs for seamless data exchange. This reduces redundancy and encourages real-time synchronization of faculty profiles across platforms.

Such integration helps maintain consistency in data and streamlines external reporting or audit requirements.

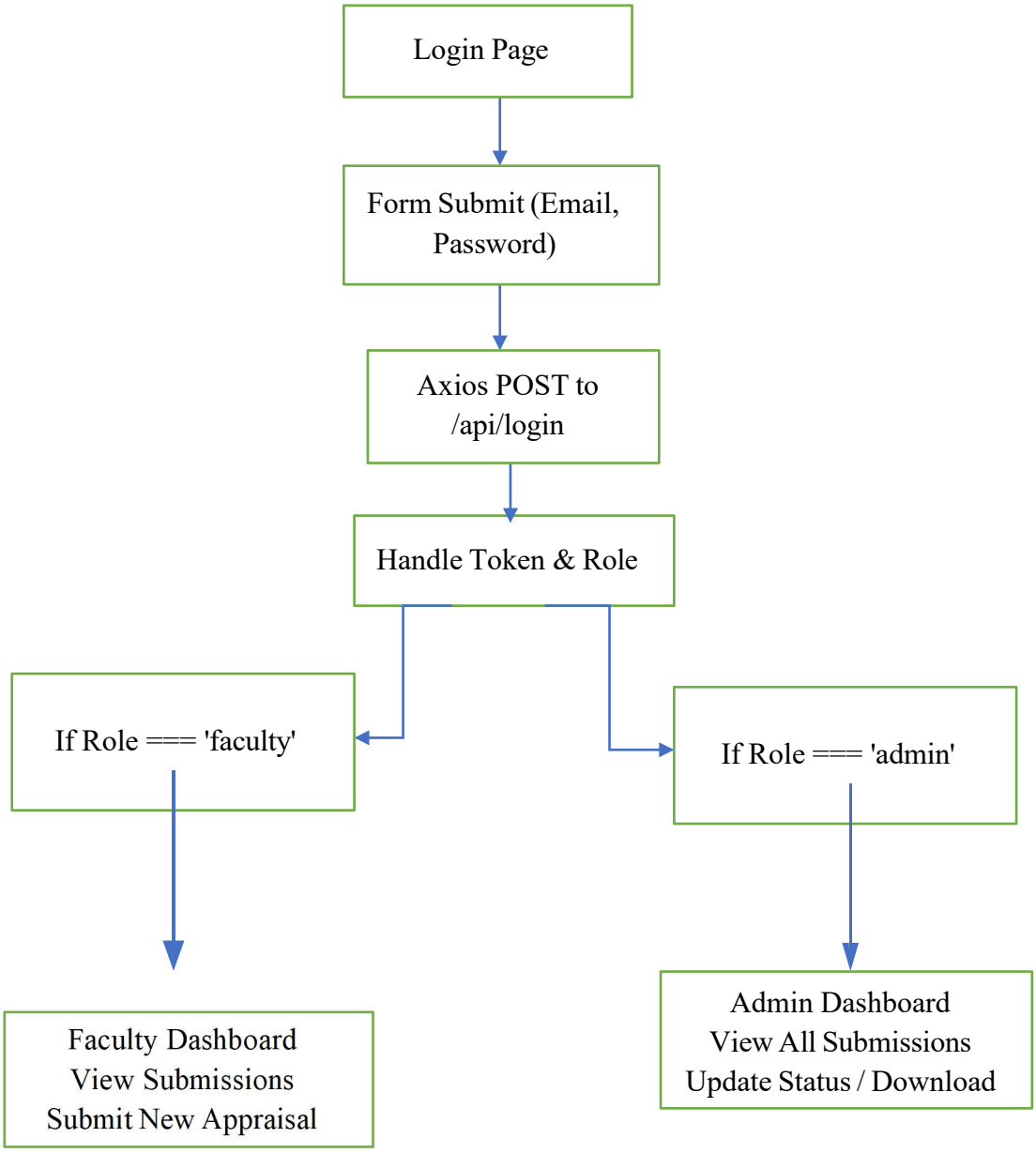
5.5 Summary

To conclude, the objectives of the proposed automated system for faculty career advancement go beyond digitization—they envision a transformative change in how faculty contributions are recognized, evaluated, and leveraged. The outlined goals ensure that the system is not only functionally robust and user-friendly, but also strategically aligned with institutional and national academic visions.From automating repetitive tasks to empowering stakeholders with data, **PSCS_321** is a step toward building a transparent, scalable, and insight-driven ecosystem in higher education.

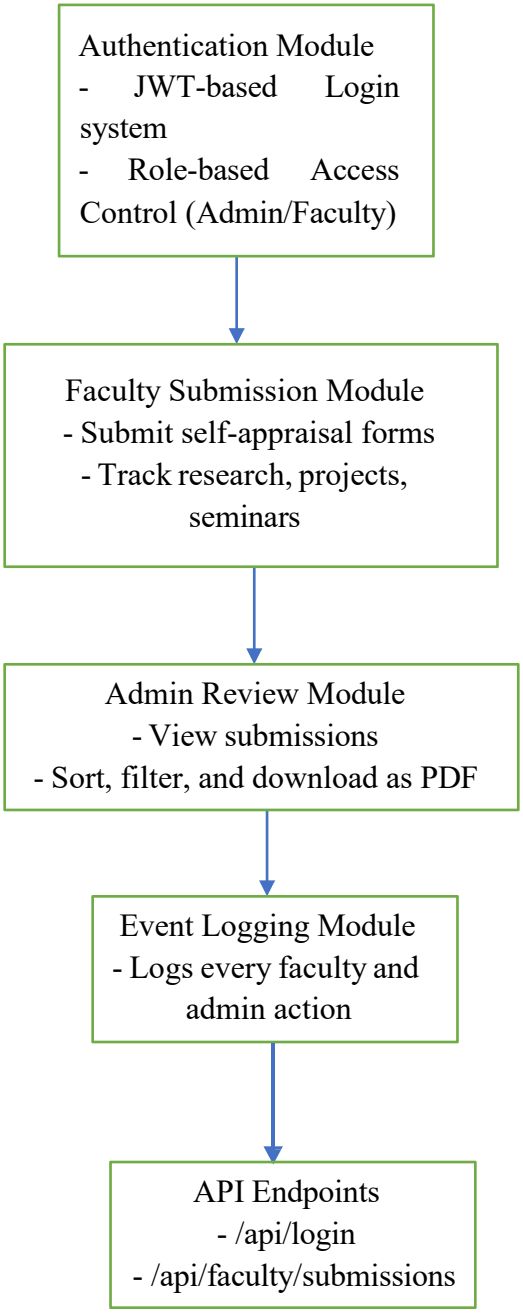
CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

6.1 Front end Architecture



6.2 Front end Architecture



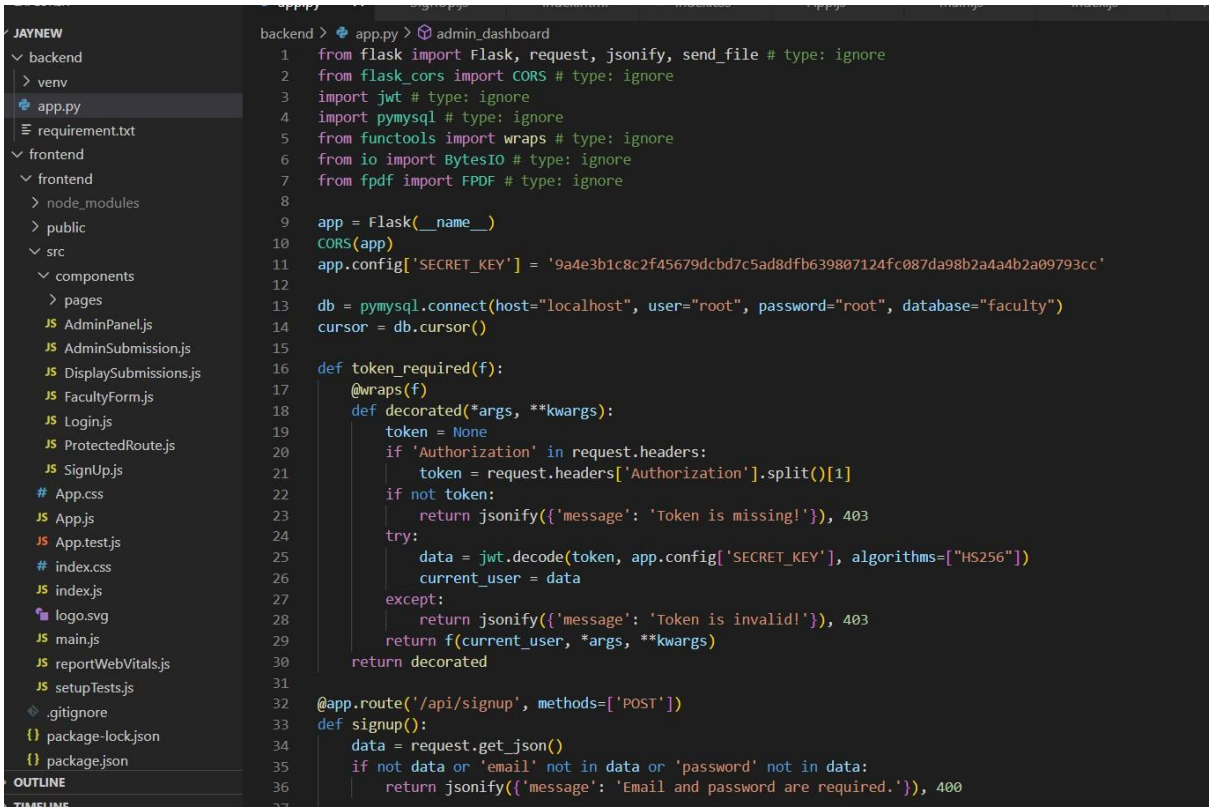


Fig 6.1 Backend design [using secret key for authentication]

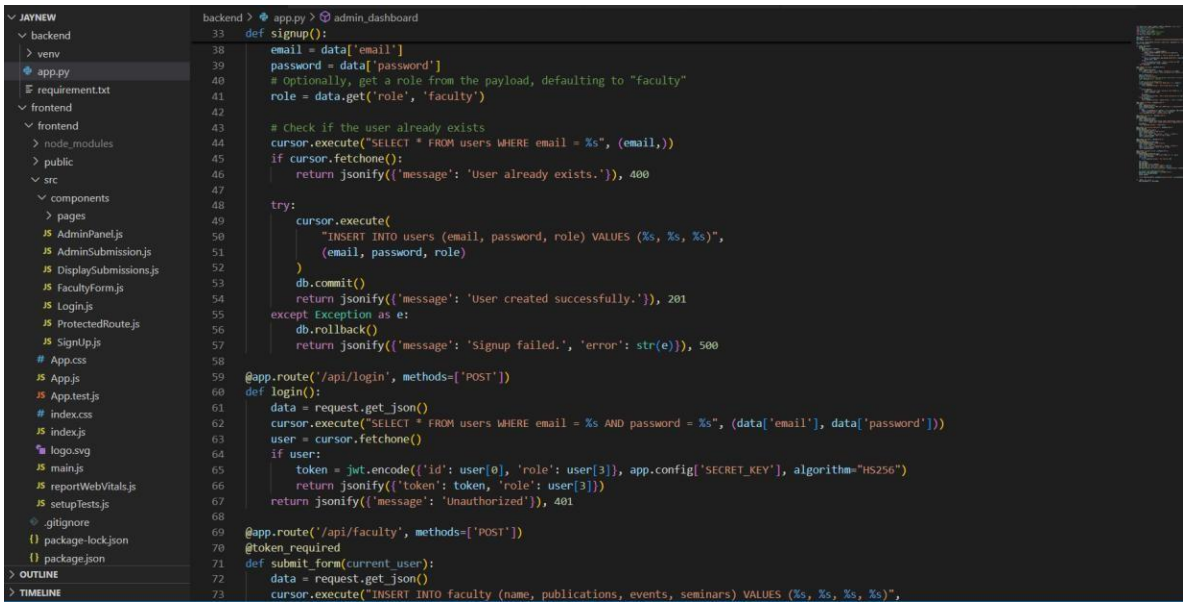
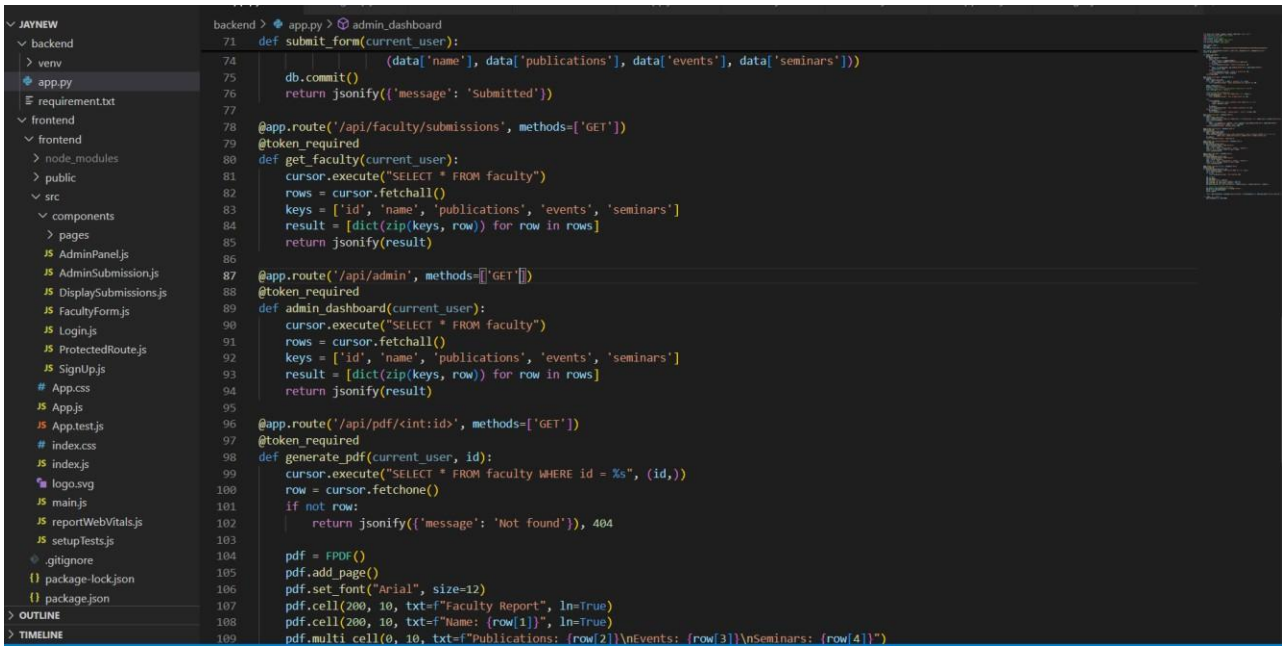
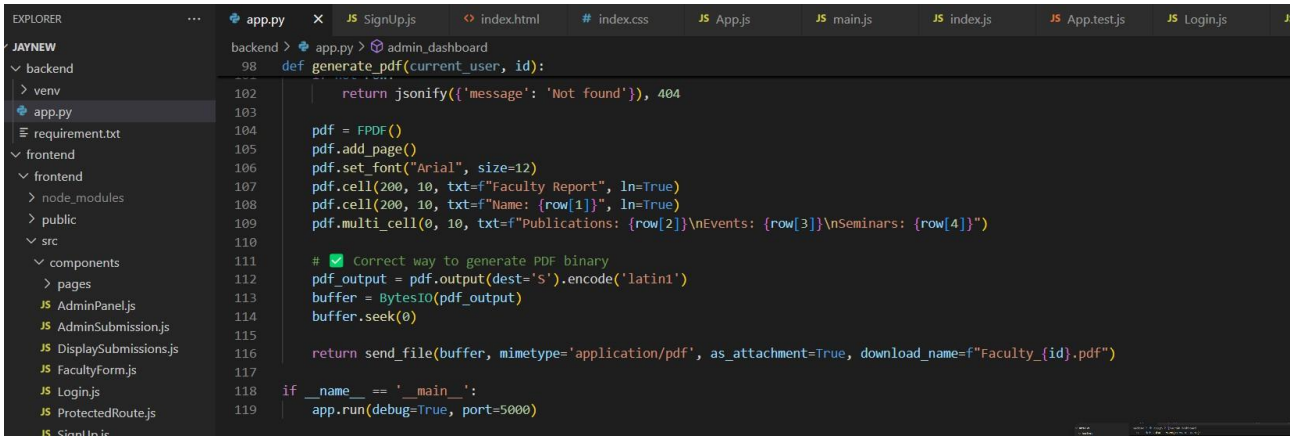


Fig 6.2 Backend Design [SQL connection]



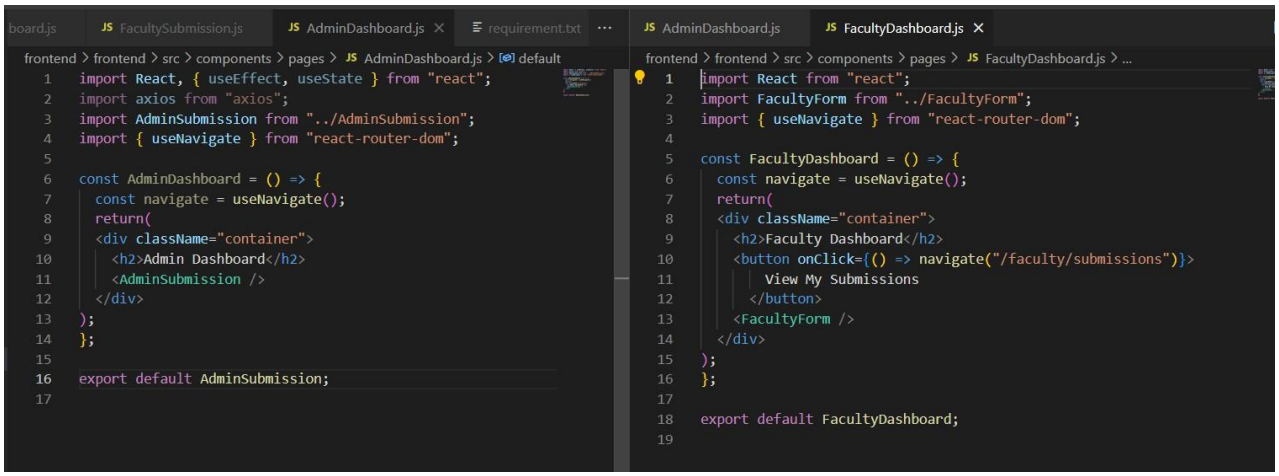
```
backend > app.py > admin_dashboard
def submit_form(current_user):
                (data['name'], data['publications'], data['events'], data['seminars']))
    db.commit()
    return jsonify({'message': 'Submitted'})

@app.route('/api/faculty/submissions', methods=['GET'])
@token_required
def get_faculty(current_user):
    cursor.execute("SELECT * FROM faculty")
    rows = cursor.fetchall()
    keys = ['id', 'name', 'publications', 'events', 'seminars']
    result = [dict(zip(keys, row)) for row in rows]
    return jsonify(result)

@app.route('/api/admin', methods=['GET'])
@token_required
def admin_dashboard(current_user):
    cursor.execute("SELECT * FROM faculty")
    rows = cursor.fetchall()
    keys = ['id', 'name', 'publications', 'events', 'seminars']
    result = [dict(zip(keys, row)) for row in rows]
    return jsonify(result)

@app.route('/api/pdf/<int:id>', methods=['GET'])
@token_required
def generate_pdf(current_user, id):
    cursor.execute("SELECT * FROM faculty WHERE id = %s", (id,))
    row = cursor.fetchone()
    if not row:
        return jsonify({'message': 'Not found'}), 404

    pdf = FPDF()
    pdf.add_page()
    pdf.set_font("Arial", size=12)
    pdf.cell(200, 10, txt=f"Faculty Report", ln=True)
    pdf.cell(200, 10, txt=f"Name: {row[1]}", ln=True)
    pdf.multi_cell(0, 10, txt=f"Publications: {row[2]}\nEvents: {row[3]}\nSeminars: {row[4]}")
```

Fig 6.3 Backend Design [Faculty page connection]



```
backend > app.py > admin_dashboard
def generate_pdf(current_user, id):
        return jsonify({'message': 'Not found'}), 404

    pdf = FPDF()
    pdf.add_page()
    pdf.set_font("Arial", size=12)
    pdf.cell(200, 10, txt=f"Faculty Report", ln=True)
    pdf.cell(200, 10, txt=f"Name: {row[1]}", ln=True)
    pdf.multi_cell(0, 10, txt=f"Publications: {row[2]}\nEvents: {row[3]}\nSeminars: {row[4]}")

    # ✅ Correct way to generate PDF binary
    pdf_output = pdf.output(dest='S').encode('latin1')
    buffer = BytesIO(pdf_output)
    buffer.seek(0)

    return send_file(buffer, mimetype='application/pdf', as_attachment=True, download_name=f"Faculty_{id}.pdf")

if __name__ == '__main__':
    app.run(debug=True, port=5000)
```

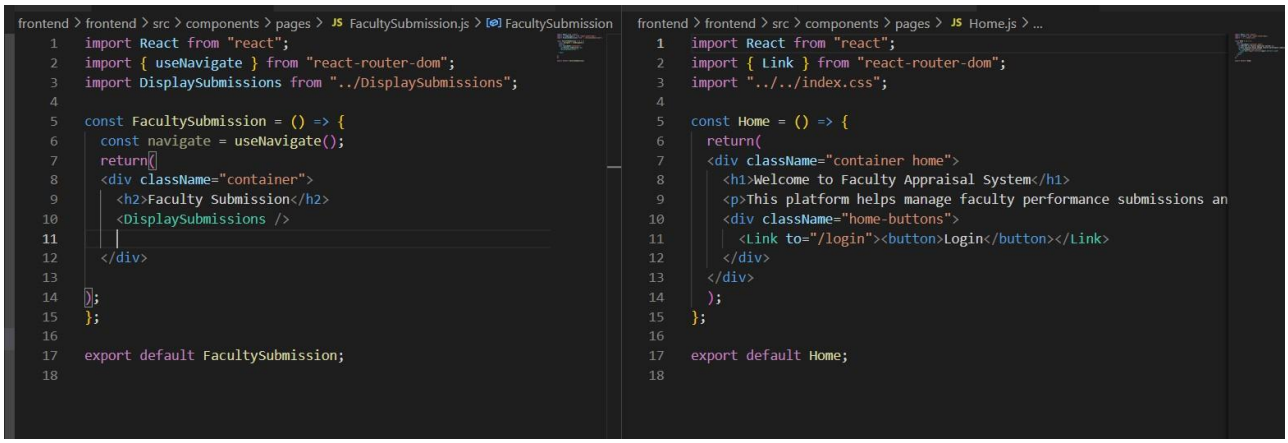
Fig 6.4 Backend Design [PDF download connection]



```
frontend > frontend > src > components > pages > AdminDashboard.js > default
import React, { useEffect, useState } from "react";
import axios from "axios";
import AdminSubmission from "../AdminSubmission";
import { useNavigate } from "react-router-dom";

const AdminDashboard = () => {
  const navigate = useNavigate();
  return(
  <div className="container">
    <h2>Admin Dashboard</h2>
    <AdminSubmission />
  </div>
);
};

export default AdminSubmission;
```

```
frontend > frontend > src > components > pages > FacultyDashboard.js > ...
import React from "react";
import FacultyForm from "../FacultyForm";
import { useNavigate } from "react-router-dom";

const FacultyDashboard = () => {
  const navigate = useNavigate();
  return(
  <div className="container">
    <h2>Faculty Dashboard</h2>
    <button onClick={() => navigate("/faculty/submissions")}>
        View My Submissions
    </button>
    <FacultyForm />
  </div>
);
};

export default FacultyDashboard;
```

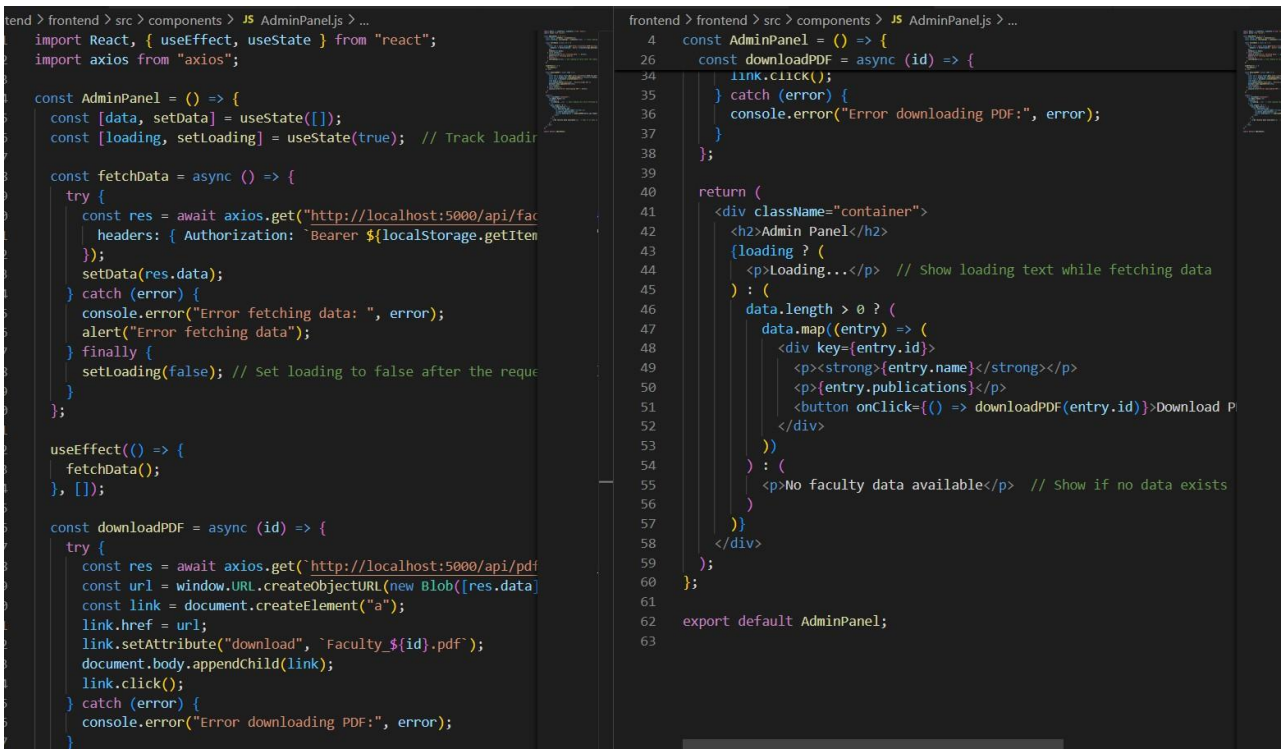
Fig 6.5 Front-end Design [ADMIN & FACULTY Dashboard]



```
frontend > frontend > src > components > pages > JS FacultySubmission.js > FacultySubmission
1   import React from "react";
2   import { useNavigate } from "react-router-dom";
3   import DisplaySubmissions from "../DisplaySubmissions";
4
5   const FacultySubmission = () => {
6     const navigate = useNavigate();
7     return(
8     <div className="container">
9       <h2>Faculty Submission</h2>
10      <DisplaySubmissions />
11
12    </div>
13
14  );
15  };
16
17  export default FacultySubmission;
18
```

```
frontend > frontend > src > components > pages > JS Home.js > ...
1   import React from "react";
2   import { Link } from "react-router-dom";
3   import "../../index.css";
4
5   const Home = () => {
6     return(
7     <div className="container home">
8       <h1>Welcome to Faculty Appraisal System</h1>
9       <p>This platform helps manage faculty performance submissions an
10      <div className="home-buttons">
11        <Link to="/login"><button>Login</button></Link>
12      </div>
13    </div>
14    );
15  };
16
17  export default Home;
18
```

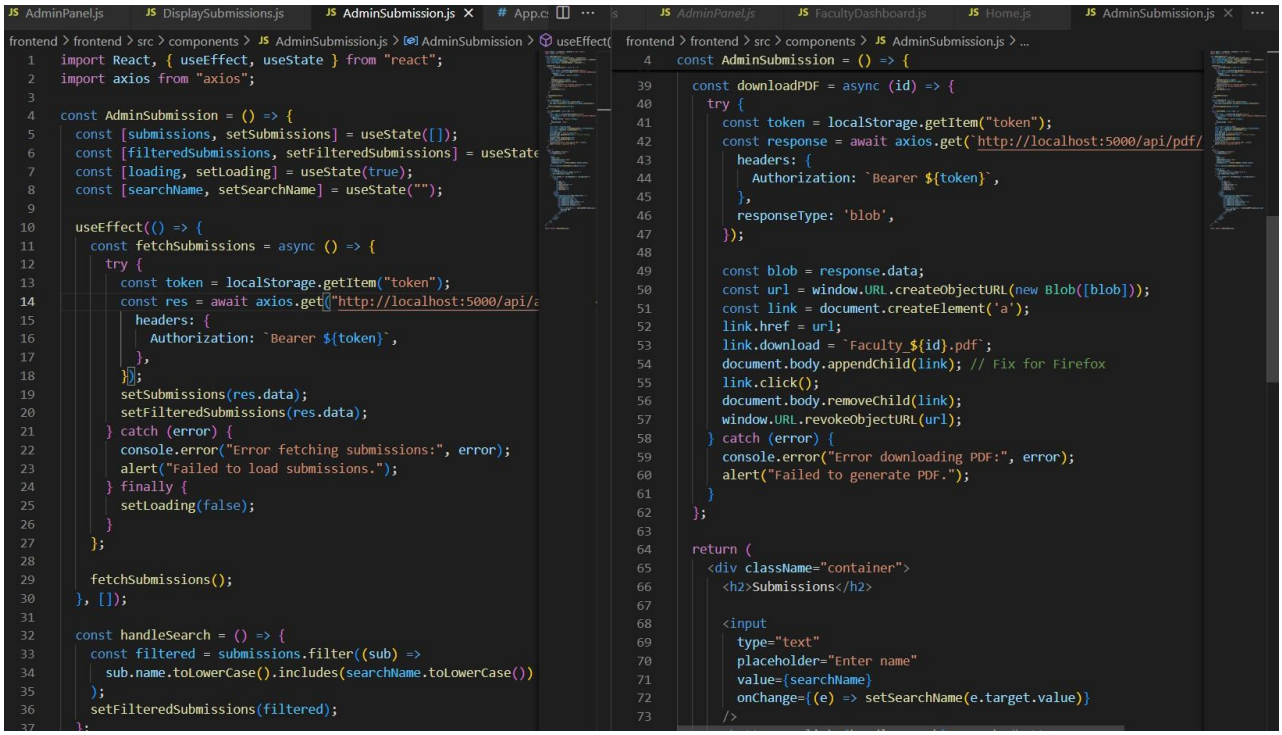
Fig 6.6 Front-end Design [Home page and Faculty Submission



```
tend > frontend > src > components > JS AdminPanel.js > ...
  import React, { useEffect, useState } from "react";
  import axios from "axios";

  const AdminPanel = () => {
    const [data, setData] = useState([]);
    const [loading, setLoading] = useState(true);  // Track loadir

    const fetchData = async () => {
      try {
        const res = await axios.get("http://localhost:5000/api/fac
          headers: { Authorization: `Bearer ${localStorage.getItem
        });
        setData(res.data);
      } catch (error) {
        console.error("Error fetching data: ", error);
        alert("Error fetching data");
      } finally {
        setLoading(false); // Set loading to false after the reque
      }
    };

    useEffect(() => {
      fetchData();
    }, []);

    const downloadPDF = async (id) => {
      try {
        const res = await axios.get(`http://localhost:5000/api/pdf
        const url = window.URL.createObjectURL(new Blob([res.data]
        const link = document.createElement("a");
        link.href = url;
        link.setAttribute("download", `Faculty_${id}.pdf`);
        document.body.appendChild(link);
        link.click();
      } catch (error) {
        console.error("Error downloading PDF:", error);
      }
```

```
frontend > frontend > src > components > JS AdminPanel.js > ...
4   const AdminPanel = () => {
26    const downloadPDF = async (id) => {
34      link.click();
35    } catch (error) {
36      console.error("Error downloading PDF:", error);
37    }
38  };
39
40  return (
41    <div className="container">
42      <h2>Admin Panel</h2>
43      {loading ? (
44        <p>Loading...</p>  // Show loading text while fetching data
45      ) : (
46        data.length > 0 ? (
47          data.map((entry) => (
48            <div key={entry.id}>
49              <p><strong>{entry.name}</strong></p>
50              <p>{entry.publications}</p>
51              <button onClick={() => downloadPDF(entry.id)}>Download P
52            </div>
53          ))
54        ) : (
55          <p>No faculty data available</p>  // Show if no data exists
56        )
57      )}
58    </div>
59  );
60  };
61
62  export default AdminPanel;
63
```

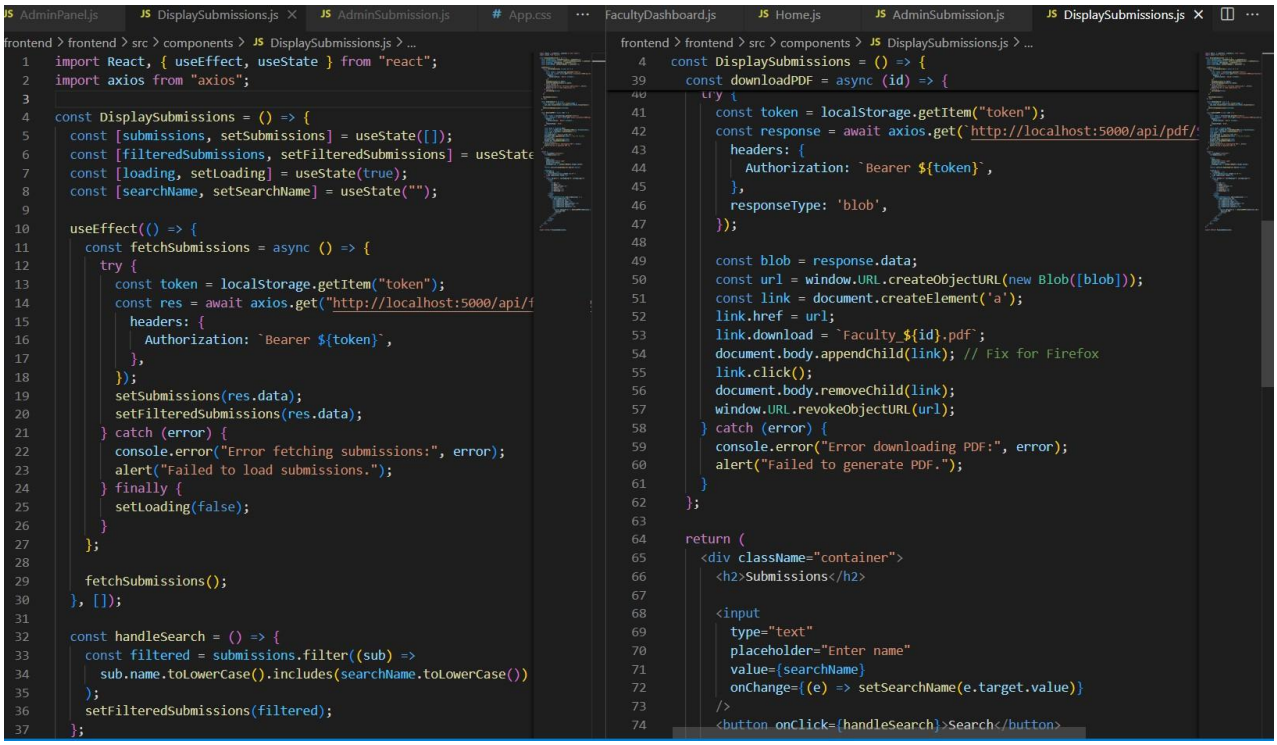
Fig 6.7 Front-end Design [Admin panel]



```
import React, { useEffect, useState } from "react";
import axios from "axios";

const AdminSubmission = () => {
  const [submissions, setSubmissions] = useState([]);
  const [filteredSubmissions, setFilteredSubmissions] = useState
  const [loading, setLoading] = useState(true);
  const [searchName, setSearchName] = useState("");

  useEffect(() => {
    const fetchSubmissions = async () => {
      try {
        const token = localStorage.getItem("token");
        const res = await axios.get("http://localhost:5000/api/
          headers: {
            Authorization: `Bearer ${token}`,
          },
        });
        setSubmissions(res.data);
        setFilteredSubmissions(res.data);
      } catch (error) {
        console.error("Error fetching submissions:", error);
        alert("Failed to load submissions.");
      } finally {
        setLoading(false);
      }
    };

    fetchSubmissions();
  }, []);

  const handleSearch = () => {
    const filtered = submissions.filter((sub) =>
      sub.name.toLowerCase().includes(searchName.toLowerCase())
    );
    setFilteredSubmissions(filtered);
  };
```

```
const AdminSubmission = () => {
  const downloadPDF = async (id) => {
    try {
      const token = localStorage.getItem("token");
      const response = await axios.get(`http://localhost:5000/api/pdf/
        headers: {
          Authorization: `Bearer ${token}`,
        },
        responseType: 'blob',
      });

      const blob = response.data;
      const url = window.URL.createObjectURL(new Blob([blob]));
      const link = document.createElement('a');
      link.href = url;
      link.download = `Faculty_${id}.pdf`;
      document.body.appendChild(link); // Fix for Firefox
      link.click();
      document.body.removeChild(link);
      window.URL.revokeObjectURL(url);
    } catch (error) {
      console.error("Error downloading PDF:", error);
      alert("Failed to generate PDF.");
    }
  };

  return (
    <div className="container">
      <h2>Submissions</h2>

      <input
        type="text"
        placeholder="Enter name"
        value={searchName}
        onChange={(e) => setSearchName(e.target.value)}
      />
```

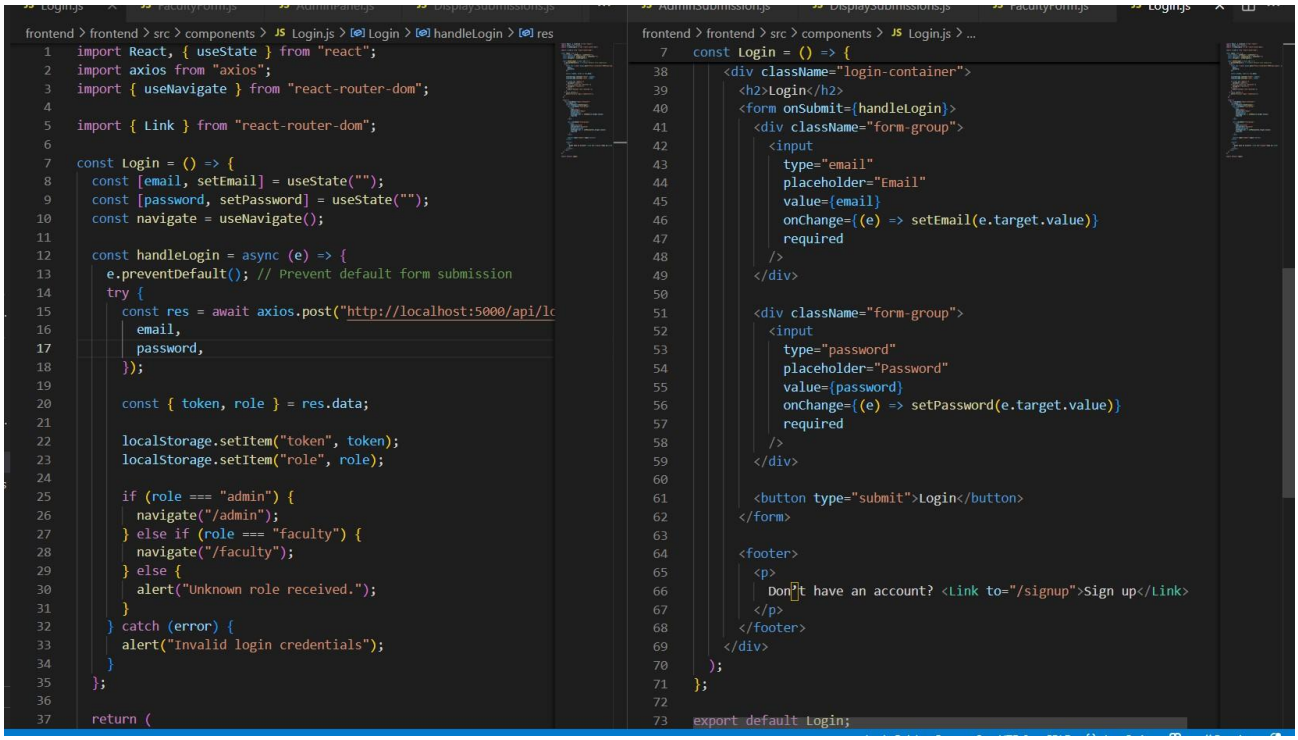
Fig 6.8 Front-end Design [Admin submission]



```
import React, { useEffect, useState } from "react";
import axios from "axios";

const DisplaySubmissions = () => {
  const [submissions, setSubmissions] = useState([]);
  const [filteredSubmissions, setFilteredSubmissions] = useState
  const [loading, setLoading] = useState(true);
  const [searchName, setSearchName] = useState("");

  useEffect(() => {
    const fetchSubmissions = async () => {
      try {
        const token = localStorage.getItem("token");
        const res = await axios.get("http://localhost:5000/api/f
          headers: {
            Authorization: `Bearer ${token}`,
          },
        });
        setSubmissions(res.data);
        setFilteredSubmissions(res.data);
      } catch (error) {
        console.error("Error fetching submissions:", error);
        alert("Failed to load submissions.");
      } finally {
        setLoading(false);
      }
    };

    fetchSubmissions();
  }, []);

  const handleSearch = () => {
    const filtered = submissions.filter((sub) =>
      sub.name.toLowerCase().includes(searchName.toLowerCase())
    );
    setFilteredSubmissions(filtered);
  };
```

```
const DisplaySubmissions = () => {
  const downloadPDF = async (id) => {
    try {
      const token = localStorage.getItem("token");
      const response = await axios.get(`http://localhost:5000/api/pdf/
        headers: {
          Authorization: `Bearer ${token}`,
        },
        responseType: 'blob',
      });

      const blob = response.data;
      const url = window.URL.createObjectURL(new Blob([blob]));
      const link = document.createElement('a');
      link.href = url;
      link.download = `Faculty_${id}.pdf`;
      document.body.appendChild(link); // Fix for Firefox
      link.click();
      document.body.removeChild(link);
      window.URL.revokeObjectURL(url);
    } catch (error) {
      console.error("Error downloading PDF:", error);
      alert("Failed to generate PDF.");
    }
  };

  return (
    <div className="container">
      <h2>Submissions</h2>

      <input
        type="text"
        placeholder="Enter name"
        value={searchName}
        onChange={(e) => setSearchName(e.target.value)}
      />
      <button onClick={handleSearch}>Search</button>
```

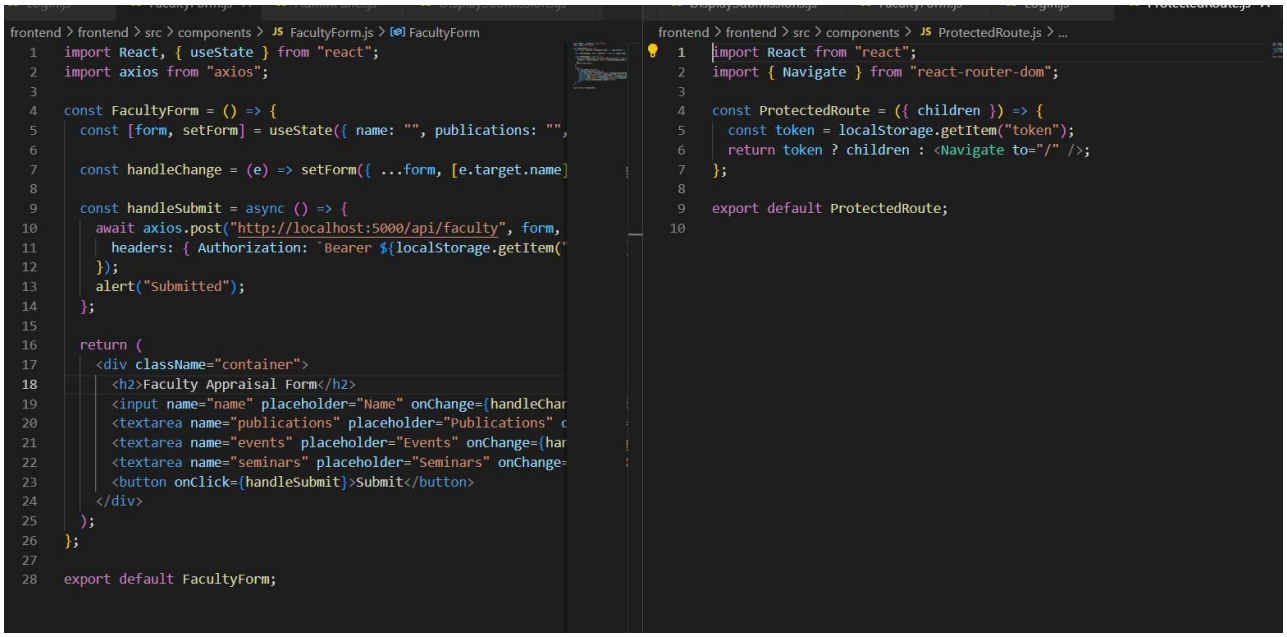
Fig 6.9 Front-end Design [Display submission]



```
frontend > frontend > src > components > Login.js > Login > handleLogin > res
import React, { useState } from "react";
import axios from "axios";
import { useNavigate } from "react-router-dom";

import { Link } from "react-router-dom";

const Login = () => {
  const [email, setEmail] = useState("");
  const [password, setPassword] = useState("");
  const navigate = useNavigate();

  const handleLogin = async (e) => {
    e.preventDefault(); // Prevent default form submission
    try {
      const res = await axios.post("http://localhost:5000/api/lc
        email,
        password,
      });

      const { token, role } = res.data;

      localStorage.setItem("token", token);
      localStorage.setItem("role", role);

      if (role === "admin") {
        navigate("/admin");
      } else if (role === "faculty") {
        navigate("/faculty");
      } else {
        alert("Unknown role received.");
      }
    } catch (error) {
      alert("Invalid login credentials");
    }
  };

  return (
```

```
frontend > frontend > src > components > Login.js > ...
const Login = () => {
    <div className="login-container">
      <h2>Login</h2>
      <form onSubmit={handleLogin}>
        <div className="form-group">
          <input
            type="email"
            placeholder="Email"
            value={email}
            onChange={(e) => setEmail(e.target.value)}
            required
          />
        </div>

        <div className="form-group">
          <input
            type="password"
            placeholder="Password"
            value={password}
            onChange={(e) => setPassword(e.target.value)}
            required
          />
        </div>

        <button type="submit">Login</button>
      </form>

      <footer>
        <p>
          Don't have an account? <Link to="/signup">Sign up</Link>
        </p>
      </footer>
    </div>
  );
};

export default Login;
```

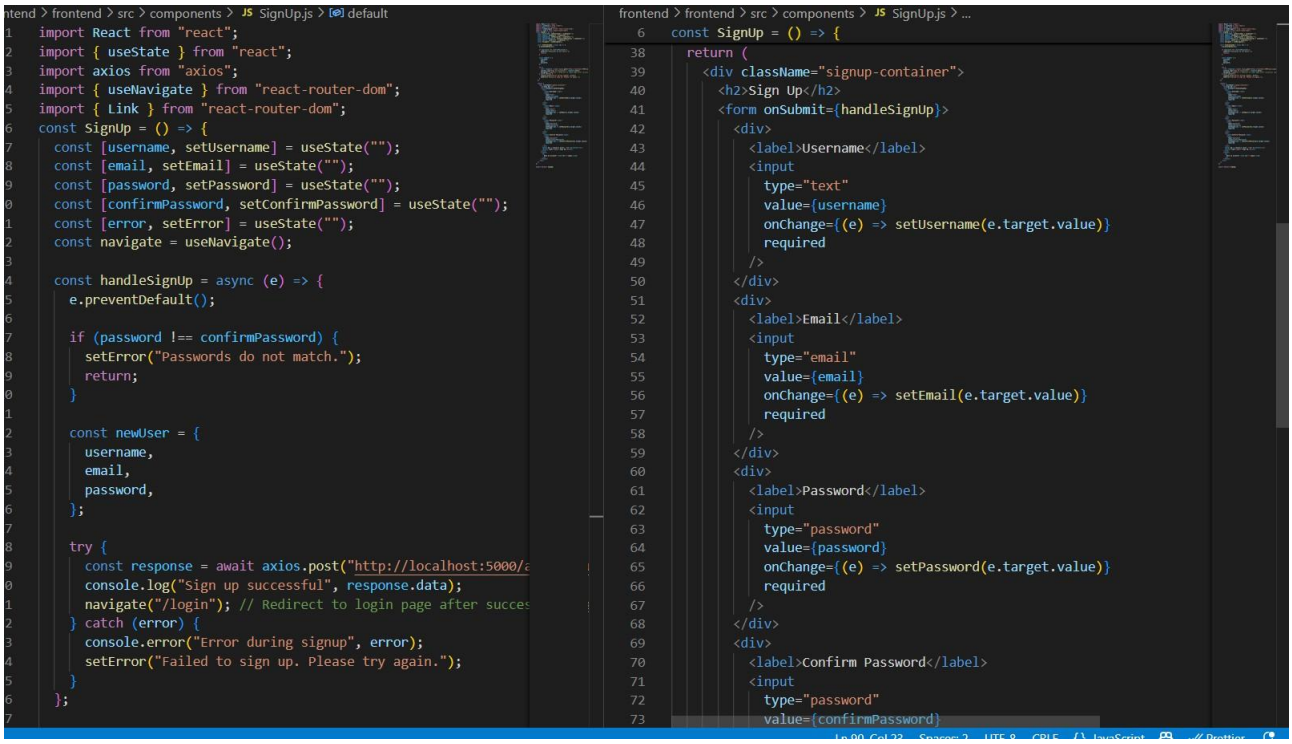
Fig 6.10 Front-end Design [Login page]



```
frontend > frontend > src > components > FacultyForm.js > FacultyForm
import React, { useState } from "react";
import axios from "axios";

const FacultyForm = () => {
  const [form, setForm] = useState({ name: "", publications: "",

  const handleChange = (e) => setForm({ ...form, [e.target.name]

  const handleSubmit = async () => {
    await axios.post("http://localhost:5000/api/faculty", form,
      headers: { Authorization: `Bearer ${localStorage.getItem("
    });
    alert("Submitted");
  };

  return (
    <div className="container">
      <h2>Faculty Appraisal Form</h2>
      <input name="name" placeholder="Name" onChange={handleChar
      <textarea name="publications" placeholder="Publications" c
      <textarea name="events" placeholder="Events" onChange={har
      <textarea name="seminars" placeholder="Seminars" onChange=
      <button onClick={handleSubmit}>Submit</button>
    </div>
  );
};

export default FacultyForm;
```

```
frontend > frontend > src > components > ProtectedRoute.js > ...
import React from "react";
import { Navigate } from "react-router-dom";

const ProtectedRoute = ({ children }) => {
  const token = localStorage.getItem("token");
  return token ? children : <Navigate to="/" />;
};

export default ProtectedRoute;
```

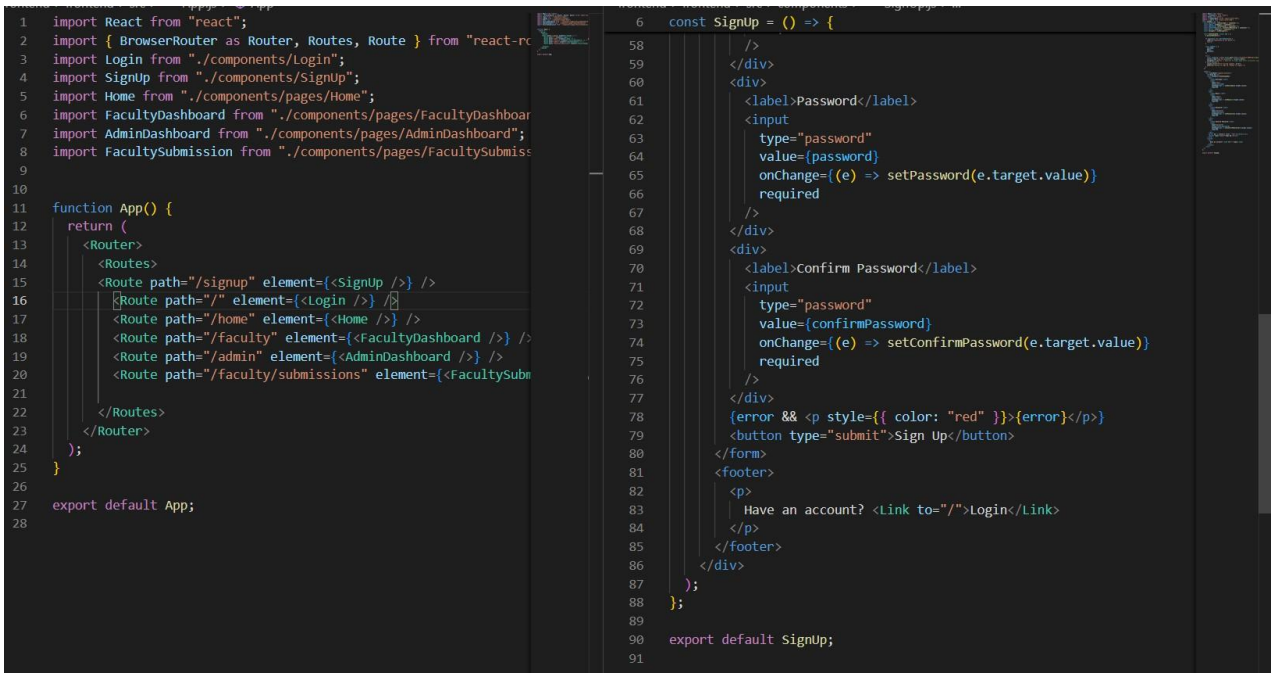
Fig 6.11 Front-end Design[Faculty Form]



```
import React from "react";
import { useState } from "react";
import axios from "axios";
import { useNavigate } from "react-router-dom";
import { Link } from "react-router-dom";
const SignUp = () => {
  const [username, setUsername] = useState("");
  const [email, setEmail] = useState("");
  const [password, setPassword] = useState("");
  const [confirmPassword, setConfirmPassword] = useState("");
  const [error, setError] = useState("");
  const navigate = useNavigate();

  const handleSignUp = async (e) => {
    e.preventDefault();

    if (password !== confirmPassword) {
      setError("Passwords do not match.");
      return;
    }

    const newUser = {
      username,
      email,
      password,
    };

    try {
      const response = await axios.post("http://localhost:5000/
      console.log("Sign up successful", response.data);
      navigate("/login"); // Redirect to login page after succes
    } catch (error) {
      console.error("Error during signup", error);
      setError("Failed to sign up. Please try again.");
    }
  };
```

```
const SignUp = () => {
  return (
    <div className="signup-container">
      <h2>Sign Up</h2>
      <form onSubmit={handleSignUp}>
        <div>
          <label>Username</label>
          <input
            type="text"
            value={username}
            onChange={(e) => setUsername(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Email</label>
          <input
            type="email"
            value={email}
            onChange={(e) => setEmail(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Password</label>
          <input
            type="password"
            value={password}
            onChange={(e) => setPassword(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Confirm Password</label>
          <input
            type="password"
            value={confirmPassword}
```

Fig 6.12 Front-end Design[Sign Up page]



```
import React from "react";
import { BrowserRouter as Router, Routes, Route } from "react-r
import Login from "./components/Login";
import SignUp from "./components/SignUp";
import Home from "./components/pages/Home";
import FacultyDashboard from "./components/pages/FacultyDashboar
import AdminDashboard from "./components/pages/AdminDashboard";
import FacultySubmission from "./components/pages/FacultySubmis


function App() {
  return (
    <Router>
      <Routes>
      <Route path="/signup" element={<SignUp />} />
        <Route path="/" element={<Login />} />
        <Route path="/home" element={<Home />} />
        <Route path="/faculty" element={<FacultyDashboard />} />
        <Route path="/admin" element={<AdminDashboard />} />
        <Route path="/faculty/submissions" element={<FacultySubm


      </Routes>
    </Router>
  );
}

export default App;
```

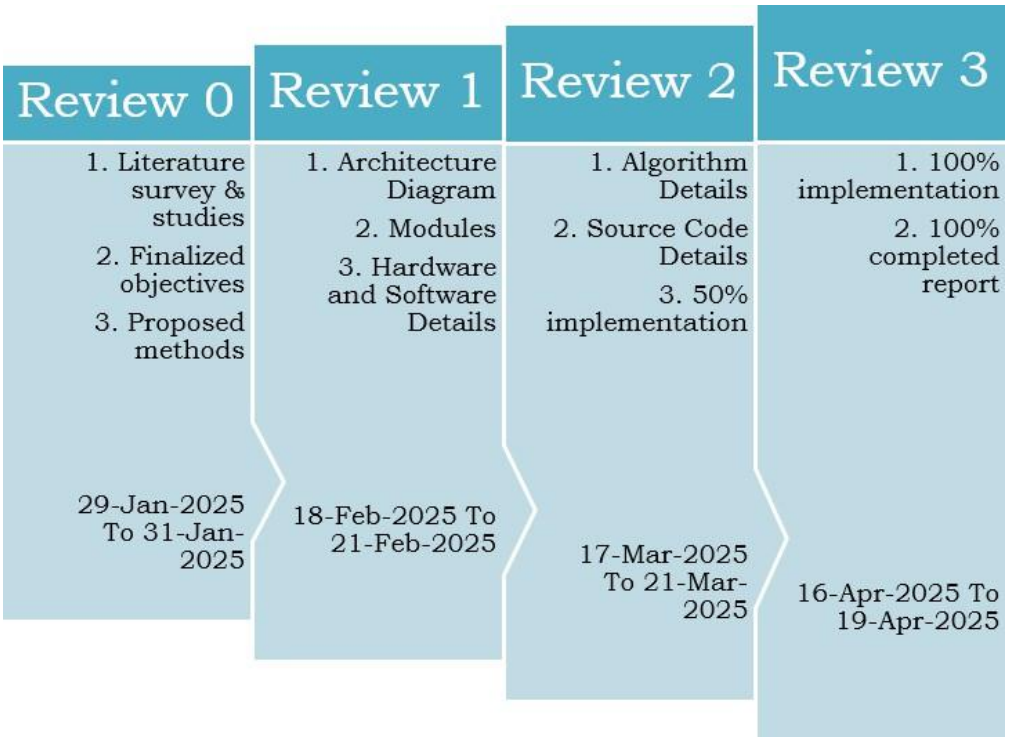
```
const SignUp = () => {
          />
        </div>
        <div>
          <label>Password</label>
          <input
            type="password"
            value={password}
            onChange={(e) => setPassword(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Confirm Password</label>
          <input
            type="password"
            value={confirmPassword}
            onChange={(e) => setConfirmPassword(e.target.value)}
            required
          />
        </div>
        {error && <p style={{ color: "red" }}>{error}</p>}
        <button type="submit">Sign Up</button>
      </form>
      <footer>
        <p>
          Have an account? <Link to="/">Login</Link>
        </p>
      </footer>
    </div>
  );
};

export default SignUp;
```

Fig 6.13 Front-end Design [App.js]

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)



CHAPTER 8
OUTCOMES

8.1 Introduction

The implementation of the Automated System for Career Advancements of the Faculties of Higher Education marks a significant step forward in institutional digital transformation. It addresses key challenges in the traditional faculty evaluation system—such as inefficiencies, opacity, delays, and lack of standardization—by introducing a comprehensive, data-driven platform for performance tracking and career advancement. This chapter explores the multi-dimensional outcomes anticipated from the system, structured across stakeholder-specific benefits, institutional improvements, and broader ecosystem impacts.

8.2 Faculty-Centric Outcomes

8.2.1 Digitally Empowered Academic Profiles

Faculty members will have access to personalized dashboards that act as their digital academic portfolio. The system allows for seamless integration of research publications, conference participation, workshops attended, patents filed, consultancy projects, and outreach activities—all in one place. This significantly reduces manual work and offers faculty a structured way to showcase their academic achievements.

These profiles can be used during internal assessments, external audits, promotion interviews, grant proposals, and even public academic networks like ResearchGate or ORCID.

8.2.2 Elimination of Redundancy and Repetitive Reporting

Traditionally, faculty members are required to report their activities in multiple formats across various departments—NAAC submissions, promotion dossiers, departmental reviews, etc. The proposed system eliminates such redundancy by providing a single source of truth, from which multiple standardized reports can be generated in real time, customized to the stakeholder's requirement.

This not only saves time but also reduces reporting fatigue and administrative burden on faculty.

8.2.3 Continuous Professional Development Tracking

The system provides a timeline view of academic activities, enabling faculty to track their own progress across semesters and academic years. Personalized feedback and system-generated recommendations (e.g., ―Next eligibility for promotion based on UGC norms‖) help faculty set clear career goals, identify performance gaps, and align with institutional benchmarks.

In the long run, this fosters a culture of continuous professional development and self-regulated learning among educators.

8.3 Administrative and Management Outcomes

8.3.1 Streamlined Faculty Appraisal Workflow

The proposed system completely redefines the faculty appraisal workflow, converting it into a paperless, secure, and traceable process. From submission to review and approval, every stage is tracked in real time. Department Heads and Review Committees can view faculty submissions, add comments, assign scores, and forward recommendations without paper movement.

This minimizes process delays, reduces dependency on physical files, and ensures that decisions are taken within the defined timeframe.

8.3.2 Evidence-Based Decision-Making

Institutional heads and policy makers can now base decisions on real-time, authentic, and structured faculty data. Whether it is identifying underperforming departments, granting study leaves, recommending training programs, or allocating departmental budgets—each decision can now be supported by data insights provided by the system's analytics dashboard.

This transition from intuition-led to **data-driven administration** improves accountability and transparency at all levels.

8.3.3 Audit-Readiness and Compliance Management

The system maintains a complete digital audit trail of each action—be it faculty entry, reviewer remark, or admin approval. This makes it **ready for internal audits, UGC inspections, NAAC/NBA evaluations, and RTI queries** at any time. Reports can be downloaded instantly with predefined formats for compliance submissions.

Such audit-readiness also reinforces the institution’s commitment to good governance and quality assurance.

8.4 Institutional-Level Impact

8.4.1 Centralized Repository of Institutional Knowledge

Over time, the system builds a rich knowledge base comprising thousands of data points across academic disciplines, faculty categories, and time periods. This database becomes a strategic asset for institutions—useful for trend analysis, policy planning, resource allocation, and long-term academic development.

Institutional leaders can monitor departmental performance, detect research clusters, and make informed investments in promising domains.

8.4.2 Institutional Branding and Ranking Benefits

Global and national institutional ranking frameworks such as NIRF, QS, and THE often consider faculty productivity, research output, and academic impact as key metrics. This system ensures that all such data is organized, verified, and readily available. As a result, institutions can confidently submit applications to ranking bodies, attract better student admissions, and secure more research collaborations and grants.

Over time, this contributes to improved brand perception and internationalization of the institution.

8.4.3 Seamless Integration with ERP and Smart Campus Solutions

The modular architecture of the proposed system enables integration with other digital initiatives such as student feedback systems, finance modules, e-library systems, and HRMS. Such interoperability strengthens the campus IT infrastructure, turning the institution into a truly smart and responsive entity.

This holistic digital ecosystem also appeals to tech-savvy faculty and students, positioning the institution as future-ready.

8.5 Broader Systemic and Educational Impact

8.5.1 Establishing National Academic Data Standards

As more institutions adopt similar automated systems, a standard academic data model will gradually emerge. This paves the way for national-level repositories that can benchmark faculty performance across institutions, support nationwide ranking systems, and identify areas of research excellence and deficiency.

Such standardization facilitates inter-institutional collaborations and cross-border academic mobility.

8.5.2 Promoting Ethical Appraisal Practices

By removing discretionary practices, maintaining audit logs, and offering transparent scorecards, the system promotes fairness and equity in career advancements. This encourages merit-based growth and fosters trust among faculty members.

Ultimately, it helps to mitigate bias, favoritism, and inconsistency—issues often cited in traditional evaluation practices.

8.5.3 Strengthening Public Trust in Higher Education

When institutions demonstrate that promotions and academic rewards are granted based on verified evidence and structured appraisal, it boosts public confidence in the integrity of higher education. This is particularly important for government institutions, which are publicly funded and must operate with the highest ethical standards.

The transparency and efficiency delivered by the system reflect directly on the institution's governance model and commitment to educational excellence.

8.6 Summary

In conclusion, the *Automated System for Career Advancements of the Faculties of Higher Education* is designed to bring tangible and measurable improvements in faculty appraisal, academic governance, and institutional credibility. It empowers educators, streamlines administrative efforts, and strengthens the institution’s digital backbone. The long-term benefits go far beyond operational convenience—they reshape the way academic value is recognized, recorded, and rewarded.

This system not only aligns with the National Education Policy (NEP) 2020 vision of digitization and accountability but also sets the stage for a future-ready, globally competitive higher education ecosystem.

CHAPTER 9

RESULTS AND DISCUSSIONS

1. Signup Page

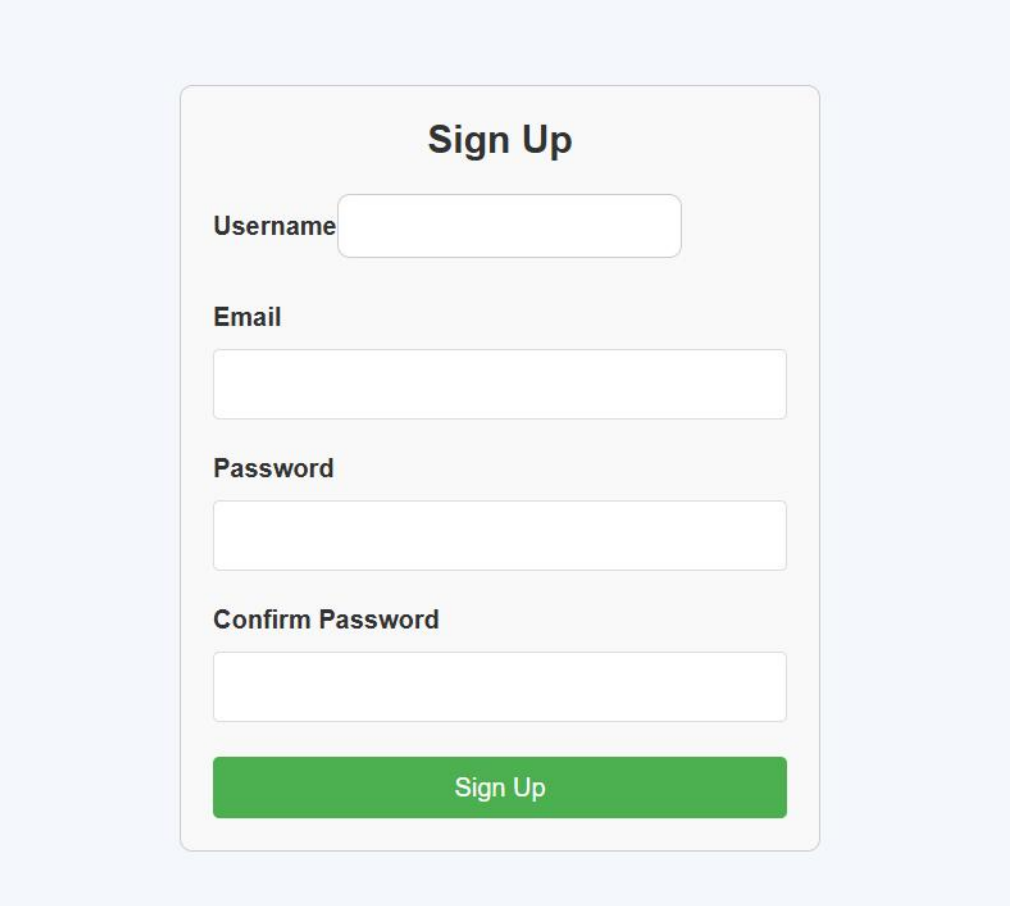


Fig 9.1 Signup Page

This screenshot displays the signup page for a web-based portal, most likely part of a faculty self-appraisal system used in higher education. The primary goal of this page is to register new users (faculty members) into the system so they can access and fill out their academic performance forms.

Interface Features:

- The page consists of a form with input fields including:
  - Email
  - Password and Confirm Password
- Each input is clearly labeled, making the user experience straightforward.
- A Submit button is placed at the bottom to finalize registration.

Design Elements:

- The design is clean and minimal, sticking to professional and functional UI principles—perfectly fitting the theme of a government or institutional portal.
- Field validations are likely implemented to ensure correct input formats (especially for email and password matching).

Purpose & Functionality: This signup page ensures that each faculty member has a unique, verified account. Once signed up, the system can track their individual appraisal submissions, automatically associate achievements with their profile, and enforce role-based access control. The information collected here is essential for identifying the faculty member within the institution and tying their appraisal records to the correct user.

This page serves as the entry point into the system, and its simplicity ensures easy onboarding for users from various academic backgrounds, even those with limited technical proficiency.

2. Faculty Dashboard for Appraisal Form Filling

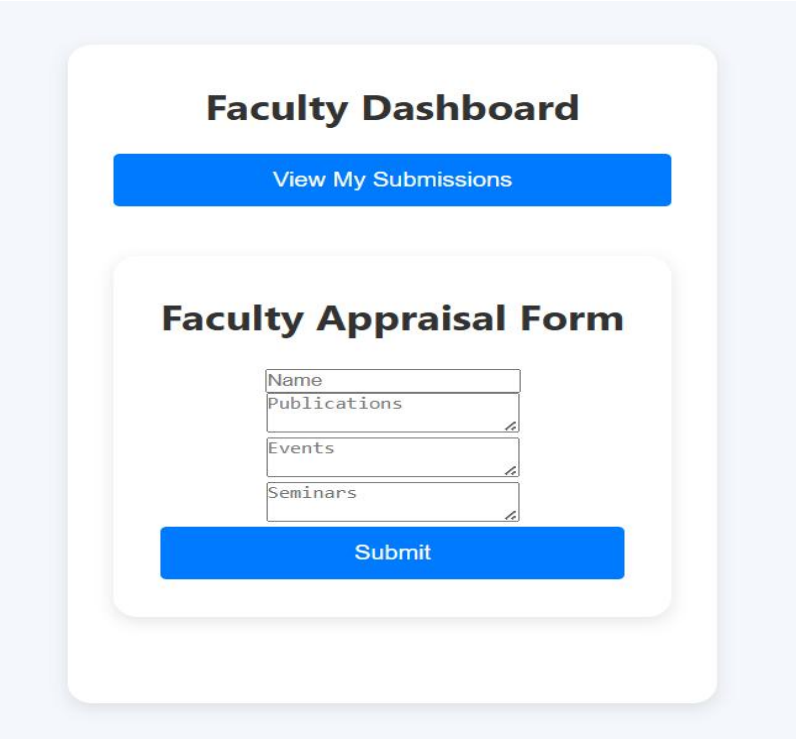


Fig 9.2 Faculty Dashboard for Appraisal Form Filling

This image shows the dashboard interface for a logged-in faculty member. Here, the user can fill out and submit various sections of their self-appraisal form — which may include teaching activities, research work, administrative duties, and more.

Main Features Visible:

- A structured multi-tab or multi-section layout, where each tab likely corresponds to a different appraisal component (e.g., Teaching, Research, Workshops, Projects).
- In this image, a specific section of the form is open, allowing the faculty to:
    - Add a title or description of the achievement.
    - Select the category or type of activity.
    - Provide date ranges (start and end date).
    - Attach supporting documents via a file upload.
- There is a ―Submit‖ or ―Save‖ button for saving this particular entry.

User Experience:

- The dashboard is designed to be modular and intuitive, so faculty can gradually complete the form over time without needing to do it all in one session.
- Upload options and dropdowns make data entry fast and less error-prone.

Purpose: This dashboard is the core workspace for faculty members. It ensures structured data collection, allowing the system to later evaluate and generate reports for each faculty based on performance. Each form submission is likely stored in the backend and tied to that user's account for administrative review.

3. Admin View Submitted Forms Page

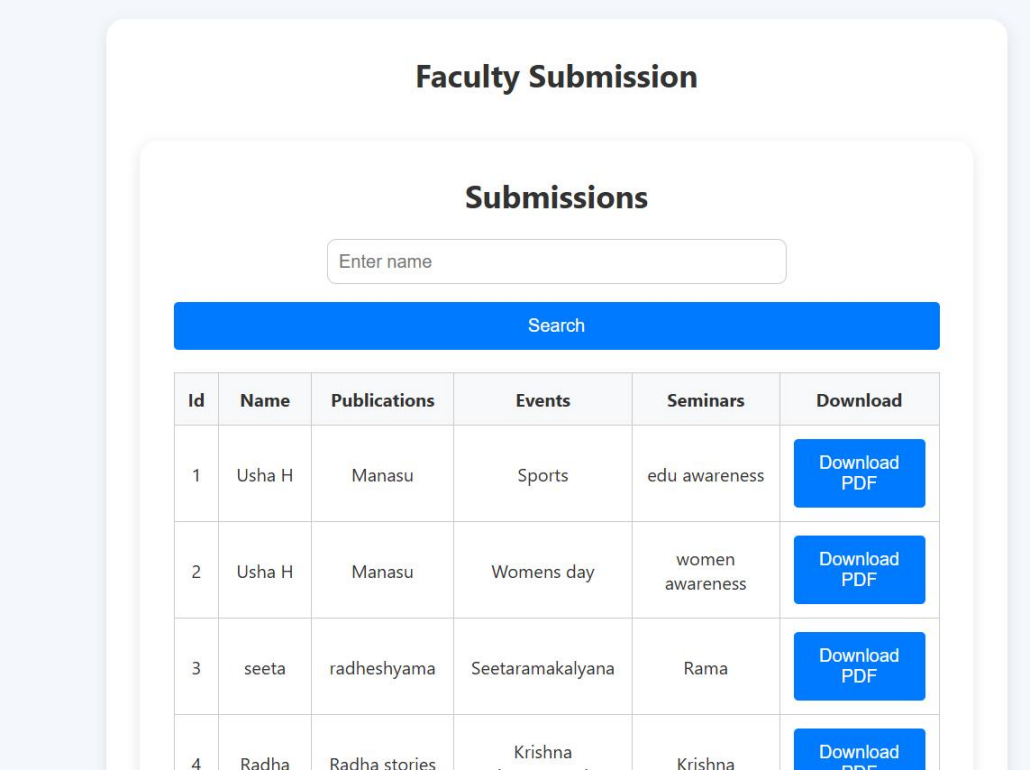


Fig 9.3 Admin View Submitted Forms Page

The third screenshot represents the administrator's or reviewer's panel, where all submitted self-appraisal forms by faculty members are displayed in an organized table format. This is the verification and processing stage of the workflow.

Features Observed:

- A large table with columns such as:
  - Faculty Name
  - Submission Title or ID
  - Date of Submission
  - Status (e.g., Submitted, Reviewed)
  - Actions – such as View, Download, or possibly Approve/Reject buttons
- Admins can click to view full submissions, check attached documents, and even download the forms as PDFs or reports.

Functionality:

- The admin uses this interface to review all incoming submissions, ensuring completeness and correctness.

- This panel likely supports filtering by department, submission date, or status to streamline the review process.

Purpose: This page plays a critical role in the career advancement workflow. It ensures the administration can efficiently handle appraisals at scale, maintain accountability, and preserve digital records. It also supports transparency by giving admins a clear view of each faculty member's contributions and progress.

4. Faculty Submission Search Page

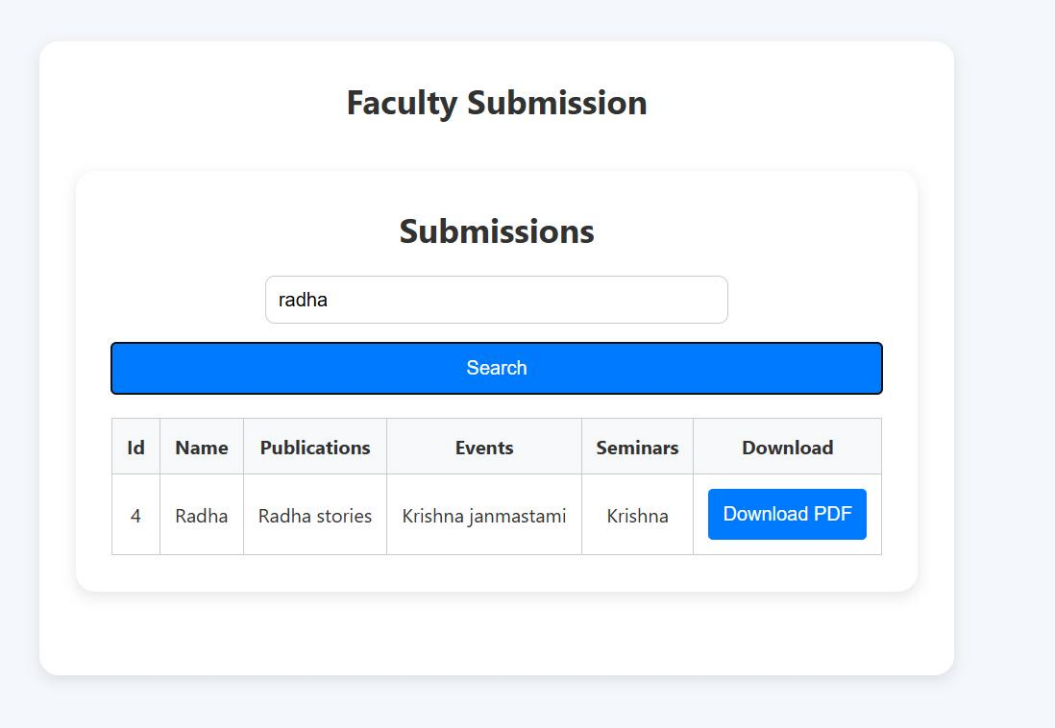


Fig 9.4 Faculty Submission Search Page

The first image displays the **Faculty Submission** interface, a dedicated module designed for administrators or evaluators to easily manage and access the self-appraisal data submitted by faculty members. At the heart of this page is a user-friendly search functionality, allowing the admin to enter a faculty member’s name and retrieve their corresponding submission details. The layout is clean and centered around efficiency, with a prominent header titled ―Submissions‖ and a single input box that invites users to type in any faculty name or

keyword. Once the keyword is entered—like "Radha" in this case—the system filters through the stored records and dynamically updates the results below.

The search results are presented in a tabular format, ensuring clarity and quick reference. The table includes essential columns such as Id, Name, Publications, Events, Seminars, and a Download option. Each row corresponds to one faculty submission. For example, faculty ID 4 named Radha has submitted details including a publication titled ―Radha stories,‖ participation in an event ―Krishna Janmastami,‖ and conducted a seminar on ―Krishna.‖ To facilitate further evaluation or record keeping, a Download PDF button is available on the rightmost column. By clicking this button, the full appraisal form submitted by the faculty can be downloaded in a PDF format, allowing offline review, printing, or archival.

The intuitive design of this page makes it an essential tool for academic administrators handling annual performance evaluations, promotions, or faculty development programs. It also demonstrates how digitizing administrative tasks can save time, reduce paperwork, and bring transparency to the appraisal workflow.

5. Admin Login Page

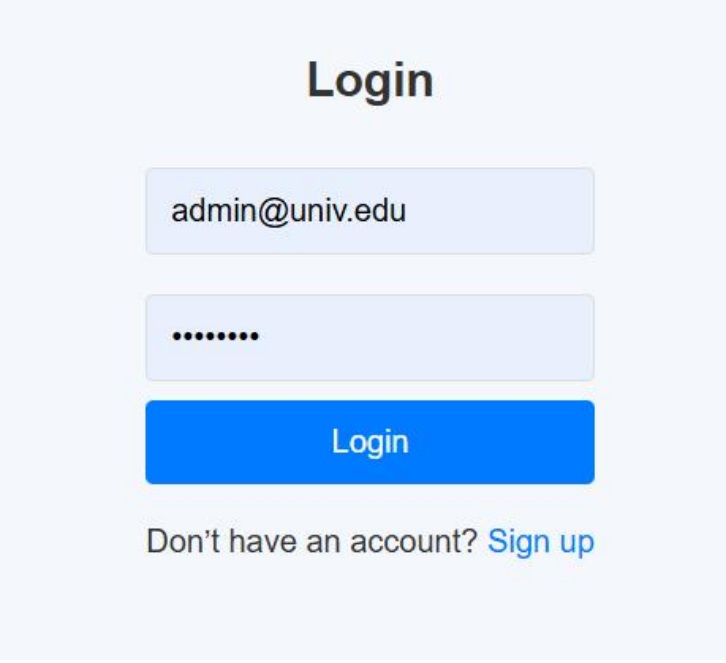


Fig 9.5 Admin Login Page

The second image depicts a simple and efficient **Admin Login Page**. This page serves as the secure entry point for university administrators to access the backend module of the Faculty Appraisal System. With a minimalistic design, the interface ensures that admins can quickly log in using their credentials. The form includes two primary input fields—one for the email address and another for the password—followed by a large blue ―Login‖ button that initiates the authentication process.

The example credentials filled in the image (email: admin@univ.edu) indicate that this is a dedicated admin login, possibly restricted to authorized users such as department heads, HR evaluators, or institutional administrators. Beneath the login form is a helpful link prompting new users to ―Sign up‖ if they do not have an account yet, providing flexibility and inclusivity in access.

Upon successful login, the admin is immediately navigated to the faculty submission list page, which is the interface shown in the first image. This seamless transition ensures quick access to the core functionality of the system. The direct routing from login to the submission dashboard reflects a user-centered design philosophy, reducing unnecessary steps and optimizing the admin workflow. This integration between login and dashboard access also adds a layer of efficiency and streamlining, which is critical in managing large-scale faculty data across academic institutions.

In sum, the login page acts as the secure gateway to the powerful backend management system and is crucial for ensuring that only authenticated users can access and manipulate sensitive faculty information.

CHAPTER 10
CONCLUSION

The system provides a structured framework for faculty self-appraisal submissions, automated performance tracking, and report generation. By leveraging modern web technologies, including React for the frontend, Node.js for the backend, and MySQL for database management, the project achieves a scalable and secure infrastructure that can be adopted by higher education institutions.

Through extensive testing and validation, the system demonstrates significant improvements in efficiency, accuracy, and accessibility compared to conventional appraisal methods. The integration of data analytics further enhances decision-making for faculty promotions and academic growth. The role-based access control ensures data security and privacy, maintaining the integrity of faculty records.

Despite the success of the system, future enhancements can further refine its functionality. The integration of AI-based predictive analytics, external academic databases, and a mobile application can enhance user experience and system efficiency.

In conclusion, provides a comprehensive, automated, and scalable solution for faculty career advancements, transforming the appraisal process and fostering professional growth in the academic sector. By adopting this system, institutions can streamline faculty evaluations, enhance transparency, and support data-driven decision-making for improved academic development.

This project set out to conceptualize, design, and propose an automated system tailored to streamline the career advancement process of faculty members in higher education institutions. Rooted in the necessity to modernize traditional academic evaluation practices, the proposed solution integrates digital technologies with standardized reporting, real-time monitoring, and secure workflow management.

The system addresses several pressing challenges, such as manual data handling, inconsistencies in promotion processes, lack of performance tracking, and delayed approvals, which have long plagued academic institutions. Through a centralized digital platform, the system enables faculty to submit and track their academic contributions

efficiently, while administrators can evaluate submissions using structured metrics and dashboards.

This multi-tiered architecture—comprising user authentication, academic activity modules, backend logic for appraisal workflows, and analytics tools—ensures transparency, fairness, and efficiency. The integration of technologies such as MySQL for data management and secure backend frameworks ensures both scalability and reliability. Importantly, the system adheres to institutional policies and regulatory frameworks such as UGC and NAAC guidelines, ensuring relevance and compliance.

The most significant achievement of the system is its faculty-centric and data-driven design, which encourages continuous professional development and academic self-reflection. The dashboard-driven interface provides immediate feedback to users, allowing them to view gaps and milestones, and track their eligibility for promotion or recognition.

On the administrative front, the system has succeeded in converting a largely manual and opaque appraisal process into a digital, traceable, and accountable framework. It provides robust role-based access control, real-time tracking of submissions and decisions, and complete audit trails, thereby ensuring that promotion and appraisal workflows are both efficient and transparent.

Institutionally, the platform builds a dynamic academic data repository that can be used for institutional benchmarking, policy formulation, accreditation support, and ranking submissions. It transforms raw academic activities into strategic insights—aligning the institution's goals with its operational realities.

This project reflects a broader shift in higher education towards digitalization, automation, and evidence-based governance. By digitizing the faculty appraisal system, institutions can ensure that academic achievements are evaluated based on merit and verified evidence. It fosters a more accountable and performance-oriented academic culture, encouraging faculty members to engage actively in research, teaching, and outreach.

Moreover, the data standardization achieved through the system sets the stage for future integration with national academic platforms, research grant systems, and higher education data networks. In a knowledge-driven economy, such integrations will be critical for enhancing institutional credibility and global competitiveness.

CHAPTER-11

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APPENDIX-A
PSUEDOCODE

1. Faculty Authentication and Login

```
BEGIN
   PROMPT user to enter email and password
   VALIDATE credentials from the database
   IF credentials are valid THEN
      ALLOW access to faculty dashboard
   ELSE
      DISPLAY error message
      REJECT login attempt
   ENDIF
END
```

2. Faculty Self-Appraisal Submission

```
BEGIN
   PROMPT faculty to enter academic and research details
   VALIDATE input fields for completeness
   IF all fields are valid THEN
      STORE self-appraisal data in database
      DISPLAY confirmation message
   ELSE
      PROMPT user to correct errors
   ENDIF
END
```

3. Performance Evaluation and Score Calculation

```
BEGIN
   RETRIEVE faculty self-appraisal data
   COMPUTE performance score using predefined criteria:
      Score = (Research Publications * Weight_1) +
              (Teaching Hours * Weight_2) +
              (Workshops Attended * Weight_3) +
              (Projects Completed * Weight_4)
   STORE computed score in database
   DISPLAY updated performance metrics on dashboard
END
```

4. Report Generation

```
BEGIN
   PROMPT user to select report type (Annual, Semester, Comparative)
   RETRIEVE relevant faculty performance data from database
   FORMAT data into structured report
   GENERATE PDF report
   ALLOW faculty/admin to download report
END
```

5. Admin Review and Approval

```
BEGIN
   PROMPT admin to review faculty self-appraisal submissions
   DISPLAY faculty scores and appraisal details
   IF data is complete and accurate THEN
      APPROVE faculty appraisal
      UPDATE status in database
   ELSE
      REJECT submission and notify faculty for corrections
   ENDIF
END
```

6. System Security and Access Control

```
BEGIN
   CHECK user role (Faculty/Admin)
   IF Faculty THEN
      ALLOW access to self-appraisal and personal dashboard
   ELSE IF Admin THEN
      ALLOW access to faculty evaluations and reports
   ELSE
      DENY access
   ENDIF
END
```

7. Future Enhancements (AI-Based Prediction)

BEGIN
  COLLECT historical performance data
  APPLY machine learning model to predict faculty growth trends
  SUGGEST improvement areas based on predictions
  DISPLAY insights on faculty dashboard
END

APPENDIX - B
SCREENSHOTS

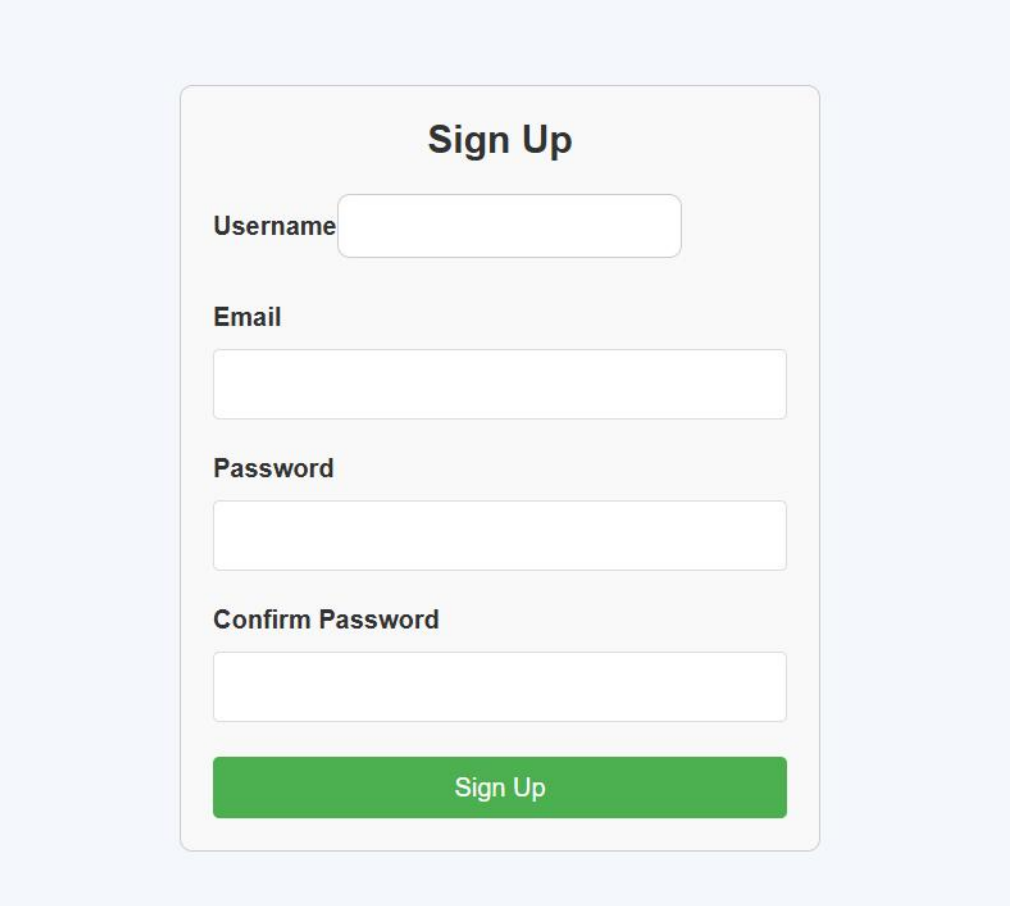


Fig 9.1 Signup Page

Fig 9.2 Faculty Dashboard for Appraisal Form Filling

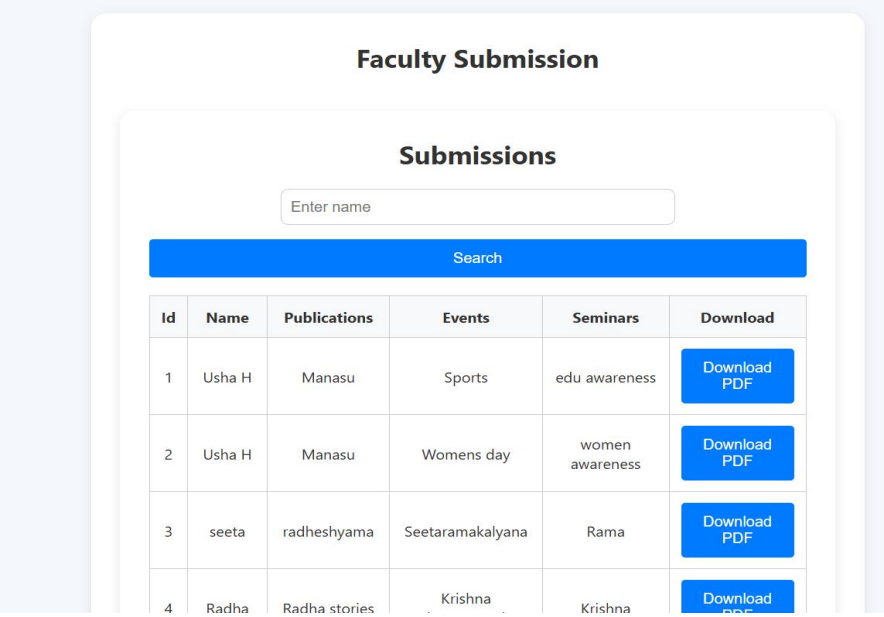


Fig 9.3 Admin View Submitted Forms Page

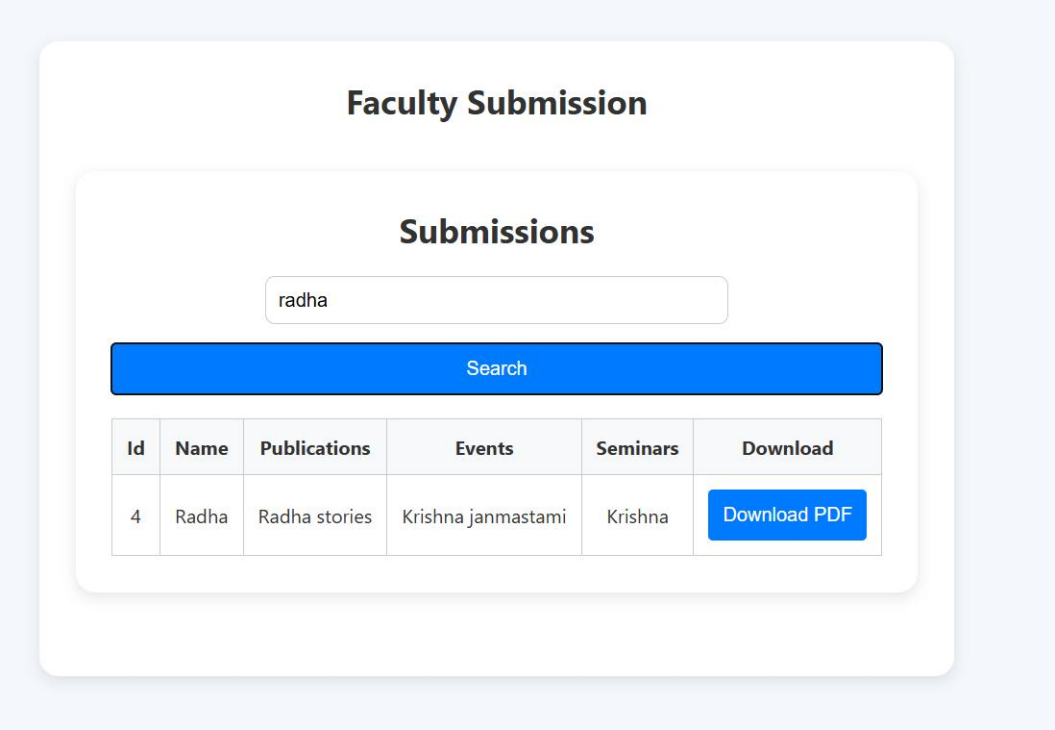


Fig 9.4 Faculty Submission Search Page

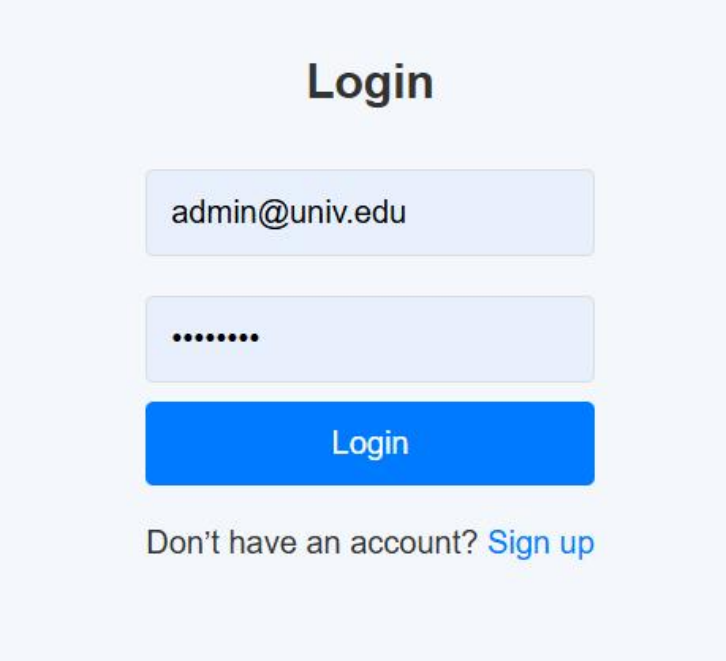


Fig 9.5 Admin Login Page

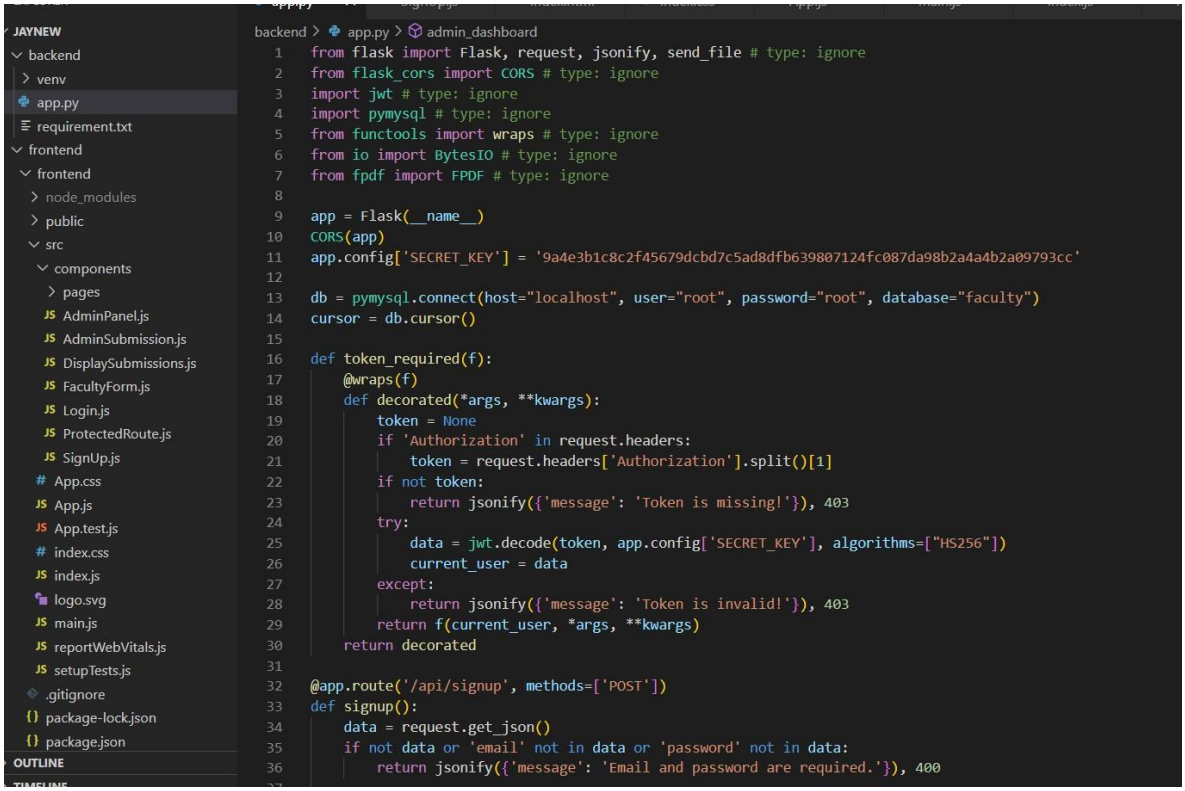


Fig 6.1 Backend design [using secret key for authentication]

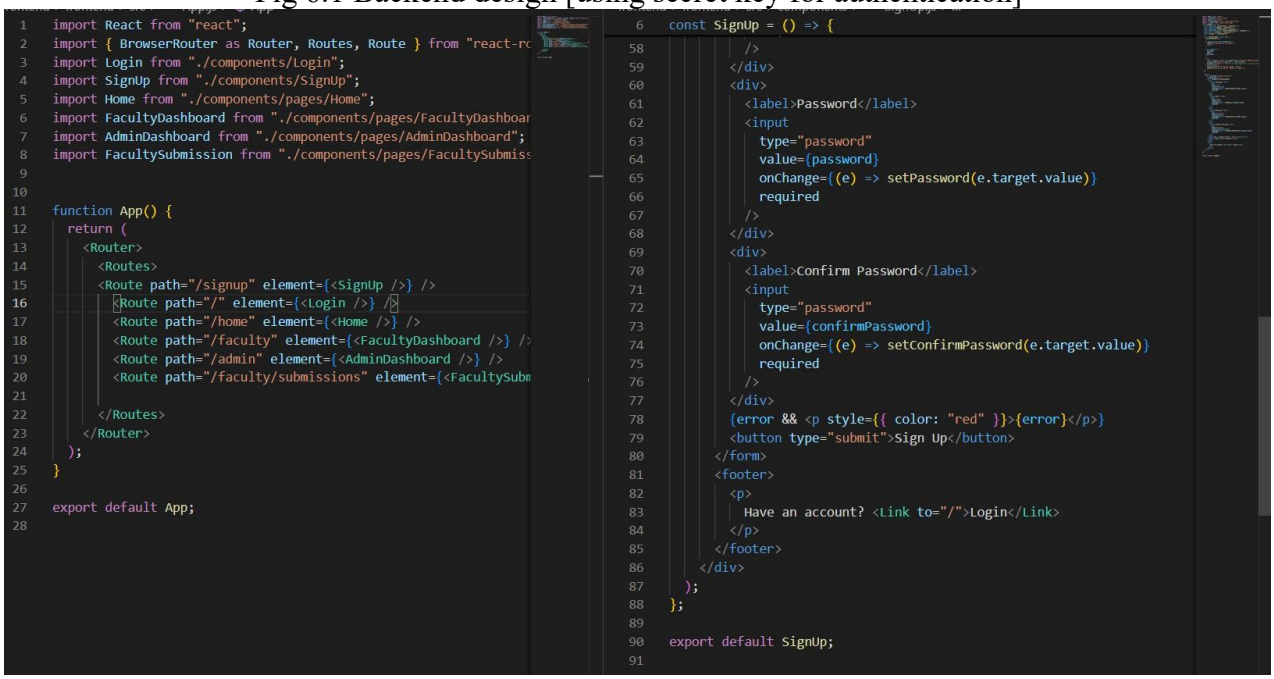


Fig 6.2 Front-end Design [App.js]

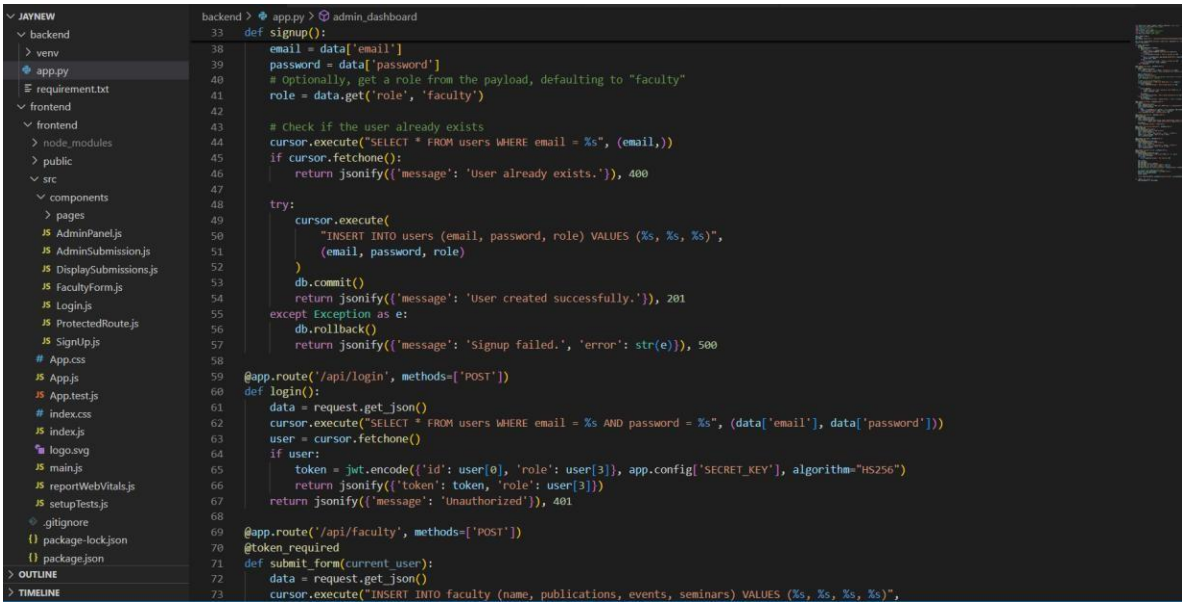


Fig 6.3 Backend Design [SQL connection]

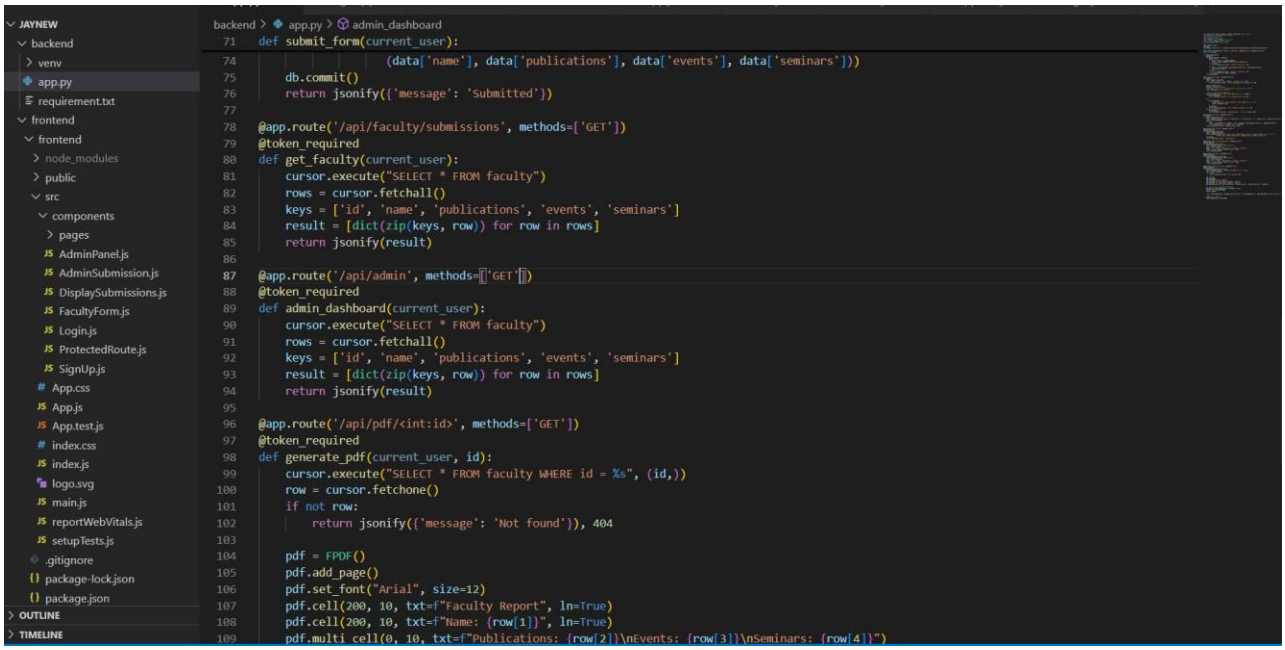


Fig 6.4 Backend Design [Faculty page connection]

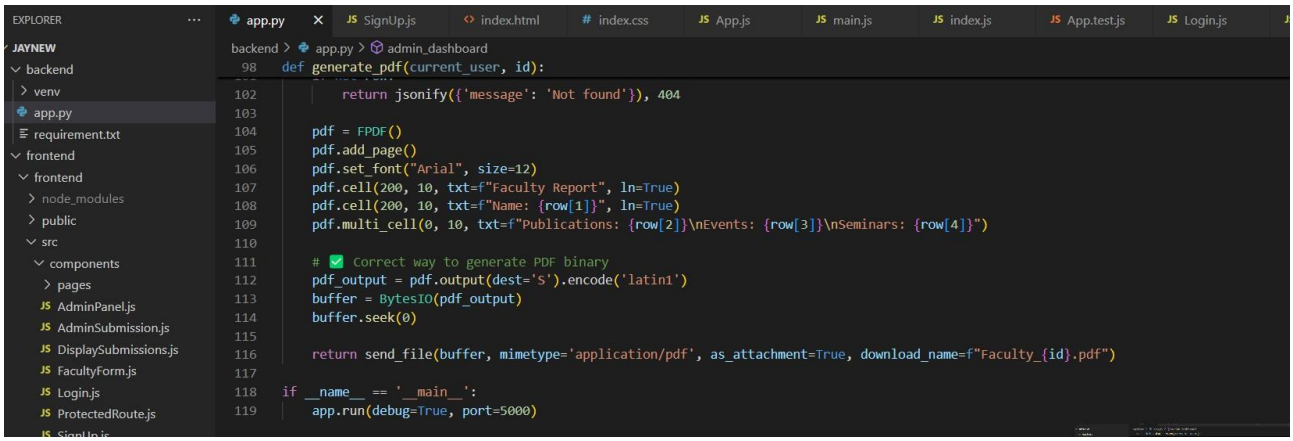


Fig 6.5 Backend Design [PDF download connection]

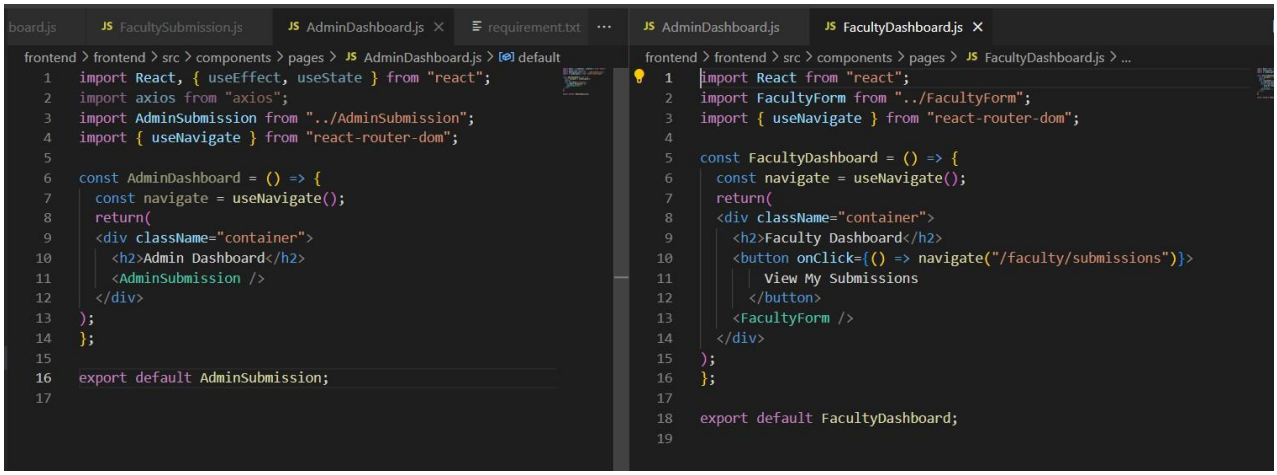


Fig 6.6 Front-end Design [ADMIN & FACULTY Dashboard]

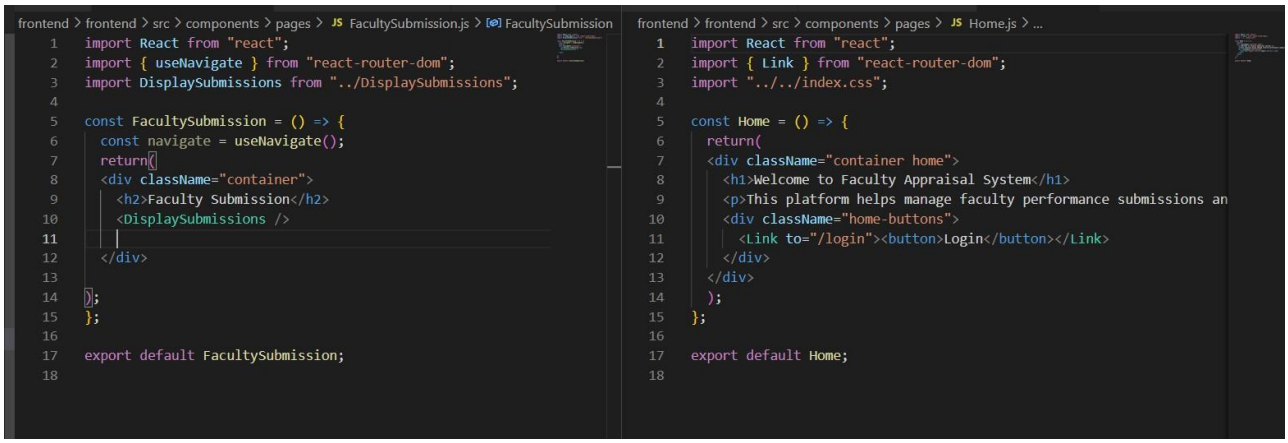
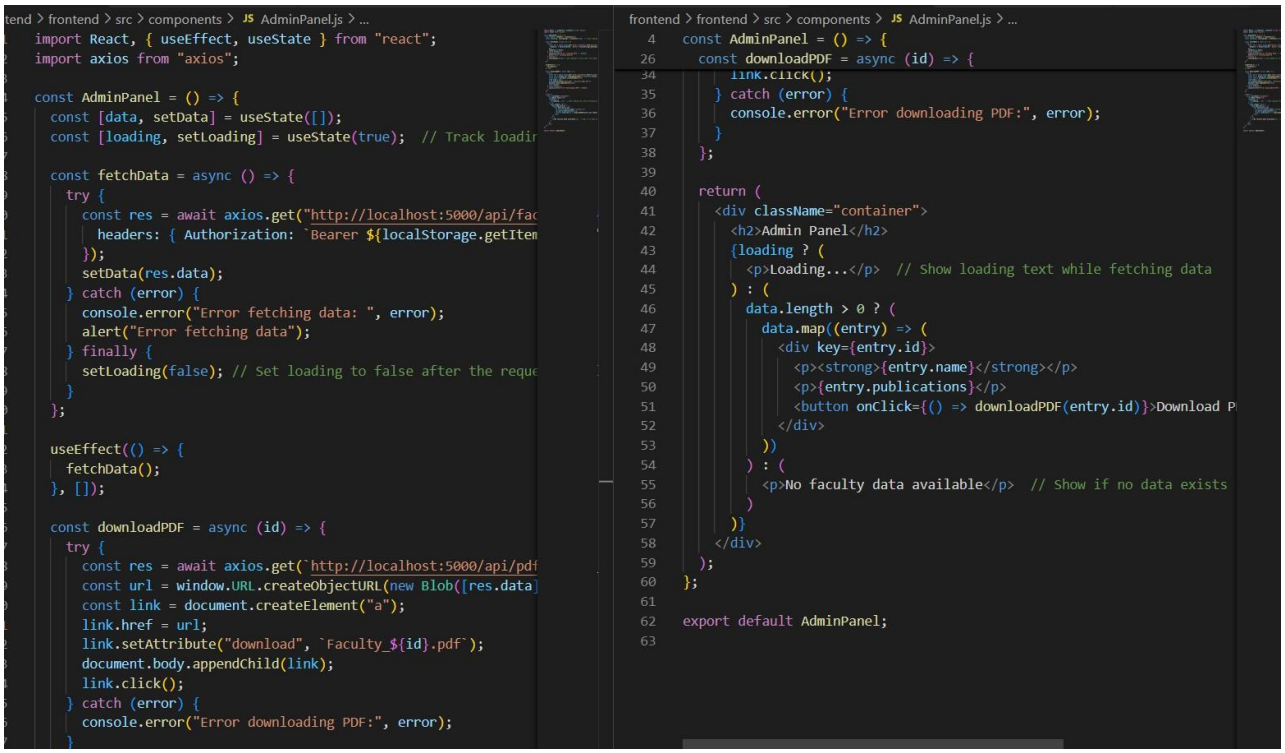


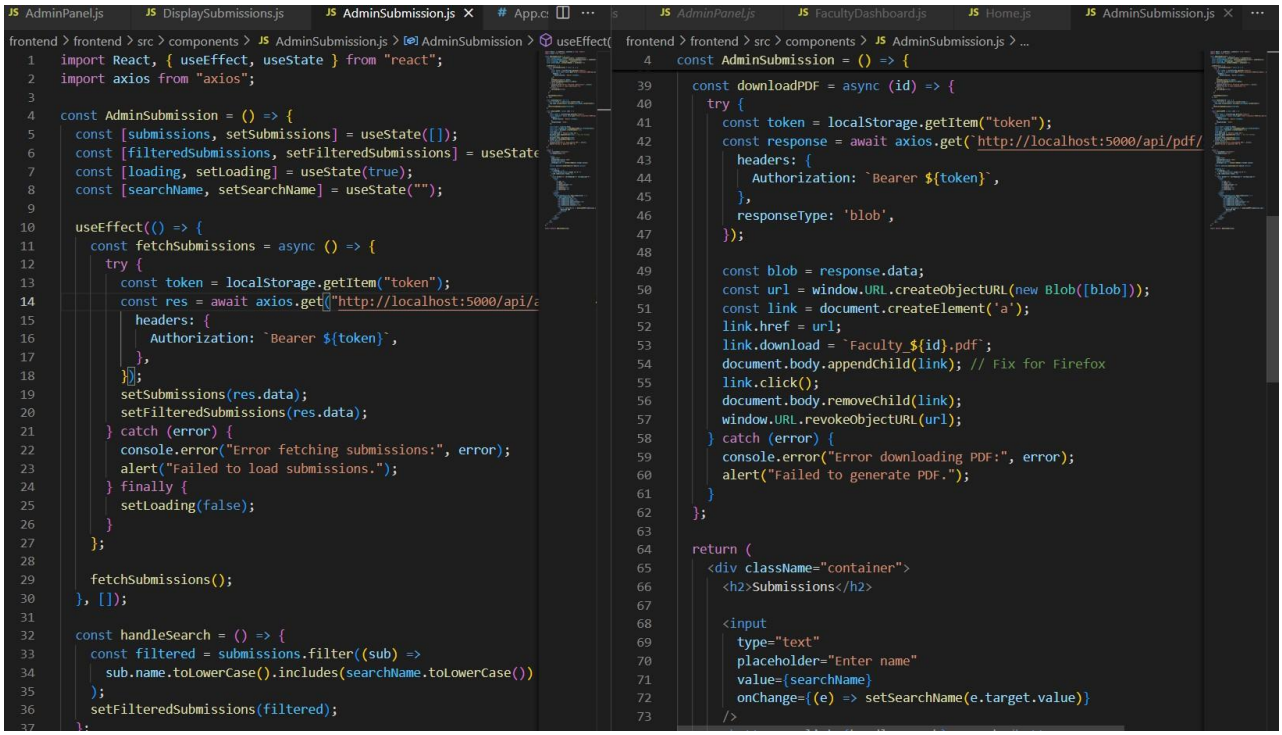
Fig 6.7 Front-end Design [Home page and Faculty Submission



```
import React, { useEffect, useState } from "react";
import axios from "axios";

const AdminPanel = () => {
  const [data, setData] = useState([]);
  const [loading, setLoading] = useState(true);  // Track loadin

  const fetchData = async () => {
    try {
      const res = await axios.get("http://localhost:5000/api/fac
        headers: { Authorization: `Bearer ${localStorage.getItem
      });
      setData(res.data);
    } catch (error) {
      console.error("Error fetching data: ", error);
      alert("Error fetching data");
    } finally {
      setLoading(false); // Set loading to false after the reque
    }
  };

  useEffect(() => {
    fetchData();
  }, []);

  const downloadPDF = async (id) => {
    try {
      const res = await axios.get(`http://localhost:5000/api/pdf
      const url = window.URL.createObjectURL(new Blob([res.data]
      const link = document.createElement("a");
      link.href = url;
      link.setAttribute("download", `Faculty_${id}.pdf`);
      document.body.appendChild(link);
      link.click();
    } catch (error) {
      console.error("Error downloading PDF:", error);
    }
```

```
const AdminPanel = () => {
  const downloadPDF = async (id) => {
      link.click();
    } catch (error) {
      console.error("Error downloading PDF:", error);
    }
  };

  return (
    <div className="container">
      <h2>Admin Panel</h2>
      {loading ? (
        <p>Loading...</p>  // Show loading text while fetching data
      ) : (
        data.length > 0 ? (
          data.map((entry) => (
            <div key={entry.id}>
              <p><strong>{entry.name}</strong></p>
              <p>{entry.publications}</p>
              <button onClick={() => downloadPDF(entry.id)}>Download P
            </div>
          ))
        ) : (
          <p>No faculty data available</p>  // Show if no data exists
        )
      )}
    </div>
  );
};

export default AdminPanel;
```

Fig 6.8 Front-end Design [Admin panel]



```
import React, { useEffect, useState } from "react";
import axios from "axios";

const AdminSubmission = () => {
  const [submissions, setSubmissions] = useState([]);
  const [filteredSubmissions, setFilteredSubmissions] = useState
  const [loading, setLoading] = useState(true);
  const [searchName, setSearchName] = useState("");

  useEffect(() => {
    const fetchSubmissions = async () => {
      try {
        const token = localStorage.getItem("token");
        const res = await axios.get("http://localhost:5000/api/
          headers: {
            Authorization: `Bearer ${token}`,
          },
        });
        setSubmissions(res.data);
        setFilteredSubmissions(res.data);
      } catch (error) {
        console.error("Error fetching submissions:", error);
        alert("Failed to load submissions.");
      } finally {
        setLoading(false);
      }
    };

    fetchSubmissions();
  }, []);

  const handleSearch = () => {
    const filtered = submissions.filter((sub) =>
      sub.name.toLowerCase().includes(searchName.toLowerCase())
    );
    setFilteredSubmissions(filtered);
  };
```

```
const AdminSubmission = () => {
  const downloadPDF = async (id) => {
    try {
      const token = localStorage.getItem("token");
      const response = await axios.get(`http://localhost:5000/api/pdf/
        headers: {
          Authorization: `Bearer ${token}`,
        },
        responseType: 'blob',
      });

      const blob = response.data;
      const url = window.URL.createObjectURL(new Blob([blob]));
      const link = document.createElement('a');
      link.href = url;
      link.download = `Faculty_${id}.pdf`;
      document.body.appendChild(link); // Fix for Firefox
      link.click();
      document.body.removeChild(link);
      window.URL.revokeObjectURL(url);
    } catch (error) {
      console.error("Error downloading PDF:", error);
      alert("Failed to generate PDF.");
    }
  };

  return (
    <div className="container">
      <h2>Submissions</h2>

      <input
        type="text"
        placeholder="Enter name"
        value={searchName}
        onChange={(e) => setSearchName(e.target.value)}
      />
```

Fig 6.9 Front-end Design [Admin submission]

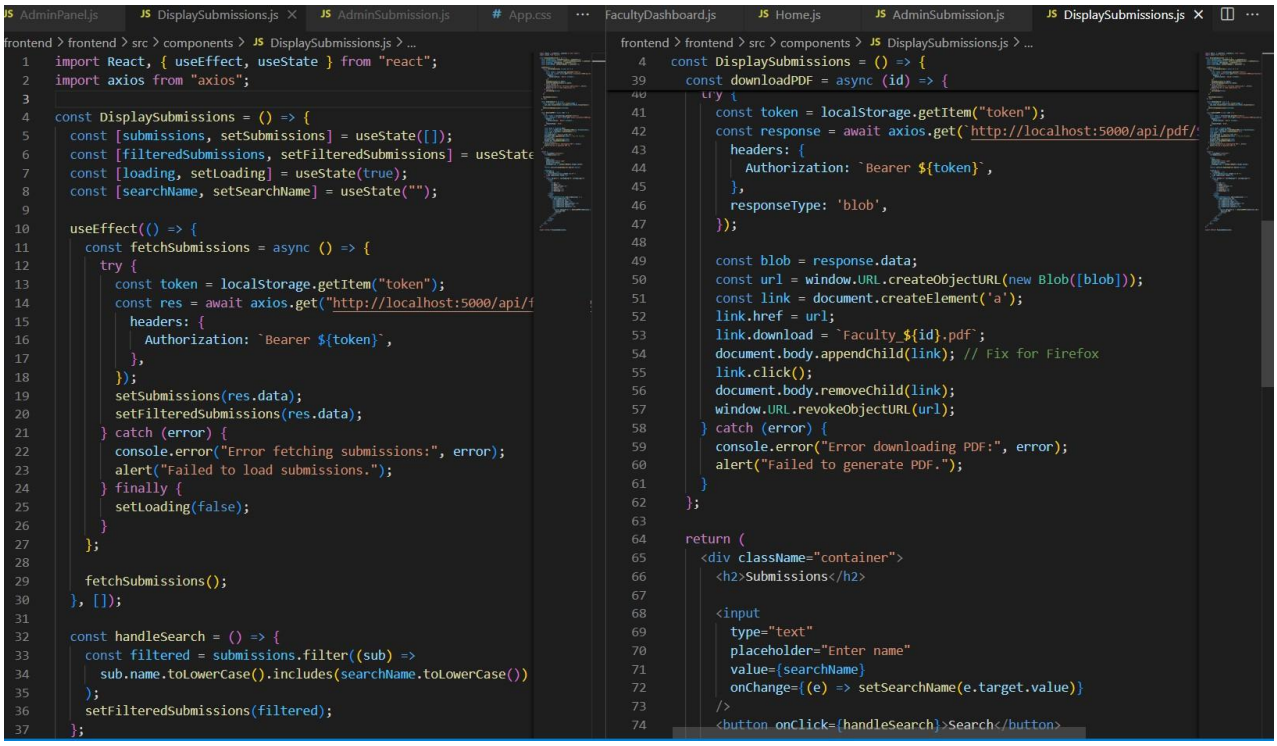


Fig 6.10 Front-end Design [Display submission]

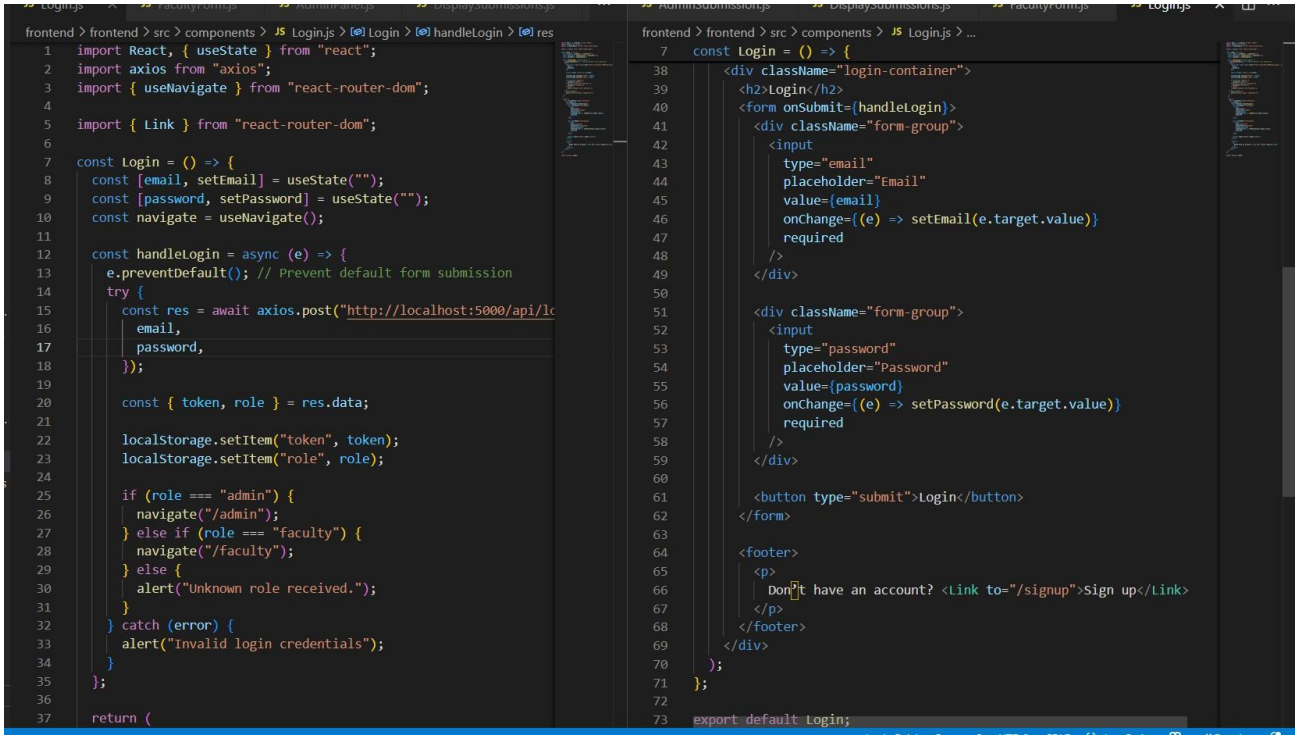
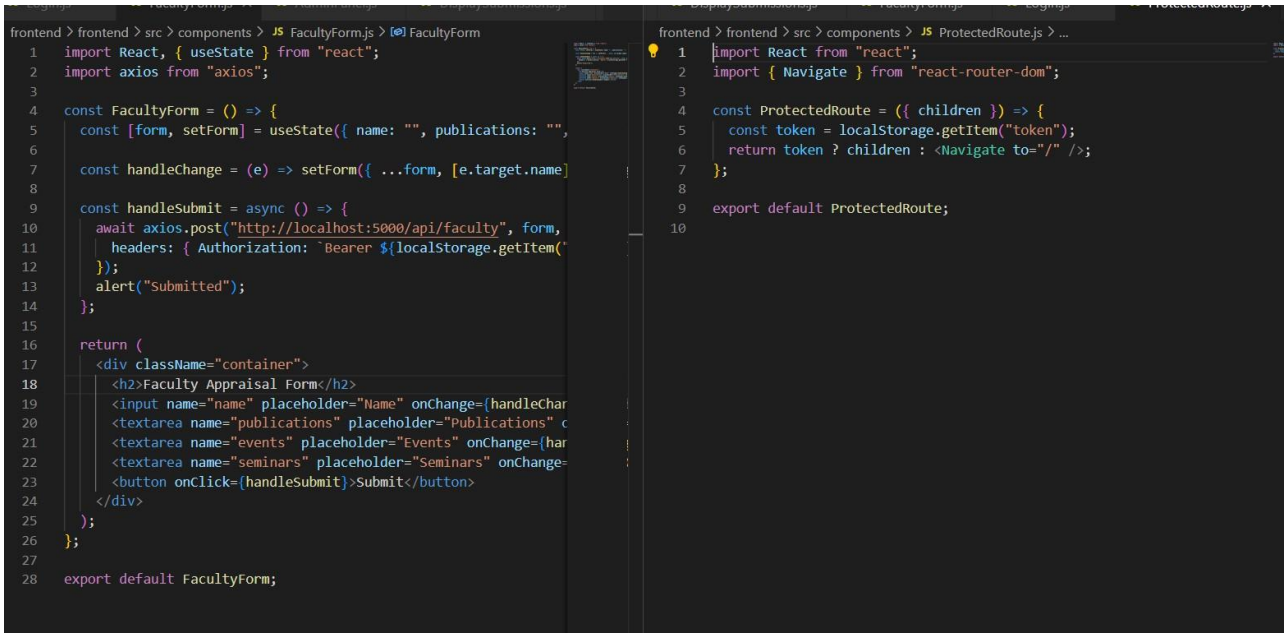


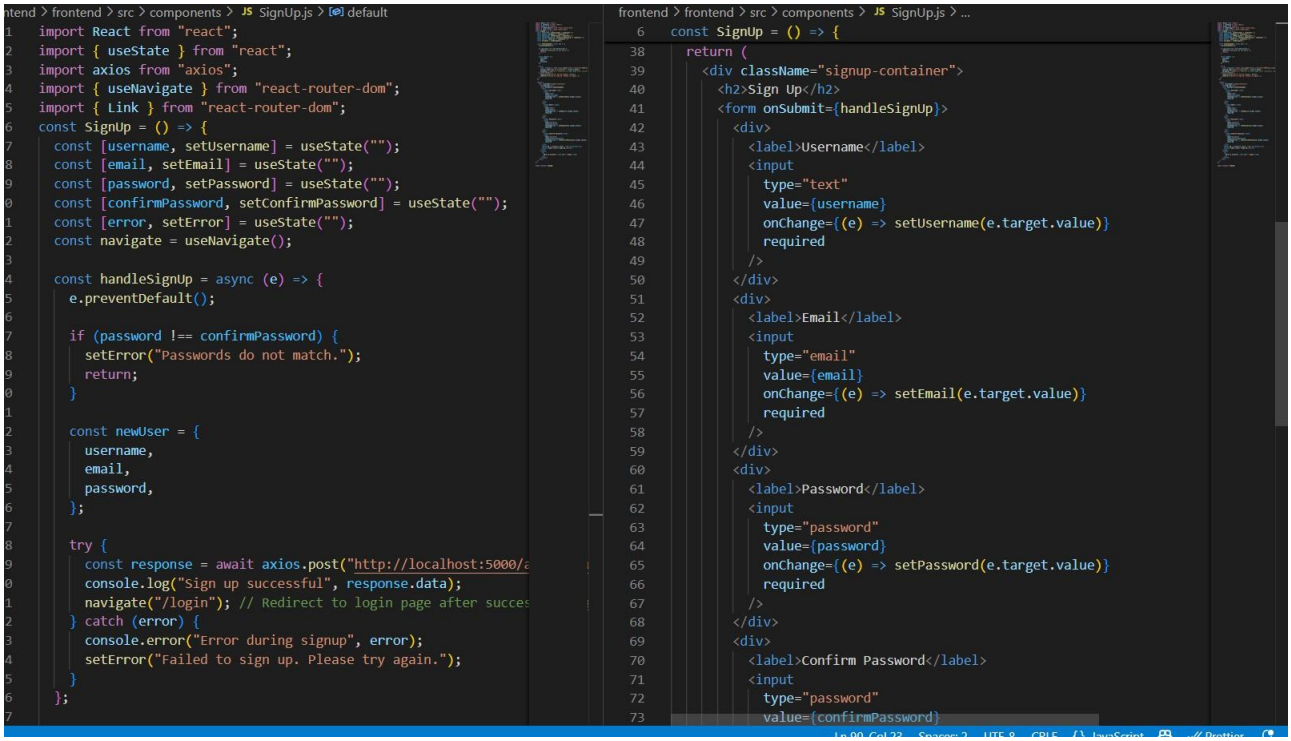
Fig 6.11 Front-end Design [Login page]



```
frontend > frontend > src > components > JS FacultyForm.js > FacultyForm
import React, { useState } from "react";
import axios from "axios";

const FacultyForm = () => {
  const [form, setForm] = useState({ name: "", publications: "",

  const handleChange = (e) => setForm({ ...form, [e.target.name]

  const handleSubmit = async () => {
    await axios.post("http://localhost:5000/api/faculty", form,
      headers: { Authorization: `Bearer ${localStorage.getItem("
    });
    alert("Submitted");
  };

  return (
    <div className="container">
      <h2>Faculty Appraisal Form</h2>
      <input name="name" placeholder="Name" onChange={handleChar
      <textarea name="publications" placeholder="Publications" c
      <textarea name="events" placeholder="Events" onChange={har
      <textarea name="seminars" placeholder="Seminars" onChange=
      <button onClick={handleSubmit}>Submit</button>
    </div>
  );
};

export default FacultyForm;
```

```
frontend > frontend > src > components > JS ProtectedRoute.js > ...
import React from "react";
import { Navigate } from "react-router-dom";

const ProtectedRoute = ({ children }) => {
  const token = localStorage.getItem("token");
  return token ? children : <Navigate to="/" />;
};

export default ProtectedRoute;
```

Fig 6.12 Front-end Design[Faculty Form]



```
ntend > frontend > src > components > JS SignUp.js > default
import React from "react";
import { useState } from "react";
import axios from "axios";
import { useNavigate } from "react-router-dom";
import { Link } from "react-router-dom";
const SignUp = () => {
  const [username, setUsername] = useState("");
  const [email, setEmail] = useState("");
  const [password, setPassword] = useState("");
  const [confirmPassword, setConfirmPassword] = useState("");
  const [error, setError] = useState("");
  const navigate = useNavigate();

  const handleSignUp = async (e) => {
    e.preventDefault();

    if (password !== confirmPassword) {
      setError("Passwords do not match.");
      return;
    }

    const newUser = {
      username,
      email,
      password,
    };

    try {
      const response = await axios.post("http://localhost:5000/a
      console.log("Sign up successful", response.data);
      navigate("/login"); // Redirect to login page after succes
    } catch (error) {
      console.error("Error during signup", error);
      setError("Failed to sign up. Please try again.");
    }
  };
```

```
frontend > frontend > src > components > JS SignUp.js > ...
const SignUp = () => {
  return (
    <div className="signup-container">
      <h2>Sign Up</h2>
      <form onSubmit={handleSignUp}>
        <div>
          <label>Username</label>
          <input
            type="text"
            value={username}
            onChange={(e) => setUsername(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Email</label>
          <input
            type="email"
            value={email}
            onChange={(e) => setEmail(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Password</label>
          <input
            type="password"
            value={password}
            onChange={(e) => setPassword(e.target.value)}
            required
          />
        </div>
        <div>
          <label>Confirm Password</label>
          <input
            type="password"
            value={confirmPassword}
```

Fig 6.13 Front-end Design[Sign Up page]