



RAJALAKSHMI ENGINEERING COLLEGE

**An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai**

GPA CALCULATOR

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AD19541 SOFTWARE ENGINEERING METHODOLOGY

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BONAFIDE CERTIFICATE

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ABSTRACT

The development of a GPA calculator website aims to support students in tracking their academic performance while providing personalized advice for improvement. Designed with a user-centric interface, the platform facilitates easy input of internal marks, subject information, and target goals, enabling students to calculate their GPA accurately. The website identifies subjects with low marks and provides tailored suggestions based on the student's academic data, helping them set achievable targets for improvement. Students can also choose to enter their completed subjects or skip entries if their semester has just begun. By focusing on technical guidance rather than emotional support, the website empowers students to monitor their progress and make informed adjustments throughout their academic journey. Additional features include a sign-in option that allows users to save their data and track their progress over multiple semesters, fostering a continuous improvement mindset. The website's interface is designed to be accessible and user-friendly, ensuring that students at all levels of technical proficiency can benefit from its capabilities. The website's design, functionality, and the potential benefits of personalized academic guidance in enhancing student performance, illustrates how technology can effectively support student's educational goals in a structured and efficient manner.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

The pursuit of academic excellence is a key focus for students, and keeping track of grades is a critical part of this journey. However, many students face challenges in accurately calculating their GPA and identifying areas where they can improve. A GPA calculator website addresses these issues by providing a centralized, user-friendly platform that enables students to track their academic performance and receive personalized guidance for improvement. By leveraging technology, this website simplifies the calculation process, fosters goal-setting, and delivers tailored academic advice to support students in achieving their target GPA. The objectives and key modules of the website, details how it aims to enhance the academic experience and empower students to take control of their educational goals.

1.2 NEED FOR THE STUDY

With growing academic competition and the need for high grades in various subjects, students often struggle to identify and focus on areas requiring improvement. The existing methods of academic evaluation provide results but lack personalized feedback and actionable insights. There is a crucial need for a system that not only evaluates performance but also guides students on how to improve in specific subjects. This study addresses this gap by developing a web application that analyzes internal exam marks and recommends strategies for academic enhancement. By understanding where they stand in relation to their target GPA, students can make informed decisions and allocate their efforts more efficiently. The study is essential because it leverages technology to provide customized feedback, fostering better academic outcomes and helping students prepare strategically for semester exams. Ultimately, this approach could revolutionize academic advising by offering a more data-centric and student-focused solution.

1.3 OVERVIEW OF THE PROJECT

This project involves creating a comprehensive web application designed to assist students in evaluating and improving their academic performance. The platform features three main components: a login/signup page, a dashboard for data input, and a feedback page. Students can log in or sign up using their email ID, and then proceed to input their internal exam marks for each subject on the dashboard. The system accommodates marks from one, two, or all three internal exams. By combining internal marks with a target GPA input, the application analyzes performance and provides feedback. This feedback includes specific areas of improvement, the score required in semester exams to meet GPA goals, and visualized data for easier understanding. The project leverages data analysis and visualization techniques to give students a clear understanding of their academic standing and actionable guidance, ensuring they can strategically work towards their goals.

1.4 OBJECTIVES OF THE STUDY

The primary objective of this study is to develop an interactive web application that provides personalized academic performance analysis for students. This tool aims to help students track their internal exam marks, identify subjects where they need to improve, and set achievable GPA goals for their semester exams. By offering detailed feedback through both visualizations and textual descriptions, the application encourages students to understand and address their academic weaknesses proactively. Another key objective is to make academic planning more data-driven and efficient, allowing students to focus on specific areas that can significantly boost their overall performance. The study also seeks to promote self-assessment and academic growth, encouraging students to take responsibility for their educational outcomes. Ultimately, this tool aims to bridge the gap between performance assessment and actionable guidance, using technology to enhance student's academic journeys.

CHAPTER 2

REVIEW OF LITERATURE

2.1 INTRODUCTION

The review of literature in academic performance analysis has evolved significantly, with a growing emphasis on the use of technology to support students in their educational journey. Early research focused on traditional methods of academic assessment, such as grade-based evaluations, which provided limited insights into students' strengths and areas needing improvement. However, as the complexity of academic curricula increased and student competition became more intense, there emerged a pressing need for more sophisticated tools that could offer personalized feedback. Studies began to explore the role of data analytics in education, demonstrating that early and continuous performance tracking can help students identify challenges and take timely action to enhance their outcomes. Researchers also highlighted the effectiveness of data visualization techniques, noting that visual feedback is more engaging and easier for students to understand compared to raw numerical data. Web-based platforms have also been a subject of considerable research, offering insights into how digital tools can make academic guidance more accessible and interactive. Despite these advancements, gaps remain in creating systems that integrate both internal and external academic assessments while providing specific strategies for improvement. Current literature emphasizes the need for applications that can analyze internal exam marks, suggest targeted areas for focus, and guide students on achieving their GPA goals. This study seeks to address these gaps by developing a web application that leverages data-driven analysis and visualization to offer comprehensive feedback. By combining performance evaluation with actionable recommendations, the project aims to create a more effective academic advising tool that empowers students to understand their performance, set realistic academic goals, and plan strategically for success in their semester exams.

CHAPTER 3

SYSTEM OVERVIEW

3.1 EXISTING SYSTEM

The existing academic performance analysis system in many educational institutions is heavily reliant on traditional, manual methods. Grades and overall academic performance are assessed using simple metrics, and feedback is typically provided in a generic manner without addressing individual student needs. Although some schools have digitized their grading systems, these platforms primarily display marks and do not offer an in-depth analysis of academic performance or actionable strategies for improvement. Additionally, these systems often lack intuitive interfaces and visual feedback, making it difficult for students to comprehend their academic standing. Students frequently miss out on personalized guidance, which could otherwise help them plan their study efforts more effectively and work towards achieving their target GPA. This gap in effective academic support highlights the limitations of the current approach, emphasizing the need for a more engaging and informative system that students can easily access and understand.

3.2 PROPOSED SYSTEM

The proposed system is a web application developed using HTML, CSS, and JavaScript to provide a more interactive and insightful academic performance analysis for students. The system includes three main pages: a login/signup page for account management, a dashboard where students can input their marks from internal exams, and a feedback page that provides detailed analysis. Unlike the existing system, this application uses client-side logic to process and analyze the entered marks, identifying areas of weakness and offering recommendations for improvement. It employs visual elements like graphs and charts created using JavaScript to present data clearly, making performance insights more understandable. Additionally, the application provides text-based feedback tailored to each student's academic status. This approach ensures that students not only see their academic standing but also understand how to improve in specific subjects to achieve their target GPA, all within an easy-to-use, visually appealing interface.

3.3 FEASIBILITY STUDY

The feasibility study of this project covers technical, operational, and economic aspects, all focused on a front-end solution using HTML, CSS, and JavaScript. Technically, the project is feasible because modern web development tools and libraries are readily available for creating interactive and engaging interfaces. HTML, CSS, and JavaScript are sufficient to build a responsive and dynamic web application that meets project requirements. Operationally, the proposed system will be easy to deploy and use. Students can access the application from any device with a browser, ensuring broad usability and accessibility. The system's interface will be designed for intuitive data input and straightforward navigation. Economically, the project is cost-effective since it relies solely on front-end technologies, eliminating the need for expensive backend servers or databases. The use of free and open-source tools makes development and maintenance affordable, making the project highly feasible for educational use.

CHAPTER 4

SYSTEM REQUIREMENTS

4.1 HARDWARE REQUIREMENTS

- **Processor (CPU)**
 - A reliable multi-core processor to support smooth execution of HTML, CSS, and JavaScript code.
 - Recommended: Intel Core i5, AMD Ryzen 5, or higher for responsive performance.
- **Memory (RAM)**
 - Sufficient RAM to handle data processing and ensure efficient rendering of the web pages.
 - Recommended: Minimum 4 GB of RAM; 8 GB or more for better multitasking and handling larger datasets.
- **Storage**
 - Adequate storage space for project files, including HTML, CSS, JavaScript scripts, and any local assets.
 - Recommended: 256 GB SSD for faster file access and application loading; more storage as needed for additional assets.
- **Display**
 - A screen with appropriate resolution for designing and testing the user interface.
 - Recommended: Full HD (1920x1080) resolution or higher for clear layout visualization and responsive design testing.
- **Network Connection**
 - A stable internet connection for accessing development resources, testing web-based functionality, and deploying the application.
 - Recommended: Broadband connection with at least 5 Mbps download/ upload speeds for efficient web development.

4.2 SOFTWARE REQUIREMENTS

- **Code Editor**
 - A text or code editor to write and manage HTML, CSS, and JavaScript code.
 - Recommended: Visual Studio Code, Sublime Text, or Atom for efficient code development.
- **Web Browser**
 - A modern browser for testing and debugging the web application.
 - Recommended: Google Chrome, Mozilla Firefox, Microsoft Edge, or Safari for comprehensive browser compatibility checks.
- **Version Control System**
 - A tool for managing and tracking changes in the project codebase.
 - Recommended: Git, along with a GitHub or Bitbucket account for collaboration and version control.
- **Frameworks and Libraries**
 - Front-end frameworks or libraries to aid in building a responsive and well-structured UI.
 - Recommended: Bootstrap (for responsive design) and custom JavaScript functions for interactivity.
- **Deployment Platform**
 - A platform for hosting the web application and making it accessible to users.
 - Recommended: GitHub Pages, Netlify, or simple file hosting services for easy deployment.
- **Additional Tools**
 - Browser developer tools for debugging and performance analysis.
 - Recommended: Built-in developer tools in Chrome, Firefox, or Edge for inspecting and improving the web app.

CHAPTER 5

SYSTEM DESIGN

5.1 SYSTEM ARCHITECTURE

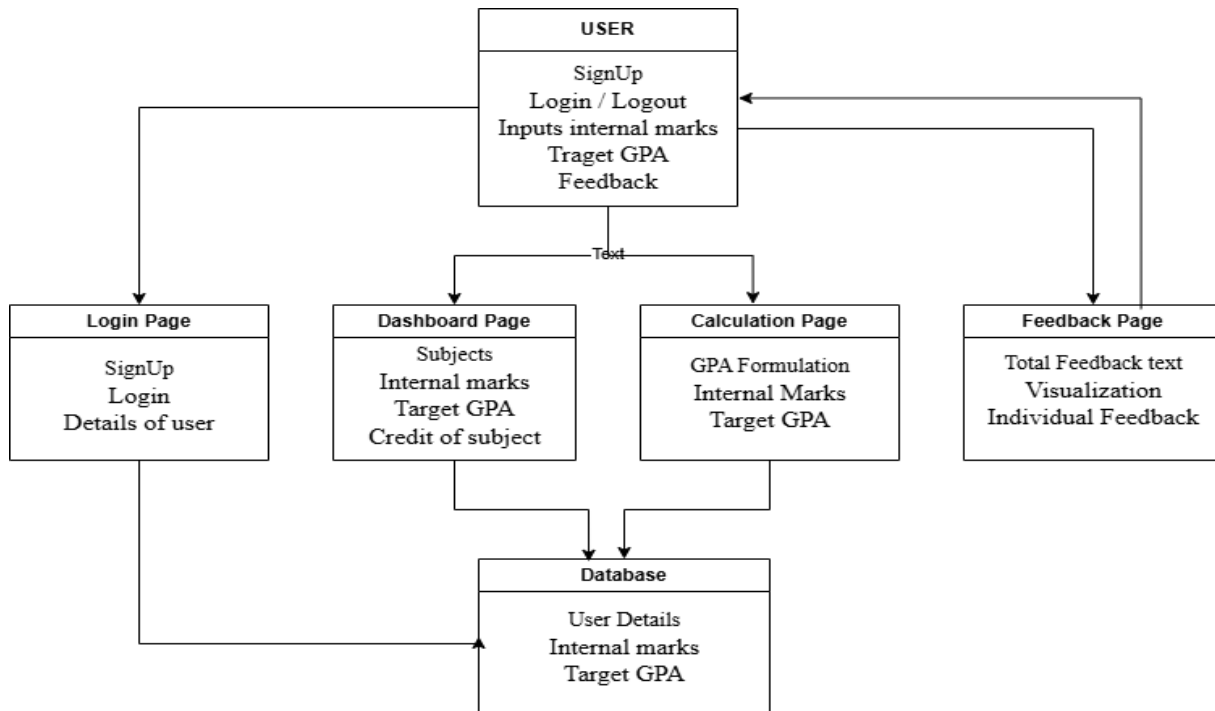


Fig 1 - Architecture diagram for GPA calculator

The architecture represents a comprehensive and student-centric web application designed to help students evaluate their academic performance and identify areas for improvement. The system is structured into four main components: the Login Page, Dashboard Page, Calculation Page, and Feedback Page, all integrated with a centralized database that facilitates data storage and management.

The process begins with the Login Page, which serves as the entry point for the application. New users can sign up by providing their email ID and other necessary credentials, which are stored in the database for authentication purposes. Returning users can log in using their credentials to access the system. This page ensures secure access, maintains user-specific data integrity, and validates user details, thereby providing seamless navigation to the subsequent components of the application.

Once logged in, students are directed to the Dashboard Page, which functions as the primary interface for collecting academic data. Students can input details such as their subjects, internal exam marks (up to three, or fewer if complete data is unavailable), the target GPA they aim to achieve, and the credit hours associated with each subject. The information entered here is critical as it forms the basis for all subsequent analyses and calculations. All these inputs are securely stored in the centralized database, ensuring they are readily available for future computations.

The Calculation Page forms the core of the application, where the data entered by the students is processed to perform detailed academic analyses. The application fetches the input data from the database and uses it to calculate the student's current GPA based on their internal marks. It then determines how much they need to score in their semester exams to achieve their target GPA, factoring in the weightage of both internal and semester marks. The system also identifies the subjects where the student is underperforming and highlights the areas requiring the most attention. This page acts as the computational backbone of the application, providing students with actionable insights and detailed breakdowns of their performance.

Finally, the Feedback Page presents the results in a user-friendly and engaging format. Students receive personalized textual feedback summarizing their overall performance, along with specific suggestions for improvement in each subject. Additionally, this page provides visualizations, such as graphs and charts, to make the feedback more comprehensible and intuitive. By offering a clear depiction of their current standing and the required effort to meet their goals, this page empowers students to take informed actions to enhance their academic outcomes.

5.2 MODULE DESCRIPTION

5.2.1 USER AUTHENTICATION MODULE

- **Description:** This module manages all aspects of user access and security within the application. It ensures that only authorized students can access their personalized dashboards and data.

- **Signup Functionality:** Allows new users to create an account by providing necessary information such as email ID, password, and other relevant details. It includes validation checks to ensure data integrity and prevent duplicate accounts.
- **Login Functionality:** Enables existing users to securely log in using their registered email ID and password. Implements authentication protocols to verify user credentials.

5.2.2 DASHBOARD/INPUT MODULE

- **Description:** The Dashboard serves as the central hub where students input and manage their academic data. It is designed to be user-friendly, allowing easy data entry and updates.
- **Subject Management:** Allows students to add, edit, or remove subjects they are enrolled in. Each subject can include details like subject name, code, and credit hours.
- **Marks Entry:** Provides input fields for students to enter their internal exam marks (up to three exams per subject). If all three marks are not available, the module accommodates partial entries.
- **Target GPA Setting:** Enables students to set their desired GPA goals, which the system will use to analyze and provide feedback on required performance.
- **Data Validation:** Ensures that all entered data adheres to predefined formats and ranges (e.g., marks out of 100), preventing erroneous entries.

5.2.3 CALCULATION/ANALYSIS MODULE

- **Description:** This module performs all necessary computations to analyze the student's academic performance based on the input data.
- **GPA Calculation:** Computes the current GPA by aggregating internal marks and factoring in the credit hours of each subject. It also projects the required semester marks needed to achieve the target GPA.
- **Performance Analysis:** Identifies strengths and weaknesses by comparing marks across different subjects and exams. It highlights subjects where performance is below expectations.
- **Data Processing:** Efficiently retrieves and processes data from the database, ensuring accurate and timely calculations.

5.2.4 FEEDBACK MODULE

- **Description:** This module delivers personalized feedback to students based on the analysis performed, helping them understand their academic standing and areas for improvement.
- **Textual Feedback:** Generates comprehensive summaries of the student's overall performance, including specific suggestions for each subject. The feedback is tailored to highlight key insights derived from the analysis.
- **Visualizations:** Presents data through interactive charts and graphs, such as bar charts for marks distribution, line graphs for performance trends, and pie charts for GPA composition. These visual aids enhance the clarity and impact of the feedback.
- **User Interface:** Ensures that feedback is displayed in an organized and visually appealing manner, making it easy for students to interpret and act upon the information.

5.2.5 USER INTERFACE (UI) AND USER EXPERIENCE (UX) MODULE

- **Description:** This module focuses on the design and usability aspects of the application, ensuring that students have an intuitive and engaging experience.
- **Responsive Design:** Ensures the application is accessible and functional across various devices and screen sizes, including desktops, tablets, and smartphones.
- **Navigation:** Provides a clear and logical flow between different pages (Login, Dashboard, Feedback), making it easy for users to move through the application.
- **Accessibility:** Incorporates features to support users with disabilities, such as keyboard navigation, screen reader compatibility, and appropriate color contrasts.
- **Aesthetic Elements:** Utilizes appealing color schemes, typography, and layout designs to create a pleasant visual experience.

CHAPTER 6

UML DIAGRAMS

6.1 DATAFLOW DIAGRAM

At **Level 0**, the DFD provides a broad overview, showing how the user interacts with the system by entering internal marks, target GPA, and other necessary details. These inputs are processed to calculate GPA and generate performance feedback, with the database acting as a central repository for storing and retrieving data securely.

Moving to **Level 1**, the DFD breaks down the system into individual processes such as login authentication, marks validation, performance analysis, GPA calculation, and feedback generation. Each of these processes interacts with the database to either retrieve or store data, ensuring that the application functions seamlessly.

Finally, the **Level 2 DFD** dives deeper into the intricate details of these processes. For example, the GPA calculation process involves retrieving internal marks from the database, applying specific formulas to compute the GPA, and determining the required semester performance to meet the target GPA. Similarly, the feedback generation process visualizes performance trends using graphs and charts while also crafting personalized textual feedback. This hierarchical breakdown ensures that every aspect of the system's functionality is clearly defined and interconnected, providing a comprehensive view of data flow.

6.2 USE CASE DIAGRAM

The Use Case Diagram is a key representation of the functionalities provided by your system and the ways in which users interact with them. The diagram outlines various use cases, starting with login and signup, which enable users to securely access the system. The signup process ensures that new users can register by providing their credentials, while the login process authenticates existing users against stored data in the database. Another significant use case is inputting marks, where students can enter their internal exam scores, target GPA, and subject details. This input serves as the foundation for the system's analysis and feedback mechanisms. The analyze performance use case processes this data to identify the student's strengths and weaknesses, helping them focus on areas requiring improvement. The GPA calculation use case involves determining the current GPA based on internal marks and

projecting the scores needed in semester exams to achieve the target GPA. Finally, the generate feedback use case delivers personalized guidance in the form of textual suggestions and visual representations, helping students understand their academic standing. This diagram emphasizes the comprehensive nature of the system and its user-centered design, making it a valuable tool for self-assessment and improvement.

6.3 SEQUENCE DIAGRAM

The Sequence Diagram illustrates the step-by-step interaction between the user and the system components, capturing the chronological order of events. The sequence begins with the login process, where the user provides their credentials, and the system verifies them against the stored data in the database. Upon successful authentication, the user is granted access to the system and can proceed to update their profile or input new data. In the profile update step, students can modify their personal information or add academic details such as internal exam marks and target GPA. The score submission process involves validating the entered marks to ensure accuracy and consistency. Once the data is validated, the analysis and notification process is triggered, where the system retrieves the submitted data from the database, computes the GPA, and identifies performance gaps. This process also generates personalized notifications, alerting students to areas that need attention. Finally, the system concludes with the feedback display, where detailed textual summaries and visual aids, such as charts and graphs, are presented to the user. This sequence not only captures the functional flow but also highlights the seamless interaction between the user, system processes, and the database.

6.4 CLASS DIAGRAM

The Class Diagram provides a detailed structural representation of the system by defining the key entities and their relationships. At the core of the system is the User class, which manages authentication data, including attributes like userID, email, and password. This class ensures secure access and serves as the parent for the Student class, which extends its functionality to include academic data such as studentID, name, and internal marks. The Exam class is responsible for storing subject-specific information, including examID, marks, and credit hours, providing the data needed for GPA calculations. The Performance Analyzer class plays a critical role in processing the input marks, identifying weak areas, and generating

performance insights. It interacts with the GPA Calculator class, which applies the necessary formulas to compute the GPA and suggests strategies for improvement. The Notification class is tasked with creating and sending performance updates and improvement suggestions to students, ensuring timely communication. Relationships between these classes, such as inheritance (e.g., Student inheriting from User) and associations (e.g., Performance Analyzer linking Student and GPA Calculator), illustrate how different entities collaborate to deliver a cohesive and functional system. This class diagram highlights the modularity and scalability of the system, making it adaptable to future enhancements.

CHAPTER 7

SOFTWARE DEVELOPMENT LIFE CYCLE MODEL

The GPA Analysis Web Application project is designed and developed using the Waterfall Model, a sequential and systematic development methodology. This approach ensures that each phase is completed before moving on to the next, providing a clear structure to the project lifecycle.

The process begins with the Requirements Phase, where detailed specifications are collected to define the functionality of the system. The key requirements include secure user authentication through a login and signup system, input validation for internal exam marks, the ability to handle incomplete data (such as missing exam marks), GPA calculation based on internal and semester exam scores, and feedback generation with visualizations and text-based performance suggestions. These requirements set the foundation for the project's objectives, ensuring a focus on user-friendly interaction and accurate performance analysis.

In the Design Phase, a comprehensive architecture is created to define the flow of the application. This includes designing the user interface for the login/signup page, the dashboard for marks input, and the feedback page for personalized insights. The backend design involves creating algorithms for GPA calculation and performance analysis, as well as structuring the database to store user data securely. Visualizations are planned to provide intuitive insights, while textual feedback is structured to offer actionable suggestions for academic improvement.

The Implementation Phase involves the development of individual components. Each module is built using HTML, CSS and JS for web development, and Matplotlib for data visualization. The login/signup page is implemented with robust authentication, while the dashboard allows flexible data entry for internal exam marks. The feedback page integrates GPA calculation logic, text feedback, and visualizations, offering a comprehensive assessment of student performance.

Next, the Integration and Testing Phase ensures that all components work seamlessly together. Unit tests are conducted for critical functions such as GPA calculations, data validation, and feedback generation to ensure accuracy.

Finally, in the Deployment and Maintenance Phase, the fully tested application is deployed for use. Maintenance plans are established to handle updates, address user feedback, and ensure the system remains reliable and secure over time. The Waterfall Model's linear structure provides a clear path for expanding the application in the future, such as adding predictive analytics, teacher feedback integration, or additional modules for a more comprehensive student performance analysis. The GPA Analysis Web Application project is designed and developed using the Waterfall Model, a sequential and systematic development methodology. This approach ensures that each phase is completed before moving on to the next, providing a clear structure to the project lifecycle.

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CHAPTER 8

PROGRAM CODE AND OUTPUTS

8.1 SAMPLE CODE

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>REC INTERNALS CALCULATOR</title>
  <link rel="icon" type="image/x-icon" href="/images/favicon.ico">
  <link rel="stylesheet" href="index.css">

  <!-- Google Analytics Tag -->
  <script async src="https://www.googletagmanager.com/gtag/js?id=G-
SF23JKLTXE"></script>
  <script>
    window.dataLayer = window.dataLayer || [];
    function gtag(){dataLayer.push(arguments);}
    gtag('js', new Date());
    gtag('config', 'G-SF23JKLTXE');
  </script>

  <!-- Boxicons Icon Library -->
  <link href="https://unpkg.com/boxicons@2.1.2/css/boxicons.min.css" rel="stylesheet" />
</head>

<body>
  <div class="background-container">
    <!-- Sidebar Menu -->
    <nav>
```



```

<div class="logo">
  <i class="bx bx-menu menu-icon"></i>
  <span class="logo-name" id="heading">REC INTERNALS
CALCULATOR</span>
</div>
<div class="sidebar">
  <div class="logo">
    <i class="bx bx-menu menu-icon"></i>
    <span class="logo-name">Menu</span>
  </div>
  <div class="sidebar-content">
    <ul class="lists">
      <li class="list">
        <a href="index.html" class="nav-link" id="home">
          <i class="bx bx-home-alt icon"></i>
          <span class="link">Home</span>
        </a>
      </li>
      <li class="list">
        <a href="gpa-calculator.html" class="nav-link" id="gpa-calculator">
          <i class="bx bxs-calculator icon"></i>
          <span class="link">GPA Calculator</span>
        </a>
      </li>
      <li class="list">
        <a href="about.html" class="nav-link" id="about">
          <i class="bx bx-group icon"></i>
          <span class="link">About</span>
        </a>
      </li>
      <li class="list">
        <a href="contact.html" class="nav-link" id="contact">

```

```

        <i class="bx bx-phone icon"></i>
        <span class="link">Contact</span>
    </a>
</li>
</ul>
</div>
</div>
</nav>

```

```

<!-- Overlay Section for Sidebar -->
<section class="overlay"></section>
<!-- JavaScript for Sidebar Functionality -->
<script src="index.js"></script>
<!-- Main Content -->
<br><br><br><br>
<div class="container">
    <!-- Hero Section -->
    <section class="hero">
        <div class="hero-content">
            <h2>Welcome to REC Internals Calculator</h2>
            <p>Track your academic progress effortlessly.</p>
            <a href="internals.html" class="calculate-buttona">Calculate Internals</a>
        </div>
    </section>
    <!-- Footer -->
    <footer>
        <p> Designed by Sandhya, Tanushri & Vikashini</p>
    </footer>
</div>
</div>
</body>
</html>

```

8.2 OUTPUT SCREENSHOTS

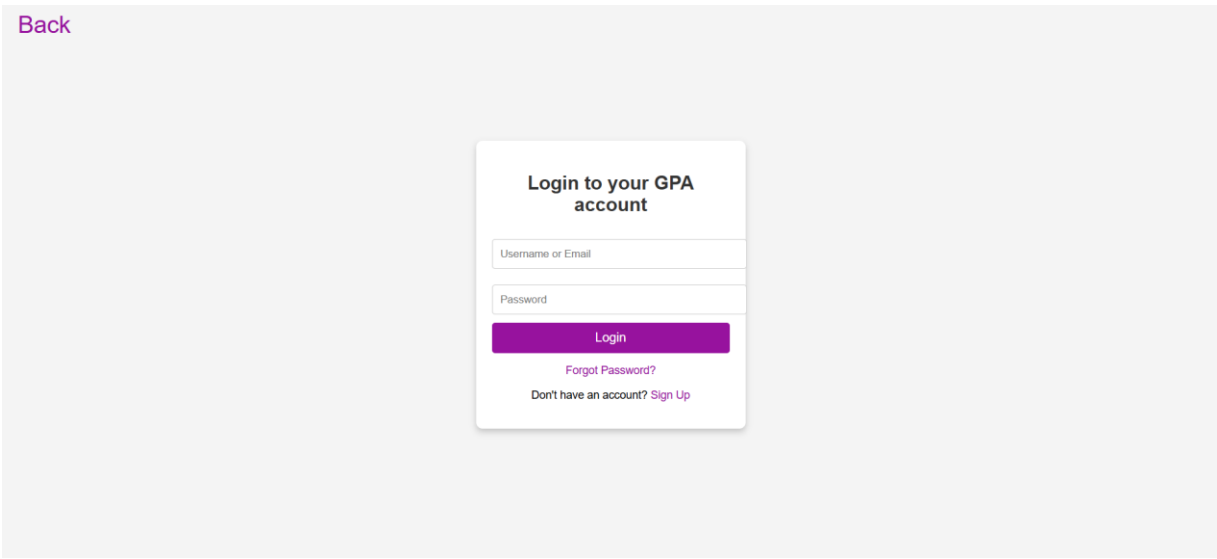


Fig 2: Login page

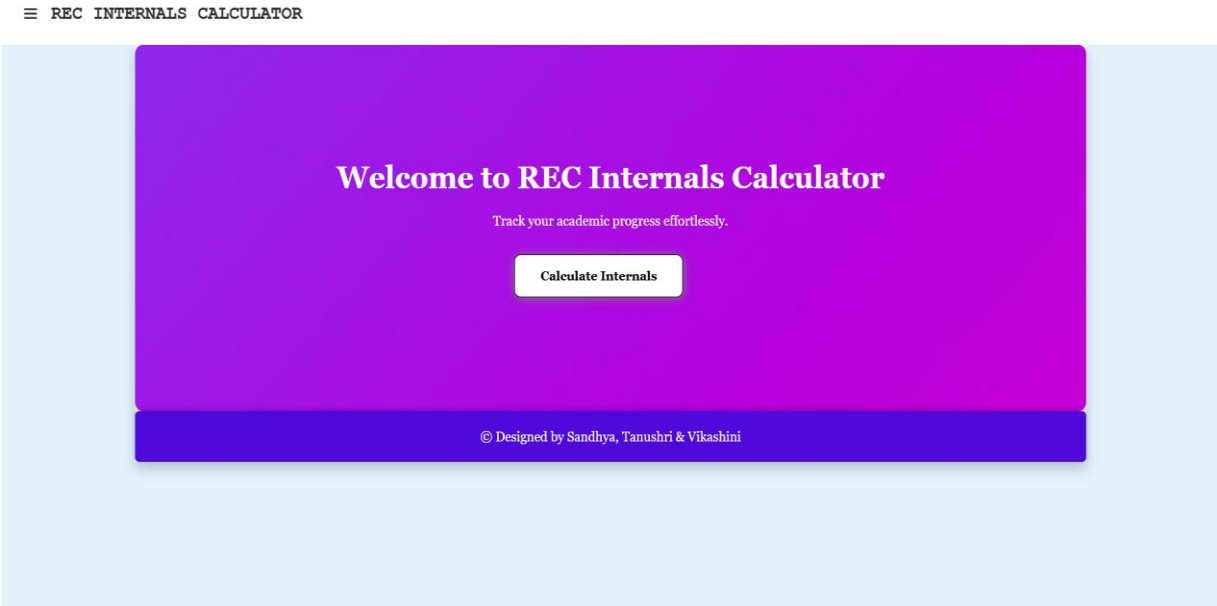
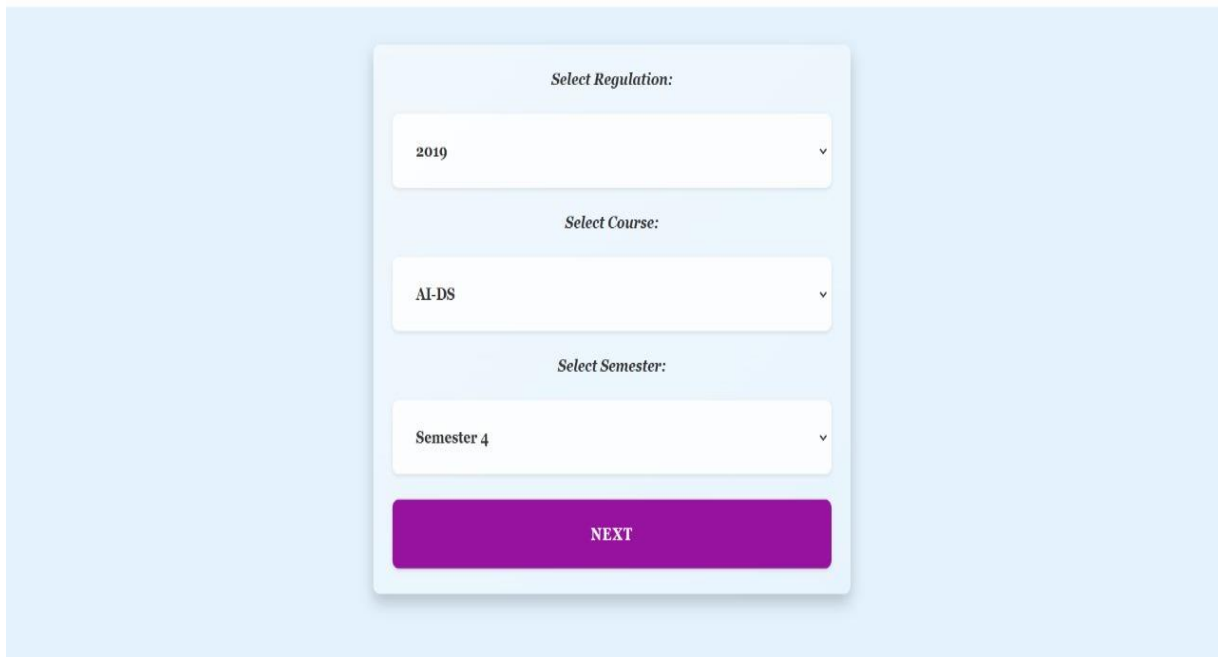


Fig 3: Home page



The screenshot shows a light blue background with a central white card. The card has three dropdown menus and a purple button. The first dropdown is labeled 'Select Regulation:' and shows '2019'. The second dropdown is labeled 'Select Course:' and shows 'AI-DS'. The third dropdown is labeled 'Select Semester:' and shows 'Semester 4'. Below the dropdowns is a purple button with the text 'NEXT'.

Select Regulation:

2019

Select Course:

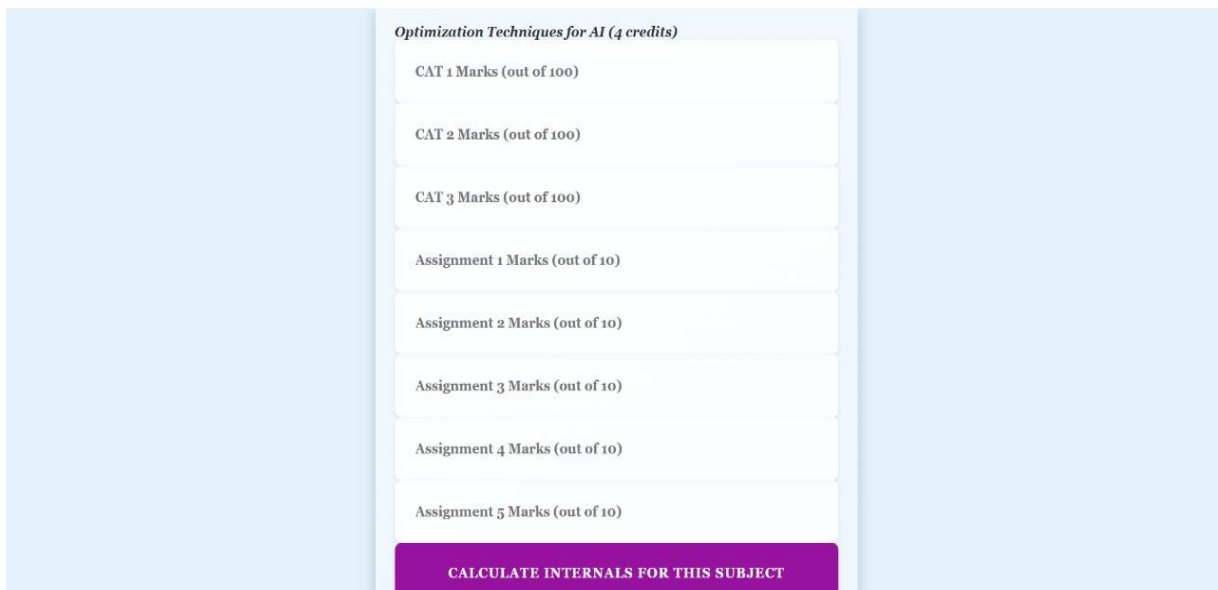
AI-DS

Select Semester:

Semester 4

NEXT

Fig 4: Semester details



The screenshot shows a light blue background with a central white card. The card has a title 'Optimization Techniques for AI (4 credits)' and eight input fields for marks. The first three fields are for CAT 1, CAT 2, and CAT 3 marks, each out of 100. The next five fields are for Assignment 1 through Assignment 5 marks, each out of 10. Below the input fields is a purple button with the text 'CALCULATE INTERNALS FOR THIS SUBJECT'.

Optimization Techniques for AI (4 credits)

CAT 1 Marks (out of 100)

CAT 2 Marks (out of 100)

CAT 3 Marks (out of 100)

Assignment 1 Marks (out of 10)

Assignment 2 Marks (out of 10)

Assignment 3 Marks (out of 10)

Assignment 4 Marks (out of 10)

Assignment 5 Marks (out of 10)

CALCULATE INTERNALS FOR THIS SUBJECT

Fig 5: Scores entry

90
80
10
9
10
9
9

CALCULATE INTERNALS FOR THIS SUBJECT

Optimization Techniques for AI is contributing 0.95 points to your total internal GPA of 5.
In this contribution, you have scored approximately 0.84 points based on your marks.

Fig 6: Sample Input

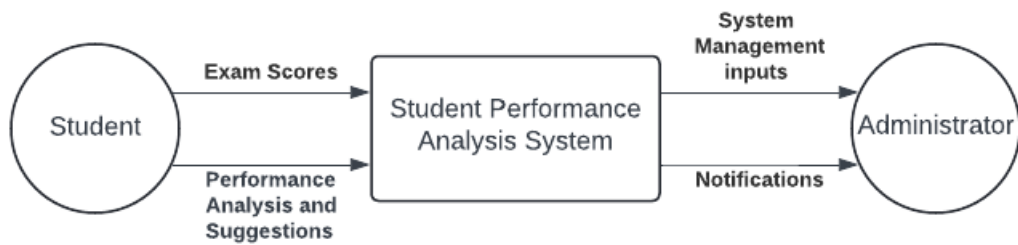


Fig 7: DFD level 0

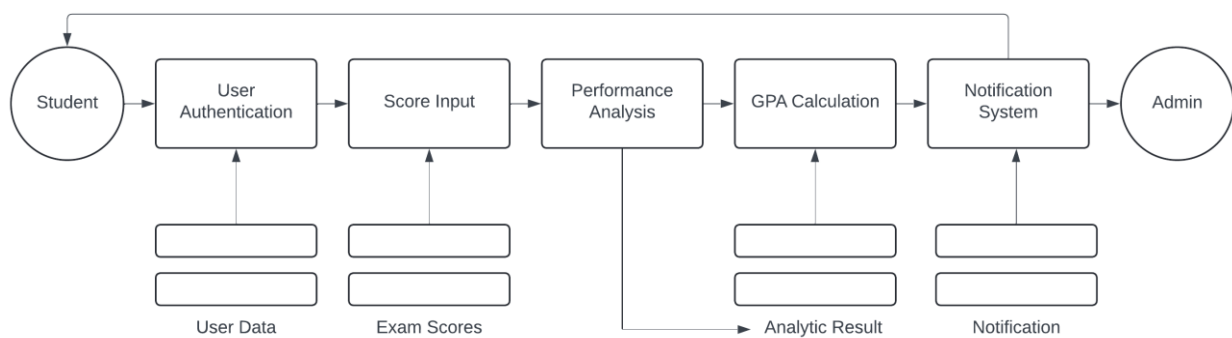


Fig 8: DFD level 1

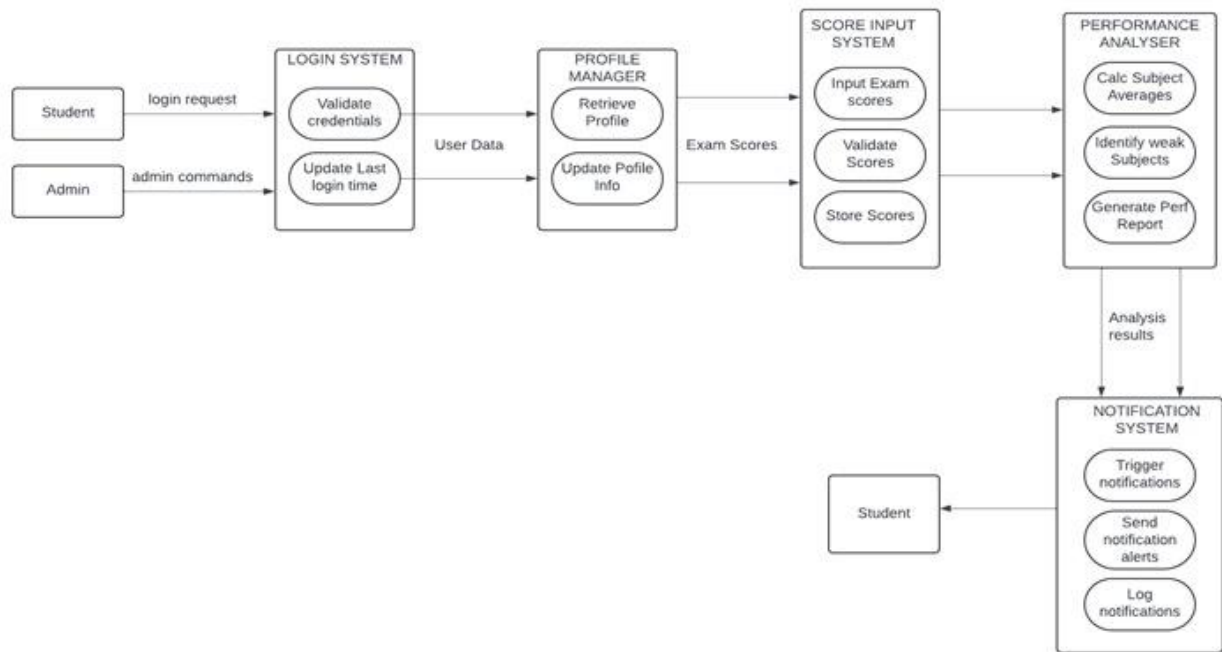


Fig 9: DFD level 2

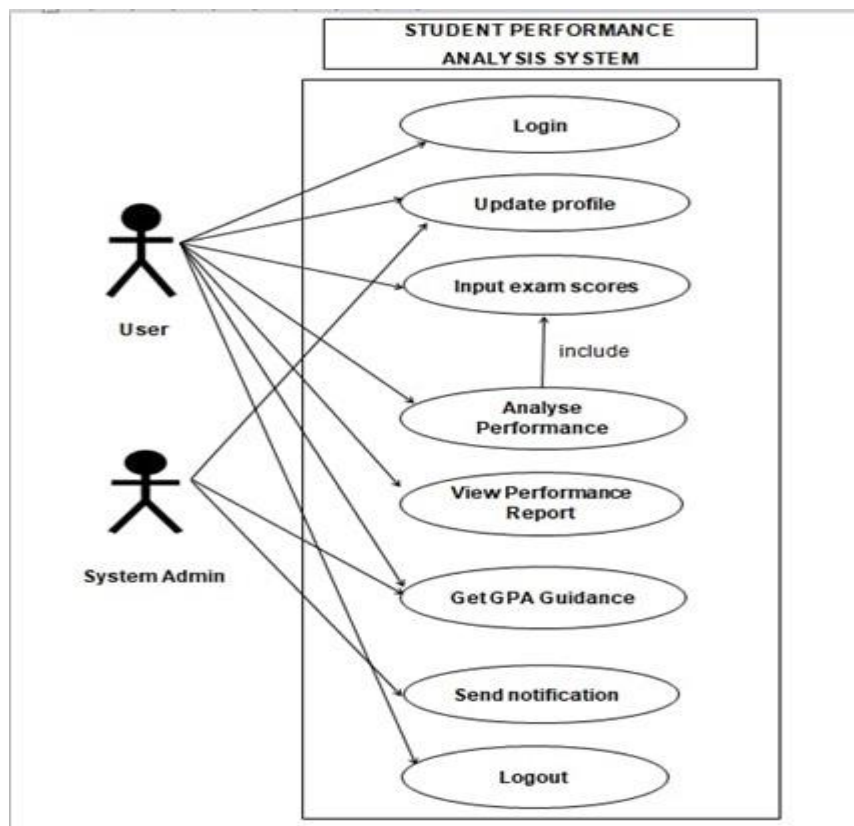


Fig 10: Use case diagram

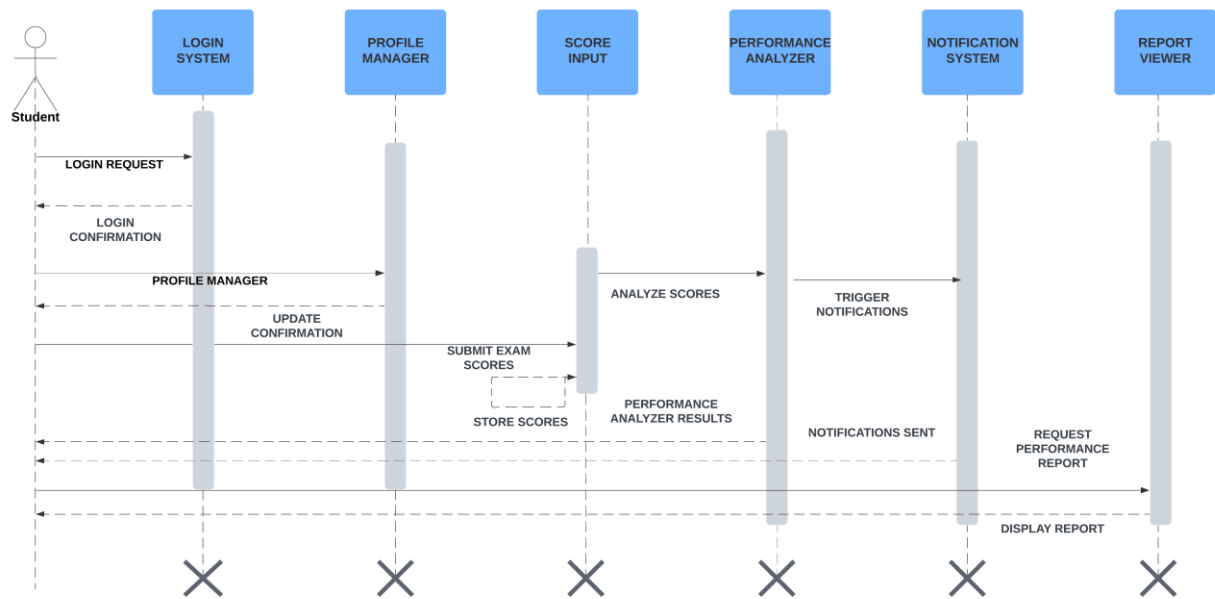


Fig 11: Sequence Diagram

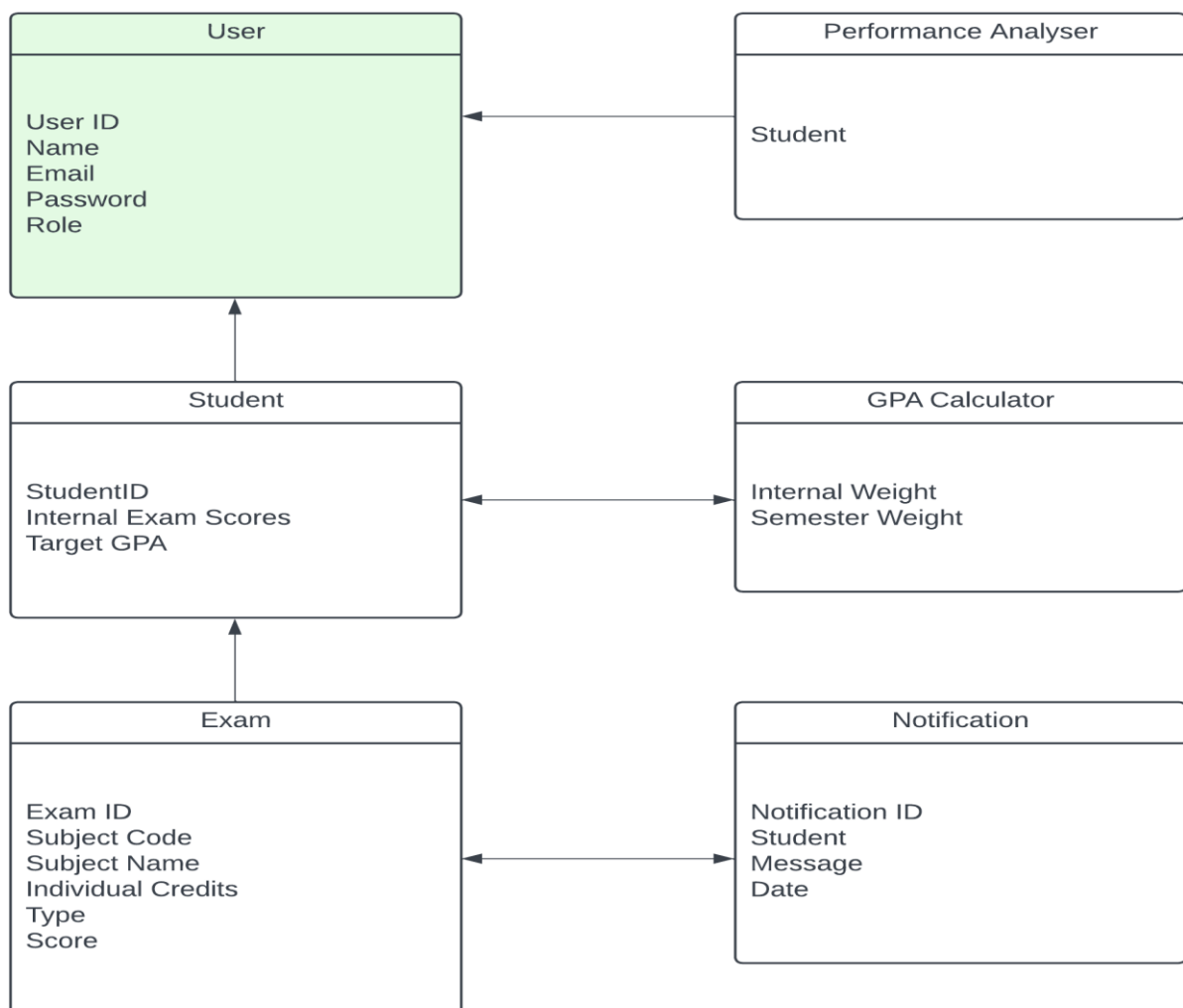


Fig 12: Class Diagram

CHAPTER 9

TESTING

9.1 UNIT TESTING

The GPA Analysis Web Application incorporates *unit testing* as a critical practice to ensure the reliability, accuracy, and maintainability of its functionalities. Each module, including user authentication, GPA calculations, and performance analysis, is independently tested to validate its behavior across a range of scenarios. Functions like `calculateGPA` and `analyzePerformance` are rigorously tested with complete, partial, and edge-case inputs to confirm their accuracy and resilience. For instance, scenarios involving missing marks, unusual credit weightages, or extreme score variations are analyzed to ensure that the system handles them gracefully without producing errors or misleading outputs.

Unit testing plays a pivotal role in identifying and addressing errors early in the development process, preventing defects from cascading into other parts of the application during integration. It also ensures that critical feedback mechanisms, both textual and graphical, generate meaningful and actionable insights for students regardless of input variations. Moreover, unit tests provide a safeguard during updates or code modifications, allowing developers to enhance or extend the system without jeopardizing existing functionalities.

By focusing on individual components, unit testing ensures the GPA Analysis Web Application remains robust, accurate, and user-friendly. It contributes to the overall quality of the project, ensuring students receive consistent, reliable, and helpful feedback to support their academic improvement.

Testing Tool Used: For unit testing, we used **Jest**, a JavaScript testing framework that is widely used for its simplicity and ability to handle asynchronous operations. Jest allows us to create test cases, compare expected and actual outcomes, and receive immediate feedback on any mismatches.

9.2 TESTING SCREENSHOTS

```
PS C:\Users\Admin\OneDrive\Documents\SE project\GPA> npm test

> test
> jest

FAIL ./gpaCalculator.test.js
  ✕ calculateGPA with perfect grades (7 ms)

  ● calculateGPA with perfect grades

    expect(received).toBeCloseTo(expected, precision)

    Expected: 3.5
    Received: 4

    Expected precision:    2
    Expected difference: < 0.005
    Received difference:   0.5
      12 |
        |
        |     at Object.toBeCloseTo (gpaCalculator.test.js:10:36)
    Test Suites: 1 failed, 1 total
    Tests:       1 failed, 1 total
    Snapshots:   0 total
    Time:        0.949 s, estimated 1 s
    Ran all test suites.
```

Fig 13: Test Case Failed

Test Suites: 1 passed, 1 total

> jest

PASS ./gpaCalculator.test.js

- ✓ calculateSubjectInternal with full marks (3 ms)
- ✓ calculateSubjectInternal with half marks
- ✓ calculateGPA with equal credits and perfect grades
- ✓ calculateGPA with varying credits

> jest

PASS ./gpaCalculator.test.js

- ✓ calculateSubjectInternal with full marks (3 ms)
- ✓ calculateSubjectInternal with half marks
- ✓ calculateGPA with equal credits and perfect grades

PASS ./gpaCalculator.test.js

- ✓ calculateSubjectInternal with full marks (3 ms)
- ✓ calculateSubjectInternal with half marks
- ✓ calculateGPA with equal credits and perfect grades
- ✓ calculateSubjectInternal with full marks (3 ms)
- ✓ calculateSubjectInternal with half marks
- ✓ calculateGPA with equal credits and perfect grades
- ✓ calculateGPA with varying credits
- ✓ calculateGPA with equal credits and perfect grades
- ✓ calculateGPA with varying credits
- ✓ calculateGPA with varying credits

Test Suites: 1 passed, 1 total

Tests: 4 passed, 4 total

Snapshots: 0 total

Time: 0.591 s

Snapshots: 0 total

Time: 0.591 s

Time: 0.591 s

Ran all test suites.

Fig 14: Test Case Passed

CHAPTER 10

RESULTS AND DISCUSSION

The GPA Analysis Web Application successfully provides a comprehensive platform for students to analyze their academic performance based on internal exam marks. The application meets its primary objectives by offering secure login and signup functionalities, enabling students to input their marks, and generating personalized feedback through textual suggestions and visualizations. The feedback includes insights into weak areas, subjects requiring improvement, and recommendations for achieving desired GPA targets.

10.1 RESULTS

The application processes both complete and partial internal exam data effectively, ensuring flexibility for students who may not have all their marks available. The GPA calculation module provides accurate projections by combining internal marks with predefined semester score requirements, enabling students to plan their study efforts strategically. The feedback system generates clear and actionable suggestions for overall performance improvement, supported by visually intuitive charts that highlight trends and areas needing attention. Testing validated the accuracy of all critical functions, including `calculateGPA`, secure authentication, and the generation of performance insights. The feedback provided by the system was consistent with expected outcomes across various test scenarios.

10.2 DISCUSSIONS

The web application addresses a significant gap in providing timely and automated performance feedback to students. By analyzing internal exam marks and projecting required semester scores, the system empowers students to make informed decisions about their study priorities. Unlike traditional manual feedback methods, which are time-consuming and prone to delays, the application delivers instant and consistent analysis, saving valuable time for both students and educators. Moreover, the flexibility to handle missing marks and adapt to varying subject credit distributions makes the application suitable for diverse academic settings. The visualization tools not only enhance user engagement but also simplify complex performance data, making it easier for students to interpret their progress and areas of improvement. While the application effectively meets its goals, its reliance on accurate data input emphasizes the importance of validating user entries. The use of unit testing ensures

robust performance, but future iterations could integrate predictive analytics to forecast GPA trends, enhancing the system's utility. Expanding the platform to include teacher feedback, attendance tracking, and extracurricular performance analysis would provide a more holistic view of student progress. In conclusion, the GPA Analysis Web Application is a reliable, efficient, and user-friendly tool that significantly enhances academic self-assessment, preparing students for better performance in their semester exams.

CHAPTER 11

CONCLUSION AND FUTURE ENHANCEMENT

11.1 CONCLUSION

The GPA Analysis Web Application effectively addresses the need for academic self-assessment among students by combining internal exam performance analysis with GPA projections. The application provides secure login and signup features, flexible input for internal marks, and meaningful feedback through textual insights and visualizations. It successfully helps students identify weak areas, set realistic goals, and focus their efforts on improving academic performance. By automating the feedback process, the application overcomes the limitations of traditional manual methods, such as delays and inconsistencies. The robust architecture, backed by accurate calculations and thorough unit testing, ensures reliability and a user-friendly experience. Overall, the project highlights the potential of technology in empowering students to take charge of their educational journey and achieve their academic goals.

11.2 FUTURE ENHANCEMENTS

The application has strong potential for further development to increase its value and scope. Key future enhancements include:

- **Predictive Analytics:** Integrating machine learning to forecast GPA trends based on historical data, enabling students to set proactive study strategies.
- **Teacher Feedback Integration:** Allowing teachers to provide personalized feedback directly within the system, complementing automated insights.
- **Attendance and Extracurricular Tracking:** Adding modules to monitor attendance and extracurricular performance for a more comprehensive view of student progress.
- **Mobile Application Development:** Extending the platform to mobile devices for improved accessibility and convenience.
- **Data Anonymization:** Implementing anonymized data analysis to support institutional-level insights while protecting student privacy.
- **Enhanced Visualizations:** Introducing interactive dashboards with advanced visualization options for deeper performance insights.

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