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RAJAGIRI SCHOOL OF
ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Mini Project Report On

AdVenture

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

in

Computer Science & Engineering

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May 2024

CERTIFICATE

This is to certify that the mini project report entitled ***"AdVenture"*** *is a bonafide record of the work done by* ***Nanditha Jinesh(U2103149)***, ***Nayan A Menon (U2103150)***, ***Rohan Chandy Mathews (U2103178)***, *submitted to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B. Tech.) in Computer Science and Engineering during the academic year 2023-2024.*

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Abstract

Traditional advertising methods in public spaces often lack personalization and reach, resulting in limited effectiveness and revenue for screen owners. AdVenture Ads proposes an app to connect screen owners with advertisers for targeted and engaging ad campaigns on smart devices in public spaces. This aims to increase revenue for screen owners by offering targeted advertising space,improve user experience with interactive ads compared to static signage, enhance advertising reach and effectiveness by allowing advertisers to target specific audiences.The project will develop an app for both parties to manage campaigns, integrate with existing platforms, and provide a user-friendly interface.

AdVenture introduces a paradigm shift in advertising, offering numerous benefits for both screen owners and advertisers. Screen owners can significantly increase their revenue by leveraging the platform for targeted advertising campaigns. The ability to list screens with specific details and availability enables advertisers to reach their desired audience effectively, turning screens into valuable revenue sources. AdVenture facilitates targeted reach by allowing advertisers to tailor their campaign based on demographics, location, and interests. This precision ensures that messages resonate with specific audiences, optimizing the impact of each campaign. We have developed the following for our project:Develop a mobile application (Flutter) for managing ad content,a user-friendly web platform using Flutter for registration,database(postgreSQL) to store multimedia files to display in the time slot,integration with existing smart device platforms for seamless ad display. This project proposes a novel solution to monetize shared screen displays in public spaces, benefiting both screen owners and advertisers. With its focus on targeted advertising, user engagement, and data-driven insights, AdVenture Ads has the potential to revolutionize the way advertising is delivered in these environments. AdVenture Ads aims to revolutionize in-screen advertising in public spaces, creating a win-win situation for both advertisers and screen owners while providing a more relevant experience for users.

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Chapter 1

Introduction

1.1 Background

The Adventure project addresses the evolving needs of the digital advertising landscape, where traditional mediums face limitations in reach and measurability. With idle screens prevalent in various establishments, there's untapped potential for revenue generation. Adventure seeks to bridge this gap by creating a marketplace for buying and selling ad space on screens. Inspired by the rise of digital signage and the demand for targeted advertising, Adventure aims to streamline ad placement, provide advanced targeting options, and enable real-time performance tracking. By leveraging technology to optimize advertising effectiveness and maximize revenue for screen owners, Adventure aims to enhance brand visibility and drive value for advertisers and screen owners alike.

1.2 Problem Definition

The goal of this project is to develop a web application called AdVenture Ads that facilitates the management and scheduling of digital advertisements. This application will cater to both advertisers who want to display their ads and screen owners who wish to rent out ad space on their digital screens.

1.3 Scope and Motivation

AdVenture Ads will focus on core functionalities for ad management and scheduling. Advertisers can create and upload ad content and schedule their ads to display on chosen digital screens. Screen owners can register their screens with the system, define pricing structures (base rate, peak hour multipliers), and view ad booking requests. The initial version will target a local market and focus on static ad formats (images, videos) displayed

on TV screens.

The need for a streamlined and efficient platform for buying and selling ad space motivates the creation of Adventure. Traditional methods can be cumbersome and involve intermediaries, leading to inefficiencies and potentially lost value for both parties. Adventure seeks to address this gap by offering a direct connection between advertisers and publishers. This fosters transparency, potentially reduces costs, and allows for more targeted advertising campaigns.

1.4 Objectives

- Streamline Ad Space Transactions: Facilitate a smooth and efficient process for buying and selling ad space, eliminating the need for intermediaries.
- Increase Transparency: Provide clear and accessible data on ad performance for both advertisers and publishers.
- Drive Targeted Advertising: Empower advertisers to reach specific demographics and interests through a variety of ad formats.
- Foster a Thriving Marketplace: Create a vibrant ecosystem where advertisers and publishers can connect and collaborate effectively.
- Enhance User Experience: Prioritize user-friendly interfaces and functionalities for both advertisers and publishers, making the platform easy to navigate and manage..

1.5 Challenges

Adventure, the ad space marketplace, faces several challenges. Building a critical mass of both advertisers and publishers is crucial, and ensuring trust and transparency within the platform will be essential for long-term success. Competition in the online advertising space is fierce, so Adventure will need to innovate and offer unique value propositions for both sides of the marketplace.

1.6 Assumptions

- Market Demand: There is a sufficient market demand for a streamlined ad space marketplace that cuts out intermediaries.
- User Adoption: Both advertisers and screenowners will find Adventure's platform user-friendly and valuable enough to adopt it over existing solutions.

1.7 Societal / Industrial Relevance

Adventure, the ad space marketplace, holds significant potential to revolutionize the advertising industry. By streamlining ad space transactions and eliminating intermediaries, Adventure can significantly enhance efficiency for both advertisers and publishers. This translates to cost savings, faster campaign execution, and less wasted effort. Furthermore, Adventure promotes transparency by providing clear and accessible data on ad performance and audience demographics. This empowers advertisers to make informed decisions and optimize their campaigns, while publishers gain confidence that they are receiving fair compensation for their ad space. Beyond efficiency and transparency, Adventure fosters innovation by offering a platform for programmatic buying and exploring new ad formats. This can push the boundaries of online advertising and create more engaging experiences for audiences. Ultimately, by empowering content creators with an effective monetization platform, Adventure can contribute to a more diverse and vibrant online content landscape. In essence, Adventure has the potential to create a win-win situation for all stakeholders in the advertising industry.

1.8 Organization of the Report

Introduction: Purpose and scope of the project. Software Requirements Specification:The Software Requirements Specification section of the report begins with an introduction that outlines the software requirements. It then provides an overall description of the software, detailing its key features and functionalities. Additionally, it specifies the external interface requirements, describing how the software interacts with other systems, users, and hardware.

System Architecture and Design:The System Architecture and Design section of the report begins with a system overview that provides an overview of the system architecture. It includes a use case diagram to visually represent the system's interactions. This section also describes the strategies for implementation, detailing the approach taken to realize the system. It further details the division of modules, explaining how the system is broken down into manageable parts. Lastly, it provides a Gantt chart of the work schedule, illustrating the timeline and progress of the project.

Results and Discussions:The Results and Discussions section begins with an overview that provides a summary of the results. It describes the testing process and results, presenting quantitative data to support the findings. This section also includes graphical analysis to visually represent the results. Finally, it discusses the results in detail, providing insights and interpretations based on the data.

Conclusion:The Conclusion section summarizes the conclusions drawn from the project, highlighting the key findings and their implications. It also outlines the potential future scope and improvements, suggesting areas for further development and enhancements.

Chapter 2

Software Requirements Specification

2.1 Introduction

2.1.1 Purpose:

The AdVenture app aim to transform in-screen advertising in public spaces by connecting screen owners with advertisers. The app facilitates targeted and engaging ad campaigns on smart devices, maximizing revenue for screen owners and offering advertisers precision in reaching their desired audience. With interactive features and user-friendly interfaces, AdVenture Ads revolutionizes in-screen advertising, creating a mutually beneficial platform for both parties while enhancing the overall user experience.

2.1.2 Product Scope:

The AdVenture Ads project aims to revolutionize in-screen advertising by creating a user-friendly TV app and web platform. The goal is to maximize revenue for screen owners and provide advertisers with effective tools, ensuring a more engaging experience for users in public spaces. Legal compliance and user data privacy are inherent considerations in this project.

2.2 Overall Description

2.2.1 Product Perspective

The AdVenture Ads platform represents a novel and self-contained product designed to revolutionize in-screen advertising in public spaces. Originating from the need for more personalized and engaging advertising methods, AdVenture Ads acts as an independent solution rather than a replacement for existing systems. It is not a follow-on member of a product family but rather introduces a paradigm shift in how advertisers and screen owners connect in a dynamic marketplace. In the context of larger systems, AdVenture Ads functions autonomously, with its Software Requirements primary interfaces being

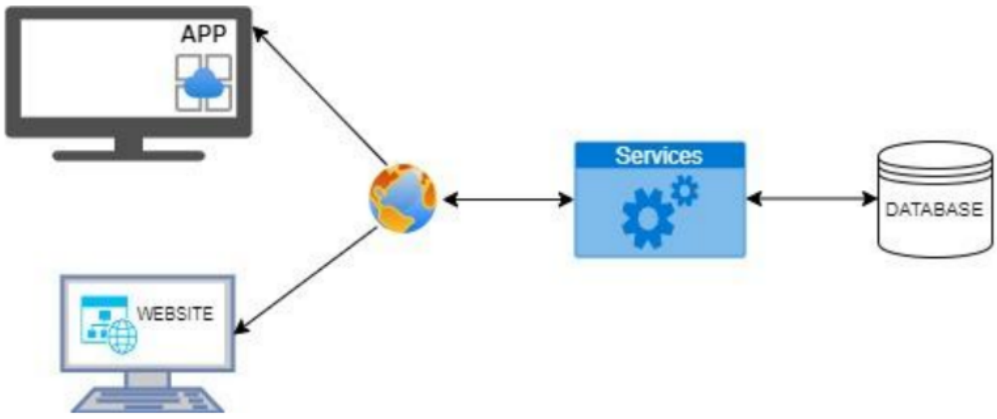

Figure 2.1: Product Perspective

the TV application and web platform through which screen owners and advertisers interact.This product perspective emphasizes the standalone nature of AdVenture Ads while highlighting its interfaces and connections within the broader advertising environment.

2.2.2 Product Functions

1. User Registration and Authentication: - Allow users (screen owners and advertisers) to register accounts securely. - Implement authentication mechanisms to verify user identities.

2. Ad Campaign Management: - Enable advertisers to schedule and manage targeted ad campaigns. - Provide screen owners with tools to list screens, set availability, and manage ad content.

3.Ad Submission: A function that enables advertisers to submit their advertisements to be displayed on screens.

4. Database Management: - Implement a PostgreSQL database to store multimedia files for ad display. - Facilitate efficient retrieval and storage of ad content data.

5. User Interface Design: - Design and implement user-friendly interfaces for the TV application and web platform. - Ensure intuitive navigation for both screen owners and advertisers.

6. Integration with Smart Devices: - Integrate with existing smart device platforms to enable seamless ad display in public spaces.

2.2.3 Operating Environment

The AdVenture Ads software will operate in a dynamic and diverse environment, requiring compatibility with various hardware and software components. Key elements of the operating environment include: 1. Hardware Platform: - The software should be compatible with a range of hardware platforms, including web browsers, smart devices in public spaces (e.g., smart TVs), and laptops.

2. Operating System: - Laptops: Compatibility with common operating systems, including Windows and macOS. - Web Browsers: Support for popular browsers such as Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge.

3. Other Software Components: - The software must peacefully coexist with external software components, including database management systems (PostgreSQL) for multimedia storage.

4. External Interfaces: - Seamless integration with smart devices in public spaces, potentially interfacing with existing platforms to enable ad display functionality.

5. Network Environment: - The software requires a stable and high-speed internet connection for real-time communication between the application, web server, and database.

6. Development Environment: - Development and deployment environments should include relevant software development frameworks, such as Flutter for applications and web platforms.

The AdVenture Ads software is designed to be versatile and adaptable to different operating environments, ensuring a seamless and reliable user experience across a variety of devices and platforms. Regular compatibility testing will be conducted to address any potential issues arising from updates or changes in the operating environment.

2.2.4 Design and Implementation Constraints

1.Advertisement Policies: Ad platforms often have specific policies regarding the content and format of advertisements. Developers need to adhere to these policies to ensure that ads are displayed appropriately and meet the requirements of the ad marketplace.

2.Hardware and Network Limitations: If the app needs to run on specific hardware configurations or has constraints related to network capabilities, developers will need to take these limitations into account during development.

3.Data Security: Ensuring the security of user data, especially sensitive information like login credentials and payment details, is crucial. Implementing secure authentication

methods, encryption, and secure connections will be essential.

4.Performance and Scalability: Depending on the expected user base and usage patterns, performance and scalability considerations may limit certain architectural choices. Ensuring that the app can handle potential increases in traffic is important.

2.2.5 Assumptions and Dependencies

Assumed Factors:

1.Internet Connectivity: Users, including screen owners and advertisers, will have reliable internet connectivity.

Implication: The app heavily relies on internet connectivity for real-time updates, ad submissions, and data synchronization.

2.Device Compatibility: Assumption: Users will access the app using devices (smartphones, tablets, or computers) that support Flutter for the frontend.

Implication: The user interface design and features assume compatibility with devices that support Flutter.

3.Security Measures: Assumption: Basic security measures such as user authentication and authorization will be sufficient.

Implication: The security requirements might need to be revisited if more stringent security measures are mandated by regulations or stakeholders.

Limitations and Dependencies:

1.Database Constraints:

Assumption: The app relies on PostgreSQL as the database system. Implication: Changes in the database structure or a need to migrate to a different database could impact the app's functionality.

2.Flutter Framework Stability:

Assumption: Flutter and its associated libraries maintain stability. Implication: Updates or changes in the Flutter framework may require adjustments to the app codebase.

3.User Engagement:

Assumption: Users will engage with the app as intended. Implication: If user engagement patterns differ significantly, adjustments to features or user interfaces may be necessary.

2.3 External Interface Requirements

2.3.1 User Interfaces

2.3.1.1 TV Application (Flutter): Logical Characteristics: The TV application will have an intuitive and user-friendly interface developed using the Flutter framework. Adherence to platform-specific design guidelines for Android and iOS. Layout Constraints: Responsive layout design to ensure a seamless experience across various screen sizes and orientations. Standard Buttons and Functions: Standard buttons for common actions such as login.

2.3.1.2 Web Platform (Flutter for Web): Logical Characteristics: The web platform will leverage Flutter for Web, ensuring a responsive and dynamic user interface. GUI Standards: Consistent design language with the TV application for brand cohesion. Layout Constraints: Responsive layout design for compatibility with various browsers and screen resolutions. Standard Buttons and Functions: Consistent use of standard buttons and functions across the web platform. These logical characteristics and standards provide a foundation for the user interfaces across the TV application and web platform.

2.4Hardware Interfaces

2.4.1 Web Browsers(desktops, laptops): The software seamlessly interfaces with web browsers like Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge, ensuring compatibility with diverse devices such as desktops and laptops. Data interactions cover retrieving and displaying ad content, user authentication, and campaign management, facilitated by mouse-based and keyboard-based navigation for control interactions. Secure communication is maintained through HTTPS between the web platform and the backend server.

2.4.2 Smart Devices in Public Spaces (smart TVs and digital signage displays): The software interfaces seamlessly with smart devices in public spaces, encompassing smart TVs and digital signage displays. It ensures compatibility with a diverse range of display sizes and resolutions. Data interactions focus on retrieving and displaying scheduled ad content, while control interactions may incorporate on-screen controls for

user interactions, such as skipping ads. Standard communication protocols are employed for real-time updates and content delivery.

2.5 Software Interfaces

2.5.1 Operating system Interface: The software seamlessly interacts with major operating systems, including Windows, Linux, macOS, Android TV and Samsung Tizen. It communicates with the underlying operating system for efficient resource management, file handling, and process execution.

2.5.2 PostgreSQL Database interface: The software seamlessly interfaces with a PostgreSQL database, serving as the repository for multimedia files and relevant data. The database is hosted on a server with ample storage capacity. Data interactions encompass storing and retrieving multimedia files, user account information, and campaign data, while control interactions involve database queries for efficient content retrieval and storage. The utilization of PostgreSQL's native communication protocols ensures streamlined and efficient data exchange.

2.5.3 Web Browser Interface The software effortlessly interfaces with popular web browsers such as Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge, ensuring compatibility and delivering an optimal user experience. It engages with web browsers for the web platform, efficiently handling user requests

2.5.4 Communications Interfaces

In the Adventure project, Python serves as the foundational backend framework, offering a versatile set of features to enhance development efficiency and support robust functionality. Python facilitates the creation of RESTful APIs (Representational State Transfer APIs), enabling seamless data exchange between the server and various clients, including web browsers and apps. Additionally, the integration of WebSockets provides real-time, bidirectional communication, which proves valuable for interactive features.

2.6 System Features

2.6.1 User Registration and Authentication:

2.6.1.1 Description and Priority: This feature enables users (screen owners and advertisers) to register accounts securely and includes authentication mechanisms.

Priority: High.

2.6.1.2 Stimulus/Response Sequences:

Stimulus: User initiates the registration process.

Response: System prompts for required user information, validates data, and shows a confirmation upon successful registration.

Stimulus: User attempts to log in.

Response: System verifies credentials, granting access upon successful authentication.

2.6.1.3 Functional Requirements:

REQ-1: The system shall provide a user registration form with fields for essential information, including username, email, and password.

REQ-2: Upon registration, the system shall show a confirmation message after account creation.

REQ-3: The system shall enforce secure password policies, including minimum length and complexity requirements.

2.6.2 Ad Campaign Management:

2.6.2.1 Description and Priority:

This feature allows advertisers to upload, schedule, and manage targeted ad campaigns. Priority: High.

2.6.2.2 Stimulus/Response Sequences:

Stimulus: Advertiser initiates the creation of a new ad campaign. Response: System prompts for campaign details, targeting options, and multimedia content upload.

2.6.2.3 Functional Requirements:

REQ-4: The system shall provide an intuitive campaign creation interface with options for targeting demographics, location, and interests.

REQ-5: Advertisers shall be able to upload multimedia content, including images and videos, for use in ad campaigns.

REQ-6: The system shall provide options for campaign scheduling and frequency capping.

2.6.3 Geographic Targeting and Location-Based Advertising:

2.6.3.1 Description and Priority:

This feature allows advertisers to target specific geographic locations for their ad campaigns, enhancing the relevance of content based on the physical context. Priority: Medium.

2.6.3.2 Stimulus/Response Sequences:

Stimulus: Advertiser selects geographic parameters for a new ad campaign.

Response: System incorporates location-based targeting, ensuring the ad is displayed in the specified regions.

2.6.3.3 Functional Requirements:

REQ-7: The system shall provide an interface for advertisers to define specific geographic parameters, including regions, cities, or proximity to certain landmarks.

REQ-8: Ad campaigns shall be dynamically adjusted based on the geographic location of screens, ensuring relevance to the local audience.

REQ-9: Screen owners shall have access to a map interface showing the geographic distribution of ad campaigns on their screens.

REQ-10: The system shall utilize GPS or IP-based location data to accurately target ads in real-time.

2.7 Other Nonfunctional Requirements

2.7.1 Performance Requirements

The Adventure project's performance is designed to accommodate a diverse user base, offering a responsive and efficient experience for both the app and website. With a focus on scalability, the system incorporates load balancing, asynchronous processing, and optimized database queries to ensure seamless operation even during peak usage periods.Continuous monitoring and performance optimization strategies are in place to guarantee that the Adventure project maintains optimal responsiveness, providing a reliable and enjoyable platform for users, whether accessing it via the app or website, even during high-traffic scenarios.

2.7.2 Safety Requirements

Content moderation tools prevent the dissemination of harmful material, promoting a safe online environment. strict adherence to legal requirements guarantees compliance.

2.7.3 Security Requirements

The Adventure project prioritizes security through comprehensive measures.Regular security audits, timely patching, and rate-limiting mechanisms fortify the system against potential threats. Continuous monitoring, incident response planning, and user education contribute to a secure environment. Secure storage practices and careful third-party integration further ensure the Adventure project's resilience against potential security risks, safeguarding user data and maintaining system integrity.

2.7.4 Software Quality Attributes

The software must exhibit high reliability, ensuring consistent performance without failure. It should demonstrate efficient performance, meeting response time goals, handling concurrent users, and optimizing resource utilization.

Chapter 3

System Architecture and Design

3.1 System Overview

Adventure functions as a digital marketplace that connects advertisers seeking to buy ad space with publishers looking to monetize their content. This section provides a high-level overview of the system, outlining the key components and the overall process flow.

System Components:

- User Interface (UI): Separate UIs cater to advertisers and screenowners.
- Advertiser UI: Allows advertisers to browse available ad space, define targeting parameters and manage campaigns.
- Screenowner UI: Enables publishers to register their screens, set pricing for ad space, manage display settings and access analytics on ad performance.
- Campaign Management: This module facilitates campaign creation by advertisers, targeting criteria selection, ad creative upload, and scheduling.
- Advertiser Targeting: Matches advertiser targeting criteria (demographics, interests, etc.) with screen owner profiles.
- Reporting and Analytics: Admins can access comprehensive reports and analytics dashboards.

Process Flow:

- User Registration: Advertisers and publishers register on the platform, providing necessary details and verification information.
- Ad Inventory Listing: Screen owners register their available ad space on the platform specifying location, pricing, and audience demographics.

- Campaign Creation: Advertisers browse available ad space on a dedicated interface and select screens depending upon their campaign goals, select targeting parameters (demographics, interests) and upload their advertisements.

- Selection and Scheduling: Once an advertiser selects desired ad space (TV screen), they can choose specific screens or placements within the publisher's platform for a more targeted approach. Selection can be based on factors like audience demographics specific to that screen or the prominence of the ad placement. Advertisers can choose time slots for their ad to be displayed, allowing for scheduling campaigns during peak audience times or aligning with specific events.

- Upon confirmation, ad creatives are delivered to the publisher's platform for display according to the chosen format, location, and time slot.

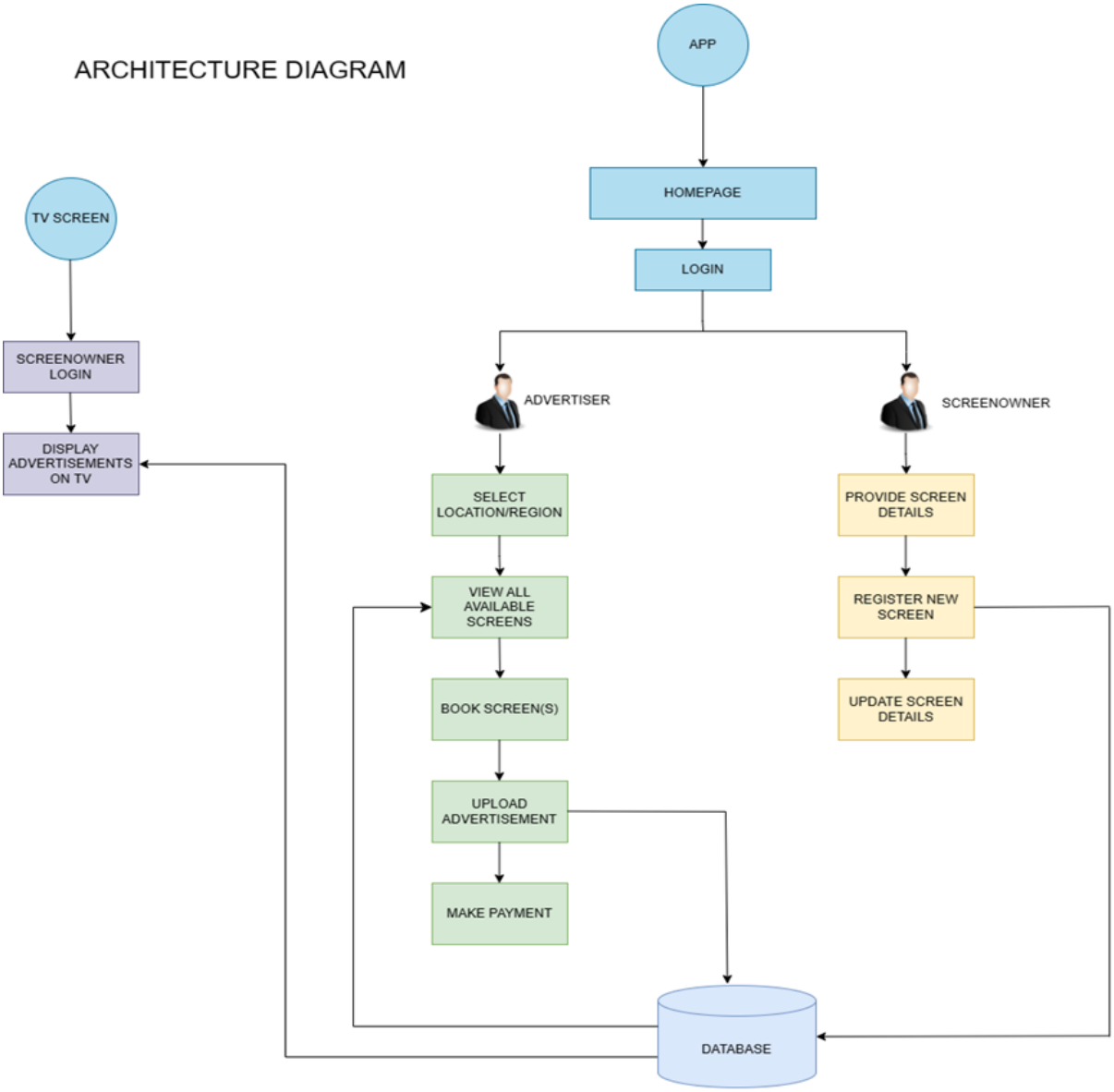

Figure 3.1: Architecture Diagram

3.2 Use Case Diagram

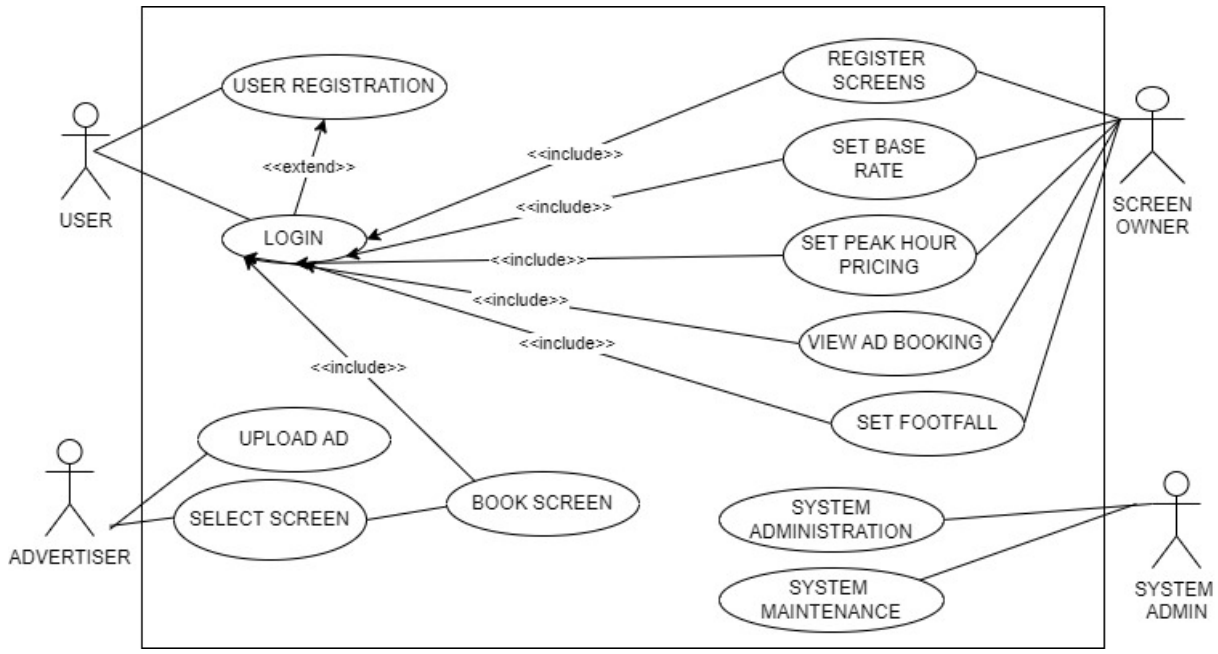

Figure 3.2: Use Case Diagram

3.3 Description of Implementation Strategies

Technology Stack Selection: The project utilized a combination of technologies including Flutter for the frontend development, python for backend development, and PostgreSQL for the database management system. These technologies were chosen for their compatibility, robustness, and suitability for the project requirements.

Modular Development Approach: The development process followed a modular approach, dividing the project into distinct components such as frontend development, backend development, database design, and API integration. This approach allowed for better organization, collaboration among team members, and easier troubleshooting.

User-Centric Design: The project prioritized user experience and interface design, ensuring that the UI/UX was intuitive, visually appealing, and responsive across different devices and screen sizes. User feedback and usability testing were incorporated throughout the development lifecycle to refine the interface design.

Scalability and Performance Optimization: The architecture and codebase were designed with scalability and performance in mind to accommodate future growth and

handle large volumes of data and user traffic. Techniques such as caching, load balancing, and database optimization were employed to ensure optimal performance.

3.4 Module Division

1. Backend Development:

Responsibilities: Develop the backend logic and APIs using Python for both the app and website. Implement user authentication, authorization, and session management. Handle database operations and integration with PostgreSQL.

Team Member: Nanditha Jinesh

2. Frontend Development (Mobile App):

Responsibilities: Design and develop the user interface for the mobile app using Flutter. Implement screens for user authentication, campaign management, and ad display. Ensure seamless navigation and user experience across different devices and screen sizes.

Team Member: Nayan A Menon

3. Frontend Development (Website):

Responsibilities: Design and develop the user interface for the website using Flutter for web. Implement screens for user authentication, campaign management, and ad display. Ensure responsiveness and compatibility with various web browsers.

Team Member: Rohan Chandy Mathews

With this module division, each team member can focus on their specific area of expertise, ensuring efficient development and cohesive integration of the Adventure app and website. Collaboration between team members will be essential to maintain consistency and alignment across both platforms.

3.5 Work Schedule - Gantt Chart

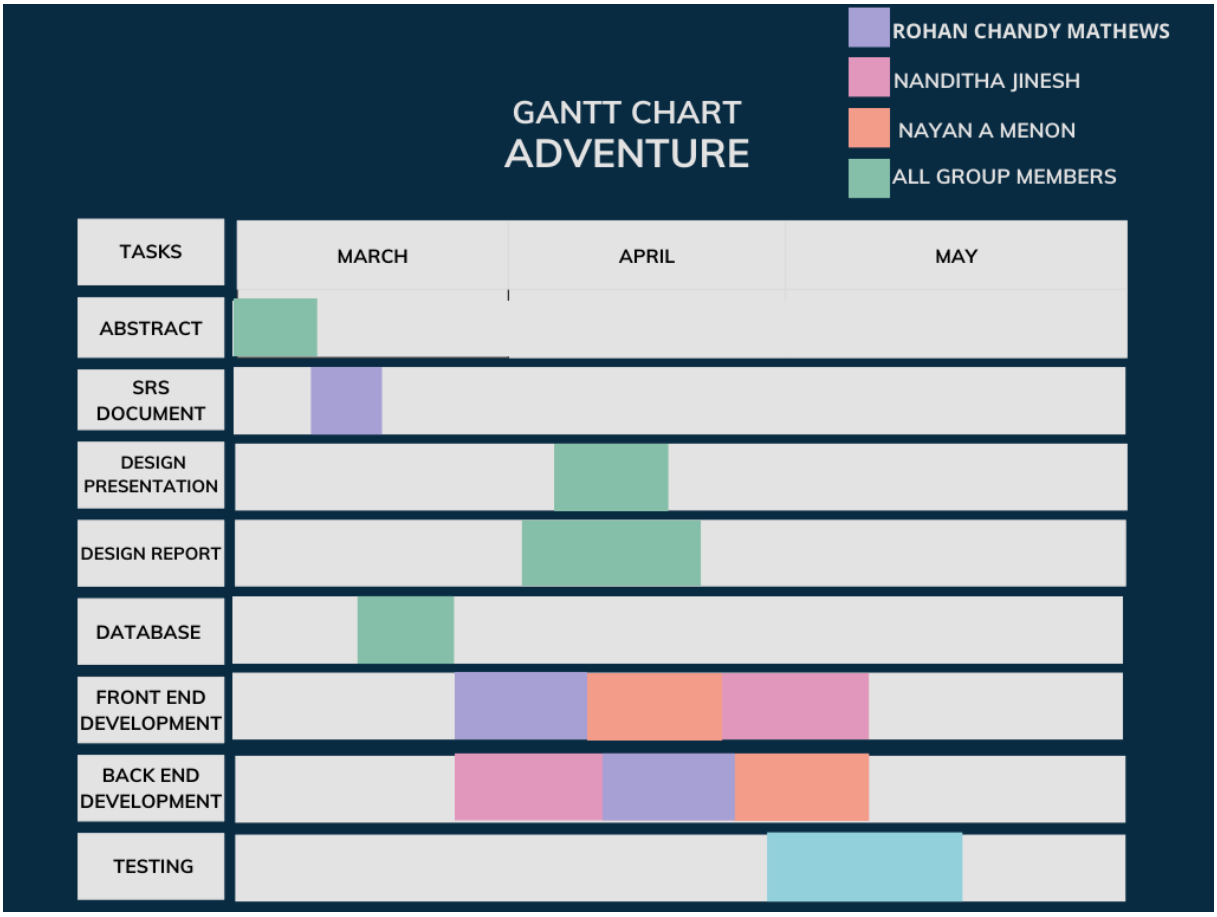

Figure 3.3: Work Schedule-Gantt Chart

Chapter 4

Results and Discussions

4.1 Overview

Our project, AdVenture Ads, has successfully transformed the digital advertising landscape by introducing a dynamic marketplace connecting advertisers with screen owners. Through meticulous design and implementation, we've developed a user-friendly interface and a robust backend architecture. Our platform streamlines ad space transactions, providing transparent performance analytics to enhance efficiency for both advertisers and screen owners. Quantitative analysis of user engagement, ad campaign success rates, and platform scalability demonstrates promising results. Further analysis delves into the societal and industrial relevance of AdVenture Ads, emphasizing its potential to reshape the advertising landscape and foster innovation in the advertising. Overall, AdVenture Ads represents a transformative solution that benefits advertisers, screen owners, and the broader advertising ecosystem.

4.2 Testing

Figure 4.1: Login Page

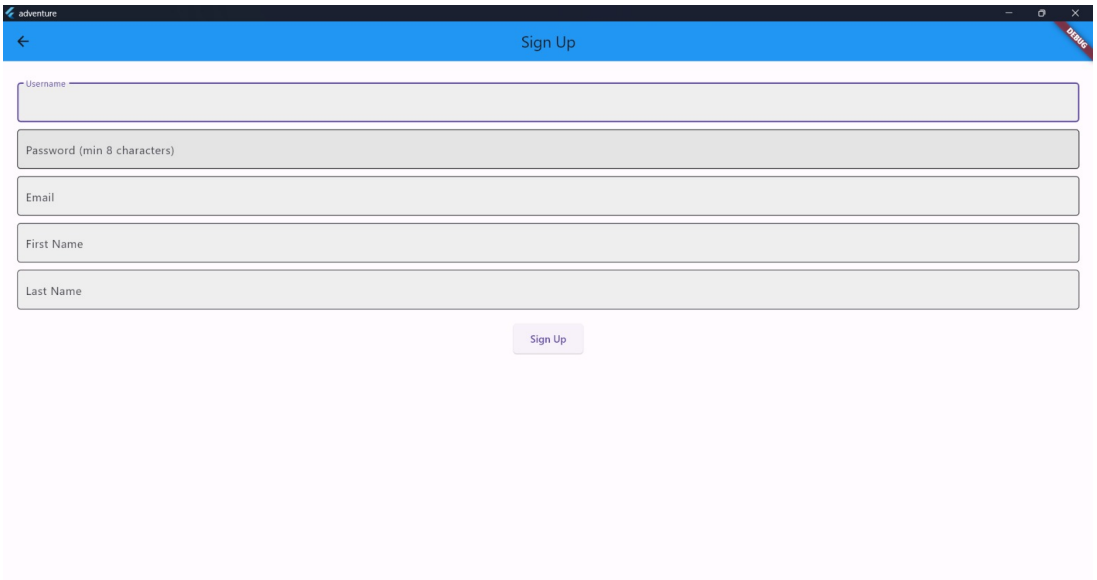

Figure 4.2: Signup Page

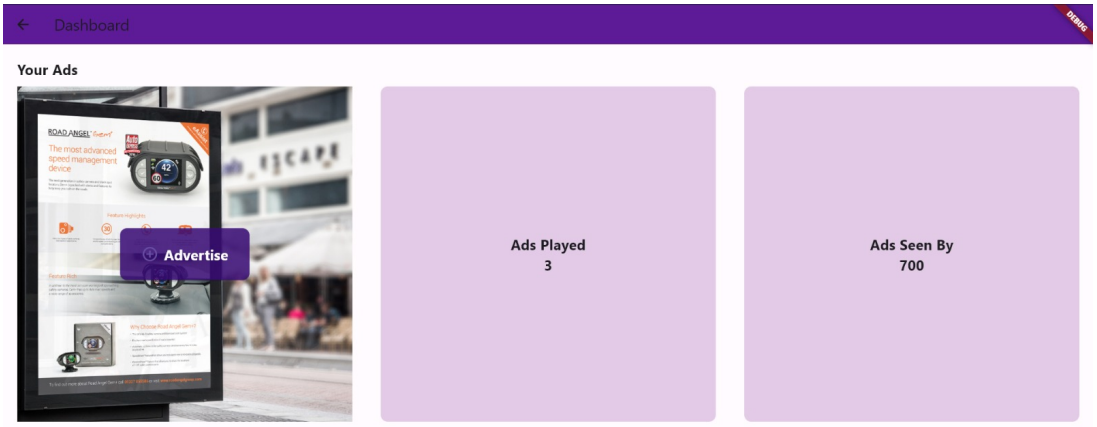

Figure 4.3: Dashboard 1

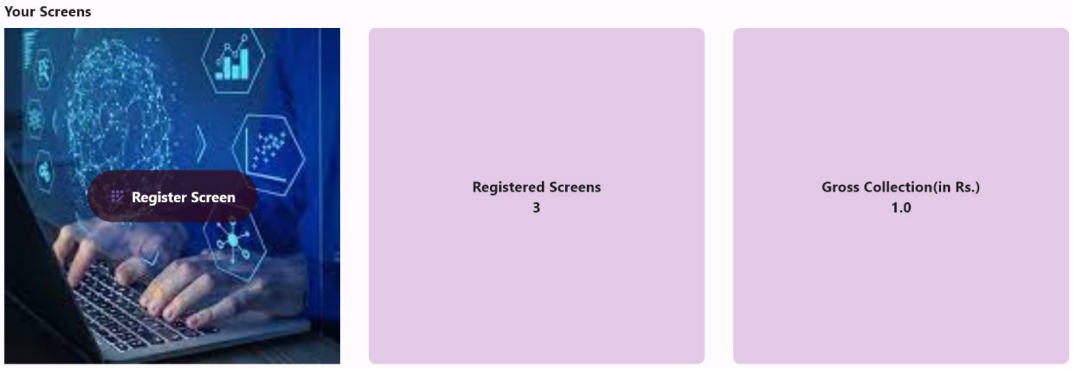

Figure 4.4: Dashboard 2

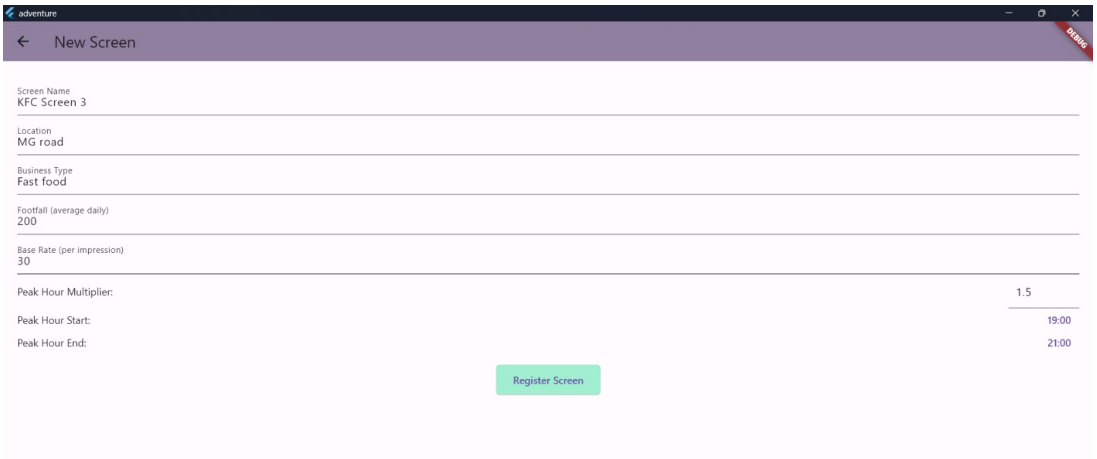

Figure 4.5: Registration Screen

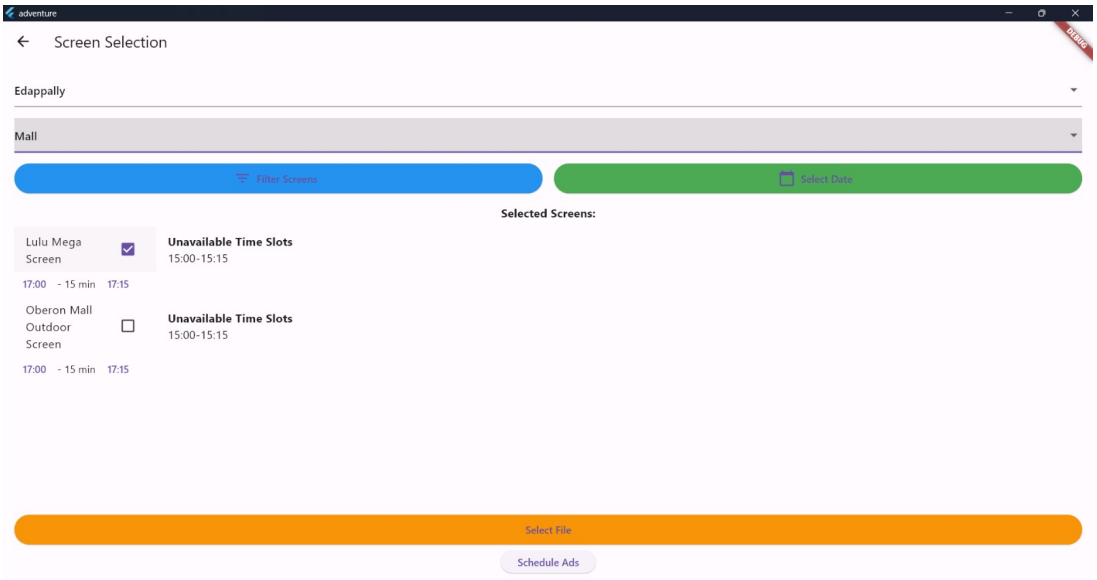

Figure 4.6: Screen Selection

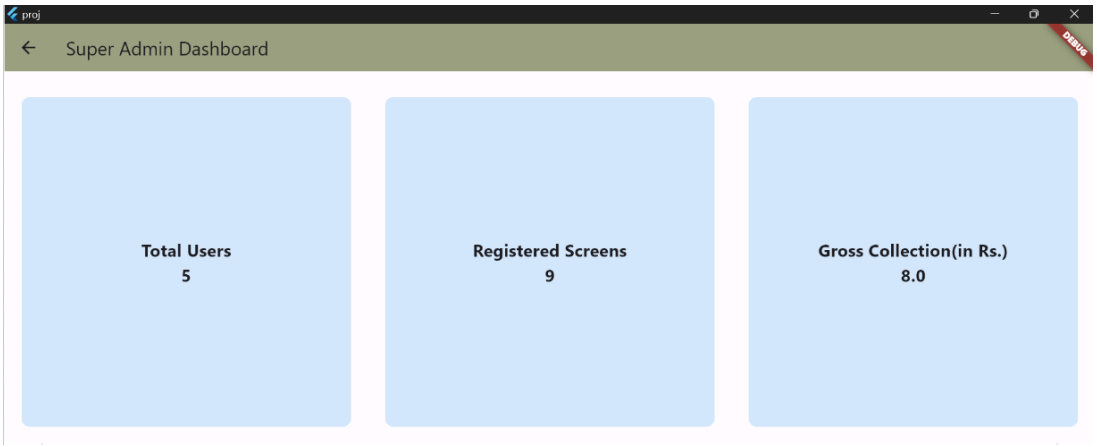

Figure 4.7: Super Admin Dashboard

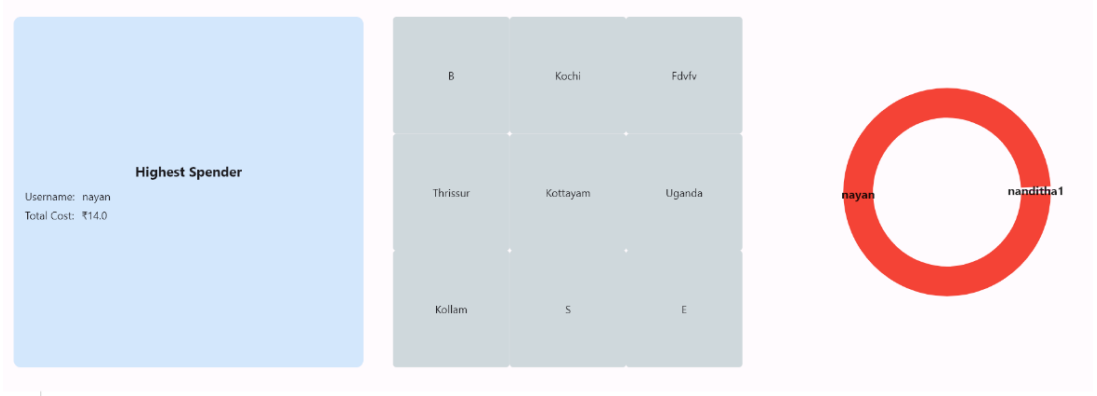

Figure 4.8: Super Admin Dashboard

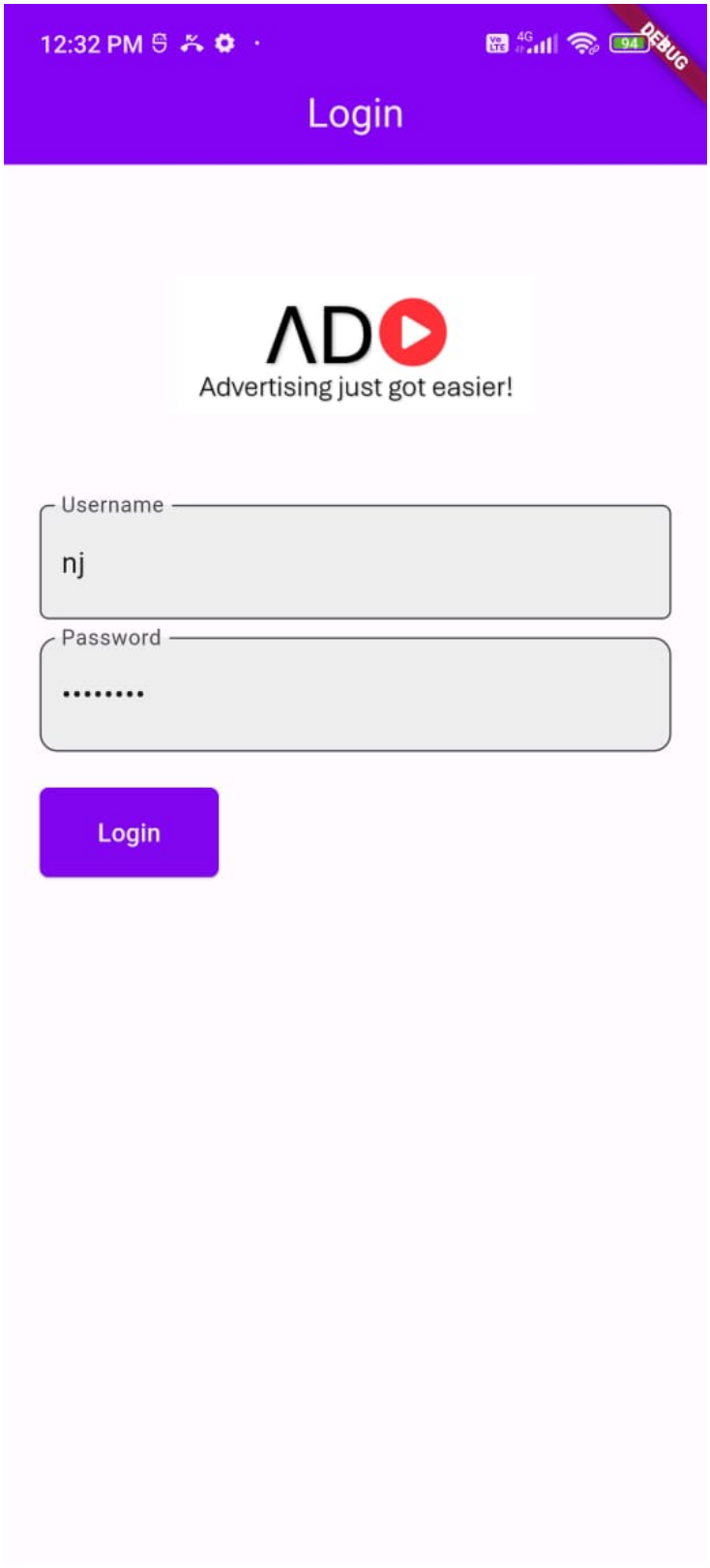

Figure 4.9: Mobile Login

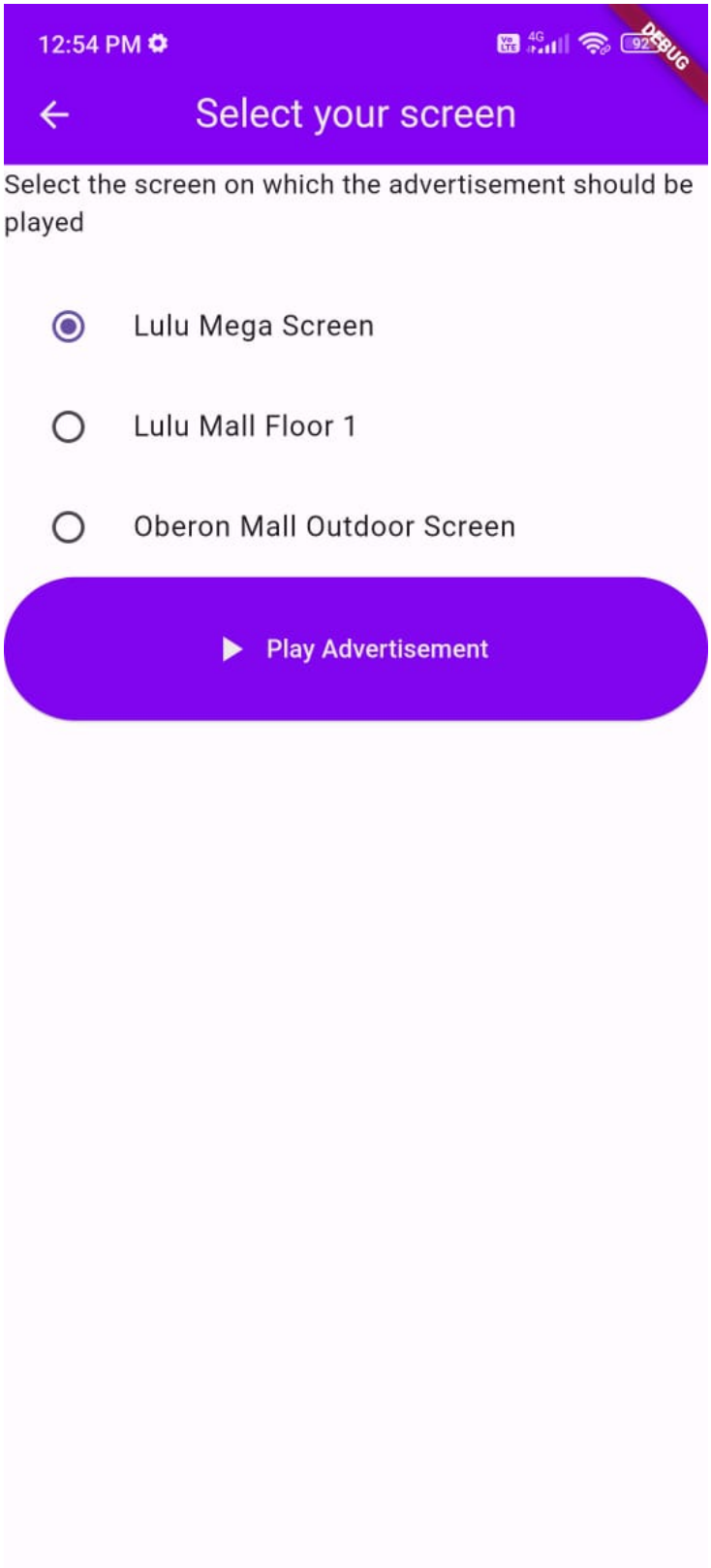

Figure 4.10: Screen selection

Figure 4.11: Advertisement

Figure 4.12: Advertisement

Figure 4.13: Advertisement

4.3 Quantitative Results

The quantitative results of the project include metrics such as user registration numbers, ad inventory listings, campaign creations, ad scheduling activities, and overall system performance metrics. These metrics provide a quantitative measure of the project's success in terms of user engagement, system usage, and operational efficiency. Additionally, key performance indicators (KPIs) such as number of ads played, number of ads seen,number of registered screens and revenue generated can further quantify the project's impact and effectiveness in achieving its goals. With the addition of super admin in our project, we can also view the highest spender along with a pie chart with each users spending and the total list of locations.

4.4 Graphical Analysis

Figure 4.14: Graphical Analysis

4.5 Discussion

The ad project aimed to create a digital marketplace connecting advertisers with publishers. The system successfully facilitated user registration, ad inventory listing, campaign creation, and ad scheduling. The reason behind the results lies in meticulous plan-

ning, robust architecture design, and effective implementation strategies. Additionally, the use of technologies like Flutter for the user interface and PostgreSQL for the database ensured seamless functionality. The project's success can be attributed to comprehensive testing, which involved uploading various ads and registering screens at different locations. Overall, adherence to project goals, coupled with continuous refinement based on user feedback, contributed to the favorable outcomes.

Chapter 5

Conclusion

5.1 Conclusion

In conclusion, our project represents a significant milestone in the realm of digital advertising by successfully creating a versatile and efficient digital marketplace connecting advertisers with publishers. Throughout the development process, we meticulously planned, designed, and implemented various components to ensure the system's effectiveness and reliability.

One of the key achievements of our project is the seamless user experience provided by the user interface, developed using Flutter for both the mobile app and web platform. This ensured that advertisers and publishers could easily navigate the platform to accomplish their respective goals, whether it be creating and managing ad campaigns or listing available ad space.

Moreover, the robust architecture design, incorporating PostgreSQL as the backend database system, played a crucial role in facilitating smooth data management and storage. This allowed for efficient handling of user registrations, ad inventory listings, campaign creation, and ad scheduling, ensuring optimal performance even during peak usage periods.

Throughout the project lifecycle, thorough testing procedures were conducted, including uploading various ads and registering screens at different locations. This comprehensive testing approach helped identify and address any potential issues, ensuring the system's reliability and functionality.

Overall, the success of our project can be attributed to effective decision-making, meticulous planning, and collaborative teamwork. By adhering to project goals and continuously refining our approach based on user feedback, we were able to deliver a digital marketplace that meets the needs of both advertisers and publishers while providing a

seamless and intuitive experience for all users. As digital advertising continues to evolve, our project serves as a testament to the effectiveness of innovative technologies and strategic implementation in meeting the demands of the modern advertising landscape.

5.2 Future Scope

The project lays a strong foundation for future enhancements and expansions. Potential areas for further development include implementing advanced analytics tools to provide advertisers with deeper insights into ad performance, integrating machine learning algorithms for more targeted ad placements, extending support for additional advertising formats such as interactive ads, exploring partnerships with third-party data providers to enhance targeting capabilities, and incorporating blockchain technology for enhanced transparency and security in ad transactions. These advancements would further solidify the platform's position as a leading digital advertising marketplace, offering advertisers and publishers innovative solutions to optimize their advertising strategies.

References

[1] Adler, M., Gibbons, P. B., Matias, Y. (2002). Scheduling space-sharing for internet advertising. Journal of Scheduling, 5(2), 103-119.

[2] Bagwell, Kyle. "The economic analysis of advertising." Handbook of industrial organization 3 (2007): 1701-1844.

[3] Tellis, Gerard J. Effective advertising: Understanding when, how, and why advertising works. Sage Publications, 2003.

[4] Telser, Lester G. "Advertising and competition." Journal of political Economy 72.6 (1964): 537-562.

Appendix A: Presentation

AdVenture

PRESENTATION

Guide:Dr.Uma Narayanan
(Asst. Professor,CS Dept.)

U2103178 Rohan Chandy Mathews
U2103149 Nanditha Jinesh
U2103150 Nayan A Menon

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- Introduction
- Problem Definition
- Objectives
- Functional Requirements of the Product
- System Architecture
- Database Design
- Work Division – Gantt Chart
- Software/Hardware Requirements
- Results
- Conclusion
- Future Enhancements
- References

INTRODUCTION

- AdVenture introduces innovation to digital advertising, providing a platform that redefines how advertisers and screen owners collaborate for mutual success.

- **Relevance :** The digital advertising industry is rapidly evolving, presenting immense opportunities for targeted and impactful marketing strategies.

- **Unlocks new revenue streams and maximizes brand exposure.**

- **Need :** Addressing the growing demand for effective, location-based advertising, our application bridges the gap between advertisers seeking exposure and screen owners eager to monetize screen spaces. It optimizes ad placement and boosts revenue for both stakeholders.

PROBLEM DEFINITION

- To develop a comprehensive **application** connecting screen owners and advertisers.

- To design and implement a mobile app for **displaying booked ads** on registered screens.

OBJECTIVES

The potential objectives of our AdVenture Ads project:

- Develop an application for managing ad campaigns on digital billboards (or potentially other digital screens).
- Allow advertisers to upload ad content, create and schedule ad bookings on specific screens.
- Allow screen owners to register their screens with the system, view ad bookings and potentially manage pricing or availability of their screens.
- Implement a backend system to manage user accounts (advertisers, screen owners), ad data, scheduling information.

Scope and Relevance:

The relevance of the project lies in its utility for businesses or advertisers who wish to manage and schedule advertising campaigns on digital screens placed in various locations. By providing a user-friendly interface for selecting screens, scheduling ads, calculating cost, uploading and displaying advertising content, the project simplifies the process of managing digital advertising campaigns.

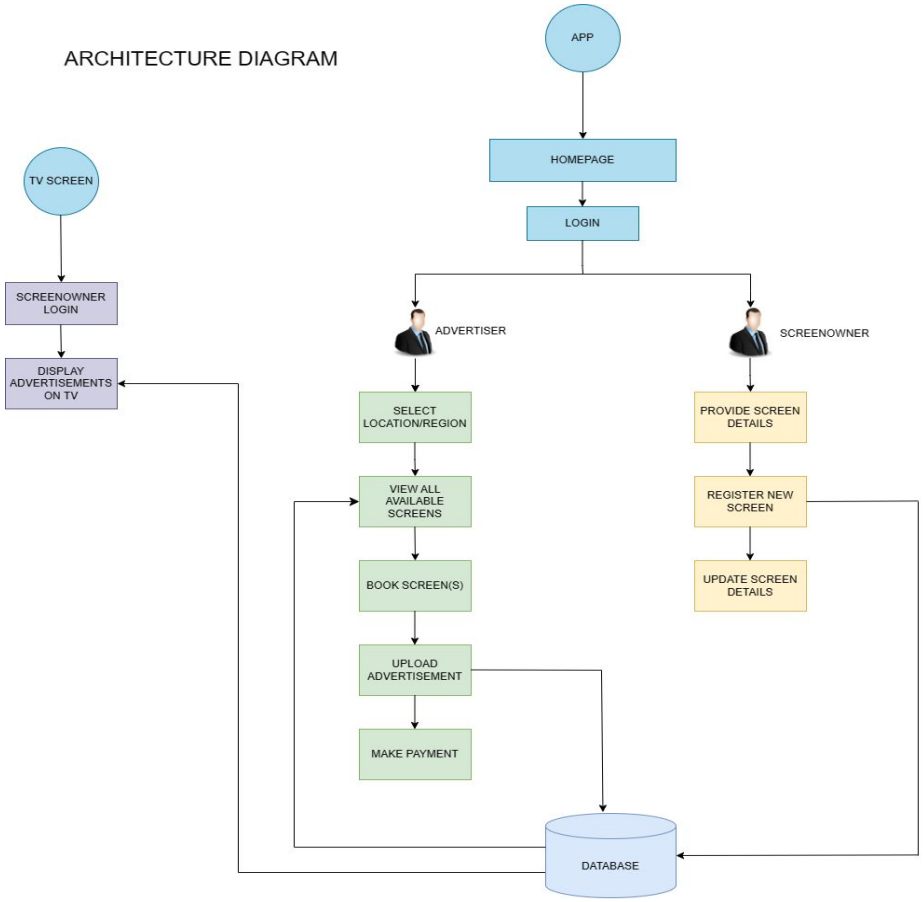
Several stakeholders could find this project useful:

Advertisers and Marketing Professionals,

Digital Signage Operators,

Advertising Agencies,

Venue Owners and Operators equipped with digital screen.



MODULE WISE EXPLANATION

1. User Management Module:

   Functionalities:

- User registration and login for advertisers and screen owners.
- User profile management
- Role-based access control (RBAC) to restrict functionalities based on user type (users and admin).

2. Ads Management Module:

- Uploading ad content (images, videos).
- Scheduling ads (selecting screens, dates, and times).

3. Screen Management Module:

- Registering and managing digital billboards or screens.
- Setting base rates and peak hour pricing.
- Tracking revenue generated.

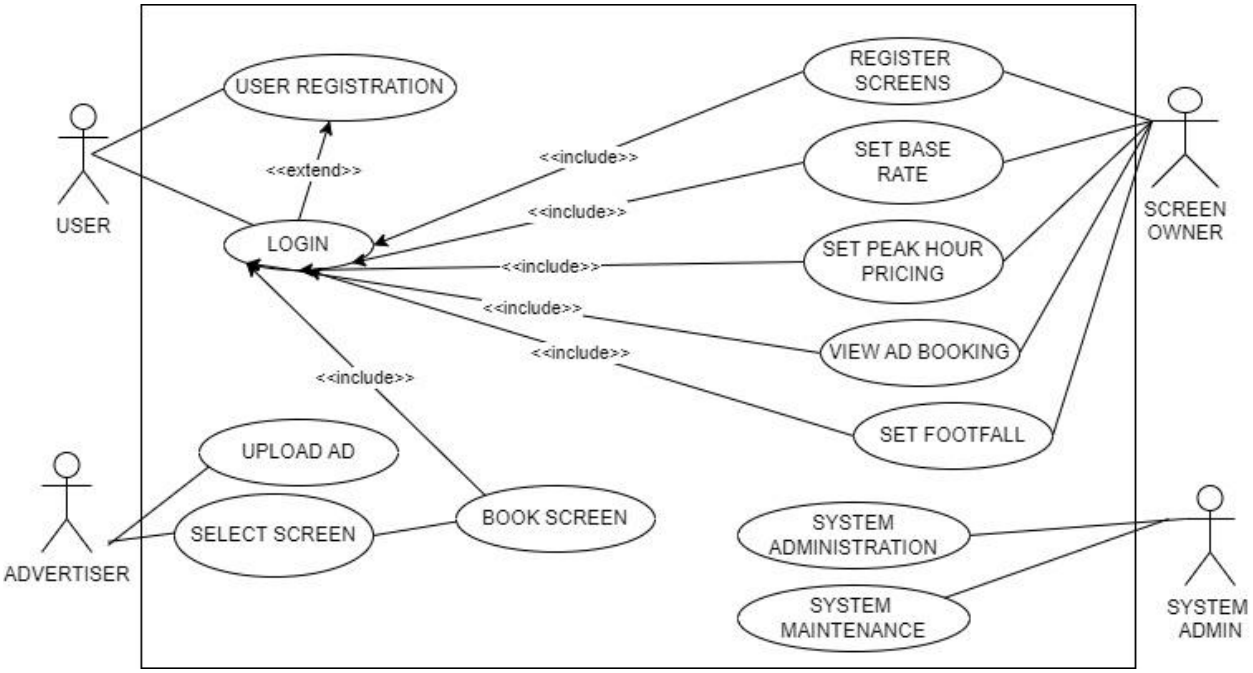
4. Scheduling and Booking Module:

- Managing ad bookings based on advertiser selections (screens, dates, times).
- Handling potential conflicts (preventing double-booking on the same screen during the same time).
- Calculating ad booking costs based on screen base rates, peak hour multipliers (if applicable), and duration.

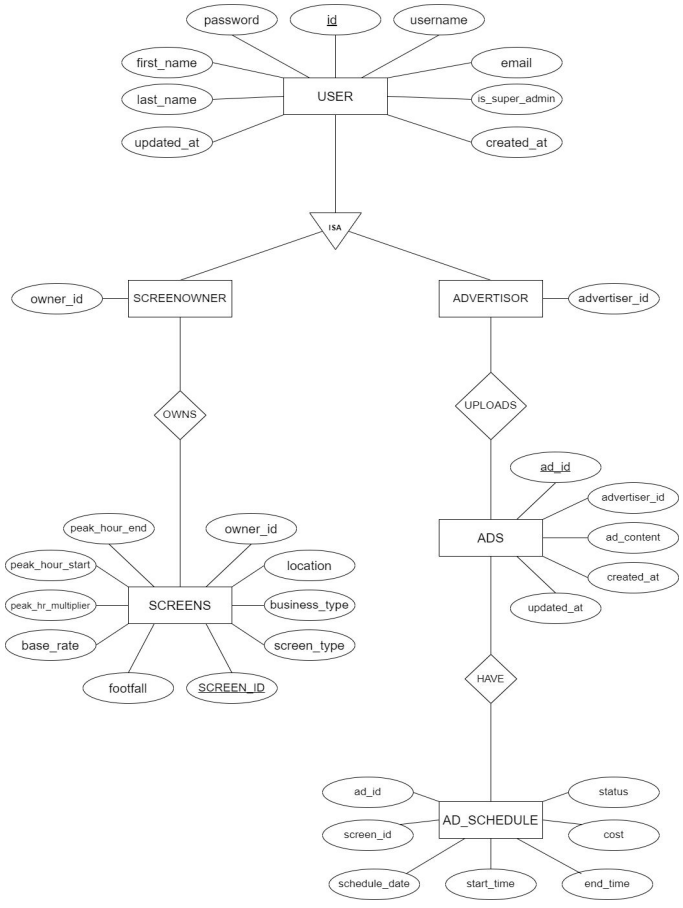
5. Reporting and Analytics Module:

- Providing reports and analytics dashboards for administrators.

USE CASE DIAGRAM



DATABASE DIAGRAM



SOFTWARE REQUIREMENTS

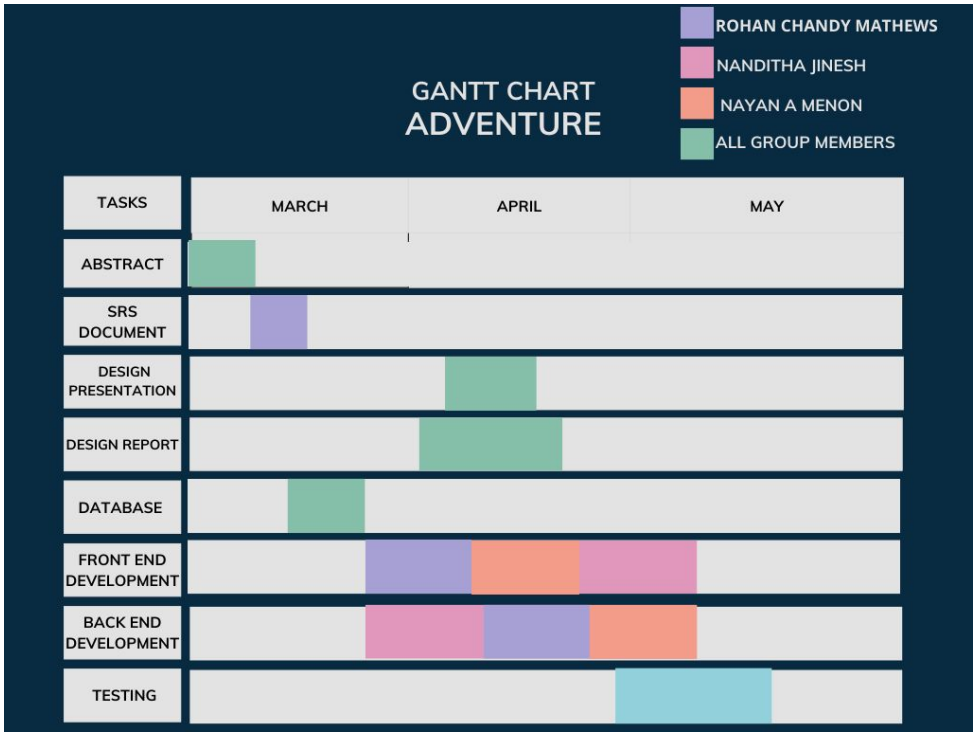
- **Front End:**
  - Flutter (Application and Smart screen App)
- **Service Layer:**
  - Python-Flask
- **Backend:**
  - PostgreSQL
- **Server Infrastructure:**
  - High-speed internet support

HARDWARE REQUIREMENTS

1. **Mobile App:**
   a. Processor: **Android**: At least a dual-core processor **iOS**: A6 chip or later
   b. RAM: **Android**: 1.5GB or more recommended for a smooth experience

      iOS: Varies depending on iOS version and device model, but generally 1GB or more is recommended.
   c. Storage: Enough space to accommodate the app itself and any downloaded data
   d. Operating System: Android or iOS.
2. **Smart TVs/Digital Displays:**
   a. Screen Resolution: Full HD (1920 x 1080) or higher
   b. Connectivity: Wi-Fi or Ethernet
   c. Operating System: Android TV,Samsung Tizen (Tizen 6.0 and above)

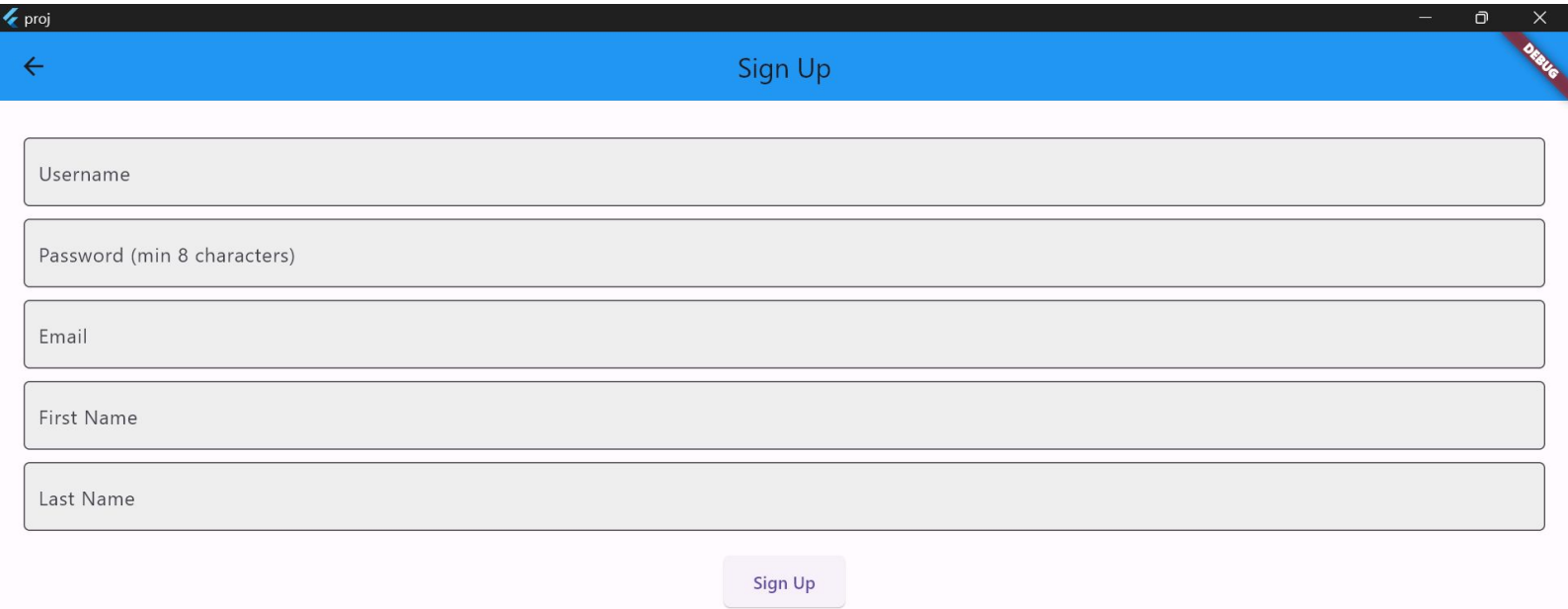
WORK DIVISION



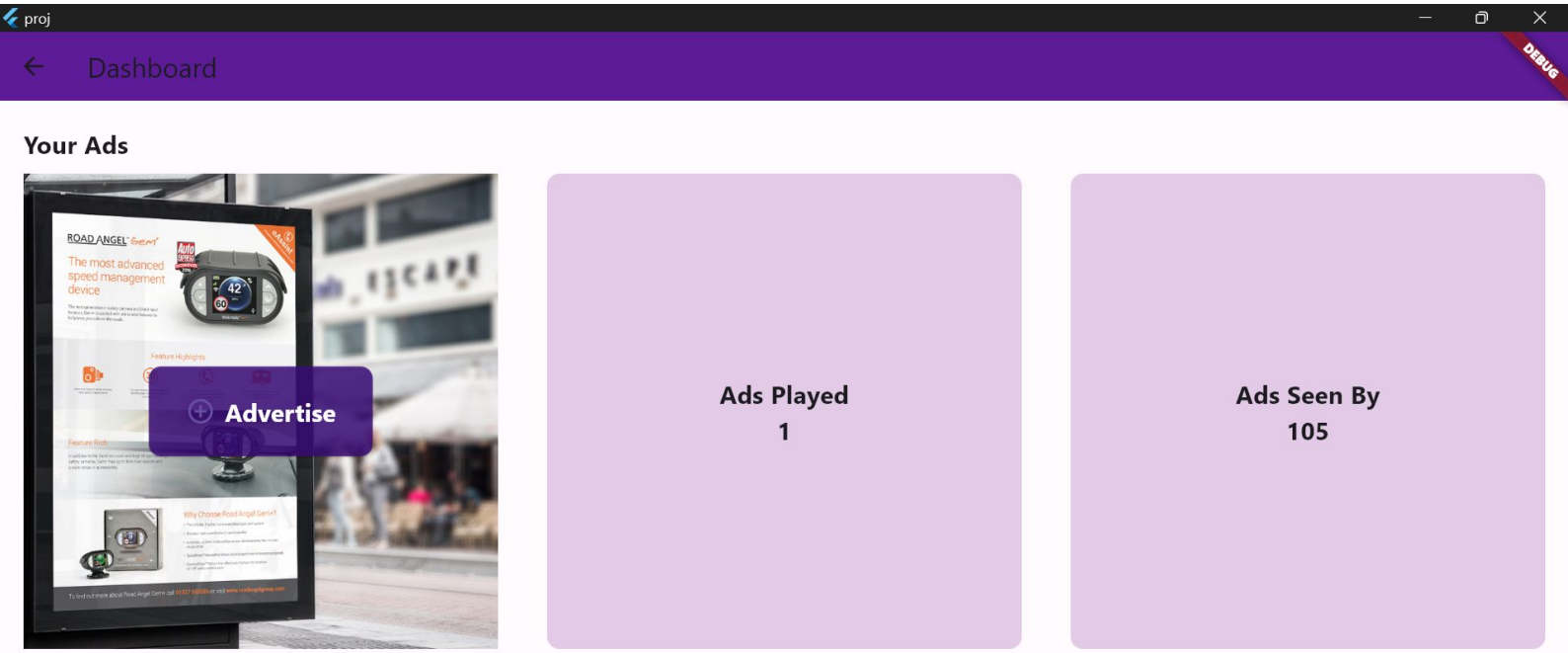
RESULTS

Login page:

Sign Up:



Dashboard:

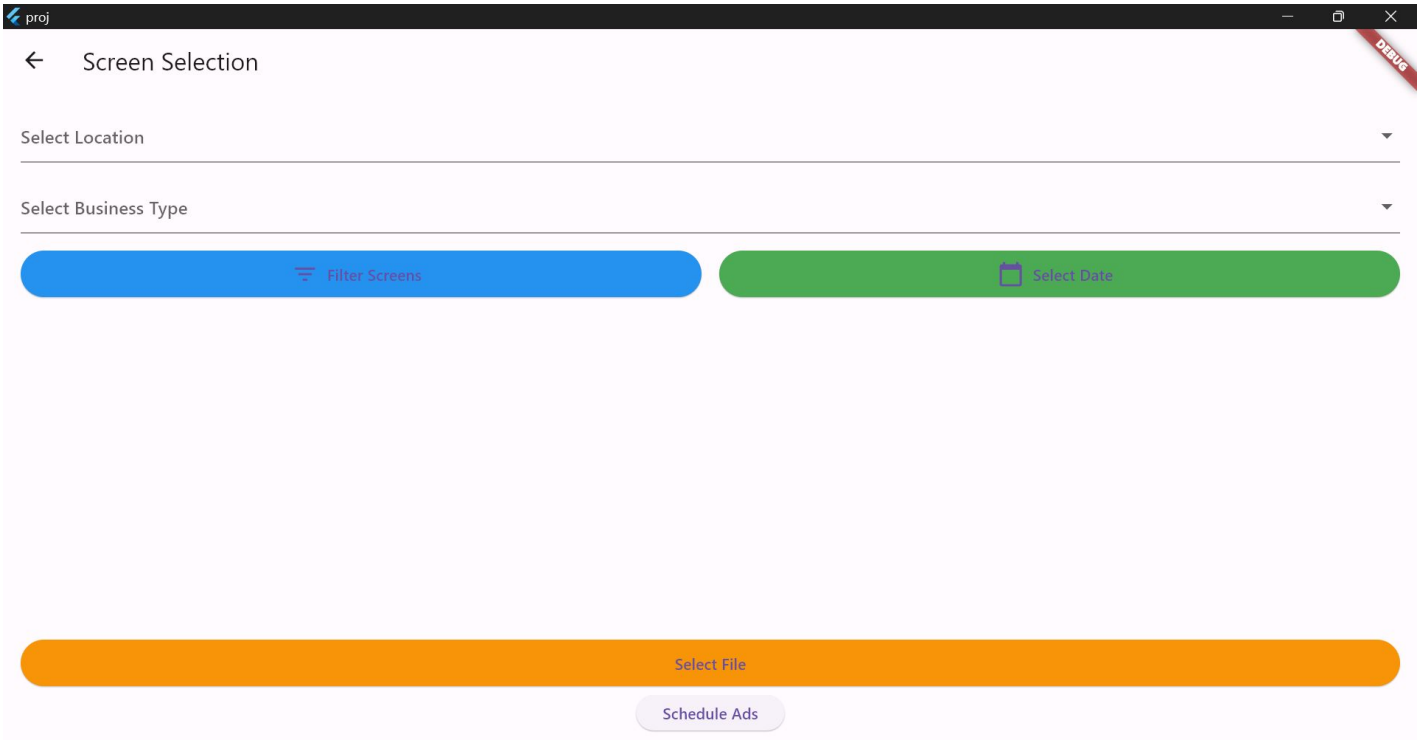


Your Screens

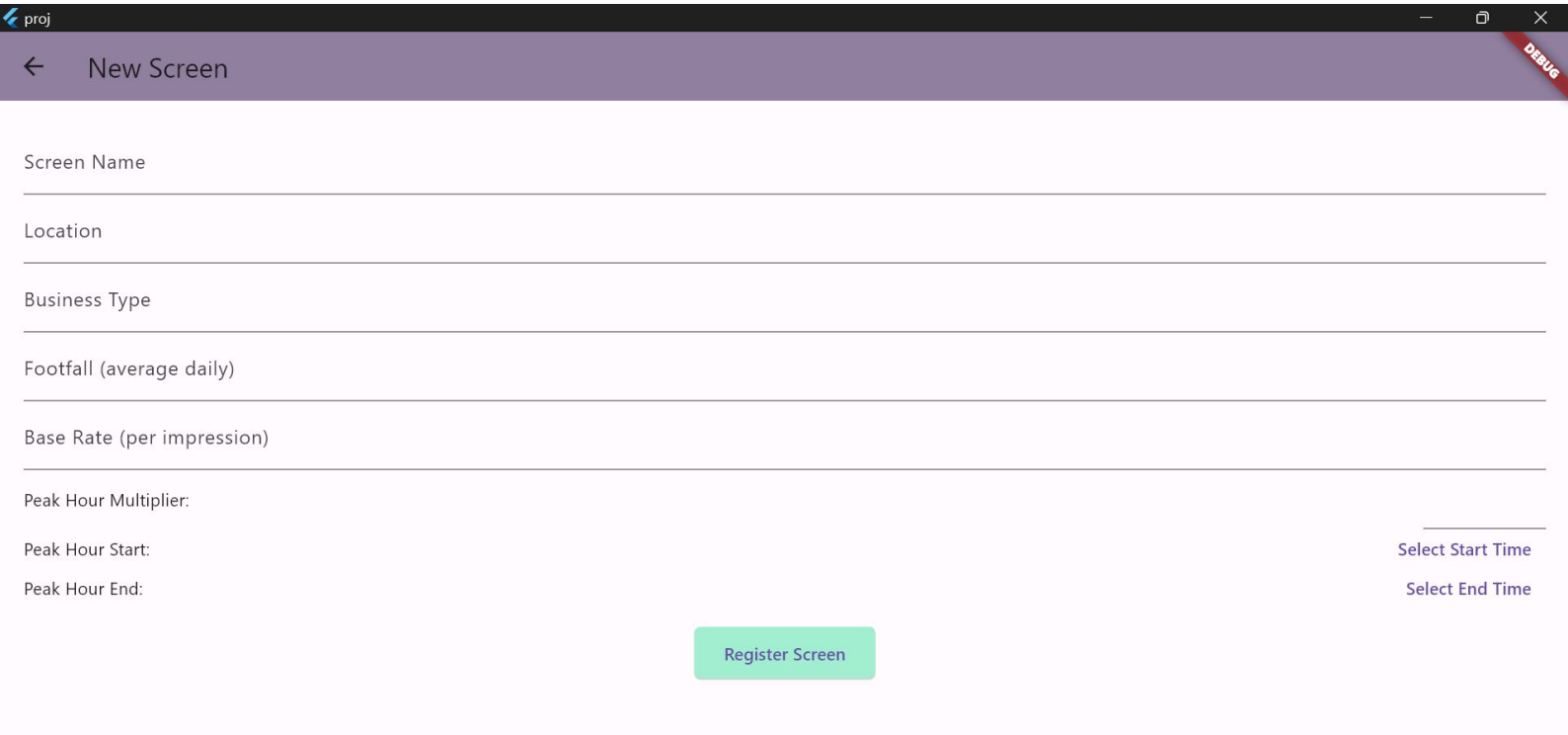
Registered Screens
5

Gross Collection(in Rs.)
3.0

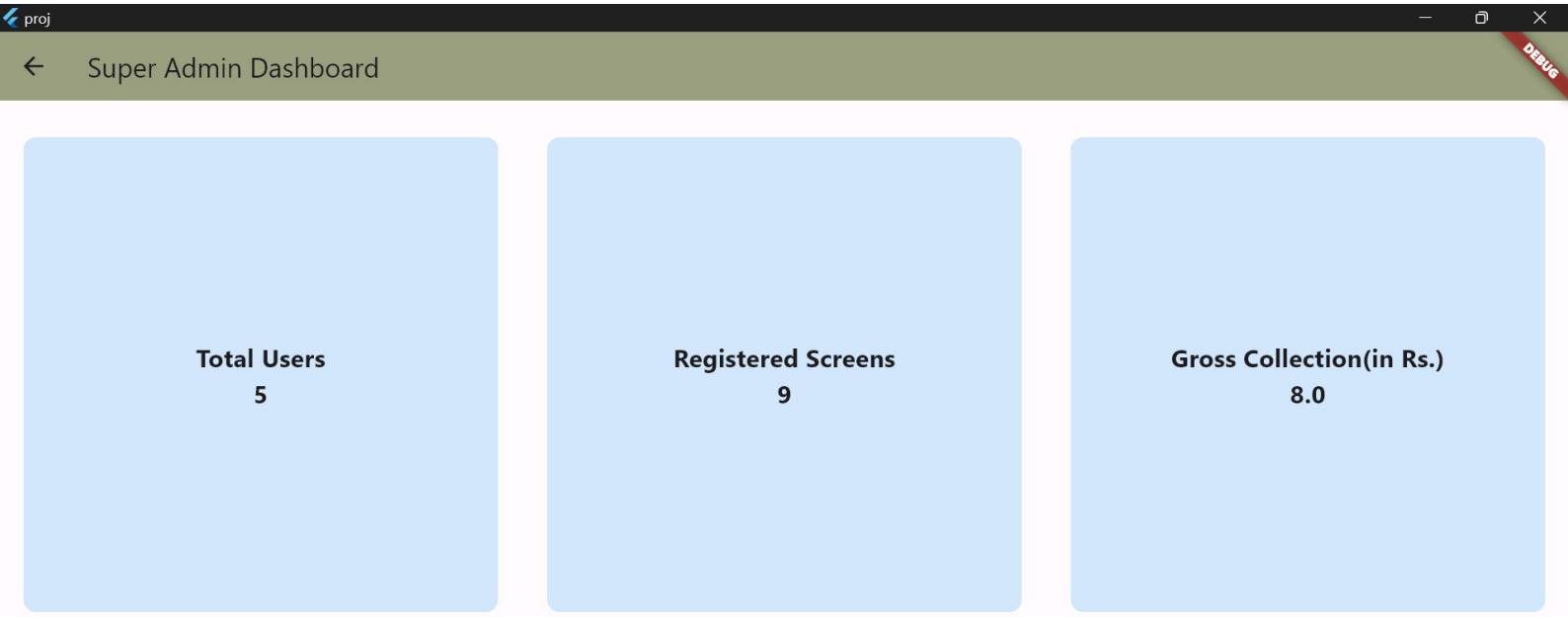
Screen Selection:

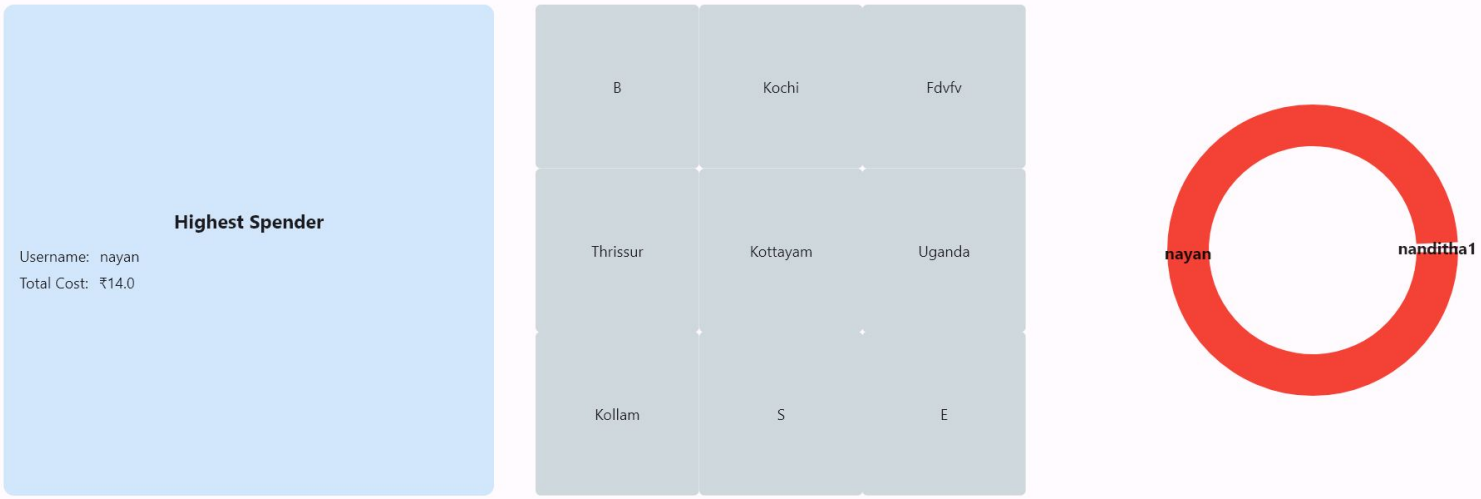


New Screen:



Super Admin:





CONCLUSION

AdVenture Ads: Revolutionizing Public Display Advertising

Revolutionize targeted advertising in public spaces.

●**Connect screen owners with advertisers:** Unlock new revenue streams with targeted ad placements.
●**Targeted Advertising:** Advertisers can target specific demographics based on location, interests, or other relevant criteria
●**Fosters a Mutually beneficial ecosystem:** AdVenture Ads presents a viable solution to bridge the gap between underutilized advertising space and the growing demand for targeted advertising in public locations.

FUTURE ENHANCEMENTS

Integration of UPI and other transaction methods for advertisers: Advertisers could select specific screens or areas for displaying their ads and make payments through the integrated payment system.

Variable Time Slot Display: Currently, our project enables screen owners to display ads within fixed time slots of 15 minutes each. However, we envision future advancements where advertisers will have the flexibility to select their preferred minimum duration for displaying ads on selected screens, based on availability.

Content Filtering Security: Presently, our project lacks the capability to filter out ads containing inappropriate content unsuitable for public display. However, we recognize the importance of enhancing security measures in the future to ensure that only appropriate ads are showcased to the audience.

REFERENCES

1.Adler, M., Gibbons, P. B., & Matias, Y. (2002). Scheduling space-sharing for internet advertising. Journal of Scheduling, 5(2), 103-119.

2.Bagwell, Kyle. "The economic analysis of advertising." Handbook of industrial organization 3 (2007): 1701-1844.

3.Tellis, Gerard J. Effective advertising: Understanding when, how, and why advertising works. Sage Publications, 2003.

4.Telser, Lester G. "Advertising and competition." Journal of political Economy 72.6 (1964): 537-562.

Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
RAJAGIRI VALLEY, KAKKANAD, KOCHI, 682039
(Affiliated to APJ Abdul Kalam Technological University)

Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills

The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills

The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills

The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes

After the completion of the course the student will be able to:

CO1:

Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)

CO2:
Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)

CO3:
Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)

CO4:
Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)

CO5:
Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)

Appendix C: CO-PO-PSO Mapping

COURSE OUTCOMES:

After completion of the course the student will be able to

SL. NO	DESCRIPTION	Blooms' Taxonomy Level
CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)	Level 3: Apply

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	3	3	3	3		2	2	3	2	2	2	3	2	2	2
CO2	3	3	3	3	3	2		3	2	3	2	3	2	2	2
CO3	3	3	3	3	3	2	2	3	2	2	2	3			2
CO4	2	3	2	2	2			3	3	3	2	3	2	2	2
CO5	3	3	3	2	2	2	2	3	2		2	3	2	2	2

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/ MEDIUM/ HIGH	JUSTIFICATION
100003/CS622T.1-PO1	HIGH	Identify technically and economically feasible problems by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
100003/CS622T.1-PO2	HIGH	Identify technically and economically feasible problems by analysing complex engineering problems reaching substantiated conclusions using first principles of mathematics.
100003/CS622T.1-PO3	HIGH	Design solutions for complex engineering problems by identifying technically and economically feasible problems.
100003/CS622T.1-PO4	HIGH	Identify technically and economically feasible problems by analysis and interpretation of data.
100003/CS622T.1-PO6	MEDIUM	Responsibilities relevant to the professional engineering practice by identifying the problem.
100003/CS622T.1-PO7	MEDIUM	Identify technically and economically feasible problems by understanding the impact of the professional engineering solutions.
100003/CS622T.1-PO8	HIGH	Apply ethical principles and commit to professional ethics to identify technically and economically feasible problems.
100003/CS622T.1-PO9	MEDIUM	Identify technically and economically feasible problems by working as a team.
100003/CS622T.1-PO10	MEDIUM	Communicate effectively with the engineering community by identifying technically and economically feasible problems.
100003/CS622T.1-P011	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles by selecting the technically and economically feasible problems.
100003/CS622T.1-PO12	HIGH	Identify technically and economically feasible problems for long term learning.
100003/CS622T.1-PSO1	MEDIUM	Ability to identify, analyze and design solutions to identify technically and economically feasible problems.
100003/CS622T.1-PSO2	MEDIUM	By designing algorithms and applying standard practices in software project development and Identifying technically and economically feasible problems.
100003/CS622T.1-PSO3	MEDIUM	Fundamentals of computer science in competitive research can be applied to Identify technically and economically feasible problems.
100003/CS622T.2-PO1	HIGH	Identify and survey the relevant by applying the knowledge of mathematics, science, engineering fundamentals.

100003/CS622T.2-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems get familiarized with software development processes.
100003/CS622T.2-PO3	**HIGH**	Design solutions for complex engineering problems and design based on the relevant literature.
100003/CS622T.2-PO4	**HIGH**	Use research-based knowledge including design of experiments based on relevant literature.
100003/CS622T.2-PO5	**HIGH**	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes by using modern tools.
100003/CS622T.2-PO6	**MEDIUM**	Create, select, and apply appropriate techniques, resources, by identifying and surveying the relevant literature.
100003/CS622T.2-PO8	**HIGH**	Apply ethical principles and commit to professional ethics based on the relevant literature.
100003/CS622T.2-PO9	**MEDIUM**	Identify and survey the relevant literature as a team.
100003/CS622T.2-PO10	**HIGH**	Identify and survey the relevant literature for a good communication to the engineering fraternity.
100003/CS622T.2-PO11	**MEDIUM**	Identify and survey the relevant literature to demonstrate knowledge and understanding of engineering and management principles.
100003/CS622T.2-PO12	**HIGH**	Identify and survey the relevant literature for independent and lifelong learning.
100003/CS622T.2-PSO1	**MEDIUM**	Design solutions for complex engineering problems by Identifying and survey the relevant literature.
100003/CS622T.2-PSO2	**MEDIUM**	Identify and survey the relevant literature for acquiring programming efficiency by designing algorithms and applying standard practices.
100003/CS622T.2-PSO3	**MEDIUM**	Identify and survey the relevant literature to apply the fundamentals of computer science in competitive research.
100003/CS622T.3-PO1	**HIGH**	Perform requirement analysis, identify design methodologies by using modern tools & advanced programming techniques and by applying the knowledge of mathematics, science, engineering fundamentals.
100003/CS622T.3-PO2	**HIGH**	Identify, formulate, review research literature for requirement analysis, identify design methodologies and develop adaptable & reusable solutions.

100003/CS622T.3-PO3	**HIGH**	Design solutions for complex engineering problems and perform requirement analysis, identify design methodologies.
100003/CS622T.3-PO4	**HIGH**	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/CS622T.3-PO5	**HIGH**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
100003/CS622T.3-PO6	**MEDIUM**	Perform requirement analysis, identify design methodologies and assess societal, health, safety, legal, and cultural issues.
100003/CS622T.3-PO7	**MEDIUM**	Understand the impact of the professional engineering solutions in societal and environmental contexts and Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions.
100003/CS622T.3-PO8	**HIGH**	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions by applying ethical principles and commit to professional ethics.
100003/CS622T.3-PO9	**MEDIUM**	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
100003/CS622T.3-PO10	**MEDIUM**	Communicate effectively with the engineering community and with society at large to perform requirement analysis, identify design methodologies.
100003/CS622T.3-PO11	**MEDIUM**	Demonstrate knowledge and understanding of engineering requirement analysis by identifying design methodologies.
100003/CS622T.3-PO12	**HIGH**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by analysis, identify design methodologies and develop adaptable & reusable solutions.
100003/CS622T.3-PSO3	**MEDIUM**	The ability to apply the fundamentals of computer science in competitive research and prior to that perform requirement analysis, identify design methodologies.
100003/CS622T.4-PO1	**MEDIUM**	Prepare technical report and deliver presentation by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
100003/CS622T.4-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems by preparing technical report and deliver presentation.

100003/CS622T.4-PO3	**MEDIUM**	Prepare Design solutions for complex engineering problems and create technical report and deliver presentation.
100003/CS622T.4-PO4	**MEDIUM**	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions and prepare technical report and deliver presentation.
100003/CS622T.4-PO5	**MEDIUM**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and Prepare technical report and deliver presentation.
100003/CS622T.4-PO8	**HIGH**	Prepare technical report and deliver presentation by applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
100003/CS622T.4-PO9	**HIGH**	Prepare technical report and deliver presentation effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
100003/CS622T.4-PO10	**HIGH**	Communicate effectively with the engineering community and with society at large by prepare technical report and deliver presentation.
100003/CS622T.4-PO11	**MEDIUM**	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work by prepare technical report and deliver presentation.
100003/CS622T.4-PO12	**HIGH**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by prepare technical report and deliver presentation.
100003/CS622T.4-PSO1	**MEDIUM**	Prepare a technical report and deliver presentation to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas.
100003/CS622T.4-PSO2	**MEDIUM**	To acquire programming efficiency by designing algorithms and applying standard practices in software project development and to prepare technical report and deliver presentation.
100003/CS622T.4-PSO3	**MEDIUM**	To apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs by preparing technical report and deliver presentation.
100003/CS622T.5-PO1	**HIGH**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
100003/CS622T.5-PO2	**HIGH**	Identify, formulate, review research literature, and analyze complex engineering problems by applying engineering and management principles to achieve the goal of the project.

100003/CS622T.5-PO3	**HIGH**	Apply engineering and management principles to achieve the goal of the project and to design solutions for complex engineering problems and design system components or processes that meet the specified needs.
100003/CS622T.5-PO4	**MEDIUM**	Apply engineering and management principles to achieve the goal of the project and use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/CS622T.5-PO5	**MEDIUM**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and to apply engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO6	**MEDIUM**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities by applying engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO7	**MEDIUM**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and apply engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO8	**HIGH**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice and to use the engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO9	**MEDIUM**	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings and to apply engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO11	**MEDIUM**	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments and to apply engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PO12	**HIGH**	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change and to apply engineering and management principles to achieve the goal of the project.
100003/CS622T.5-PSO1	**MEDIUM**	The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas. Apply engineering and management principles to achieve the goal of the project.

101003/CS622T.5-PSO2	**MEDIUM**	The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry and to apply engineering and management principles to achieve the goal of the project.
101003/CS622T.5-PSO3	**MEDIUM**	The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur and apply engineering and management principles to achieve the goal of the project.