

22ME411- PRODUCT DEVELOPMENT LAB 4

“Diagnosing Diseases with the Power of AI and ML”

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BONAFIDE CERTIFICATE

Certified that this project report “**Diagnosing Diseases with the Power of AI and ML**” is the bonafide work of **Aakash A(111722203001), Rohit Vijayan B(111722203012), Divakar G(111722203022), Jayaseelan U(111722203036)** who carried out the Product Development Lab 4 under my supervision.

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ABSTRACT

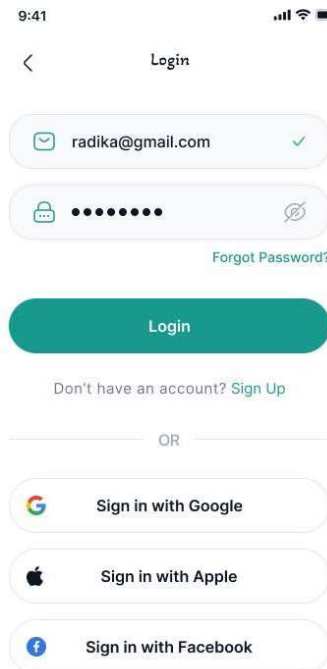
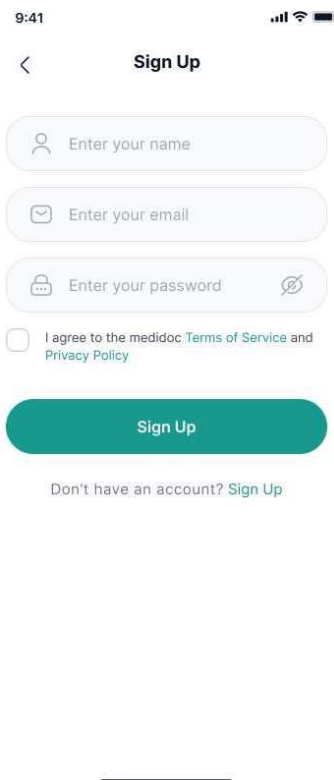
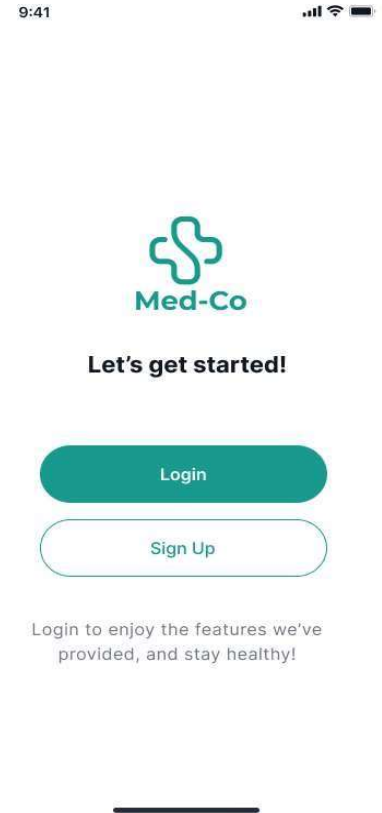
This project represents a groundbreaking healthcare solution that has successfully been developed to address the pressing challenges of healthcare access and diagnosis. Leveraging advanced Artificial Intelligence (AI) and Machine Learning (ML) technologies, the project offers a comprehensive platform designed to serve both rural and urban populations. With the completion of its development phase, the project now stands as a transformative tool for healthcare management and coordination.

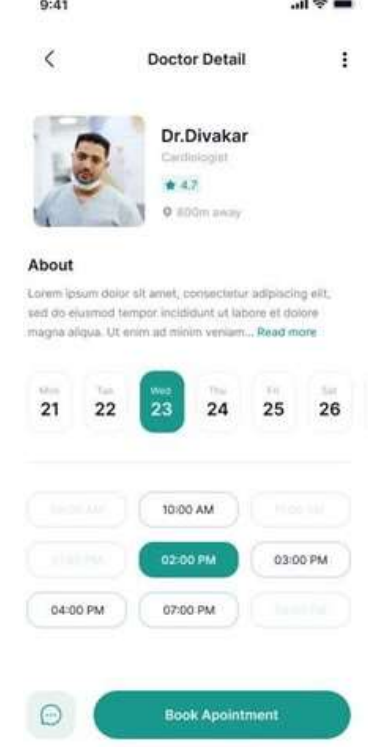
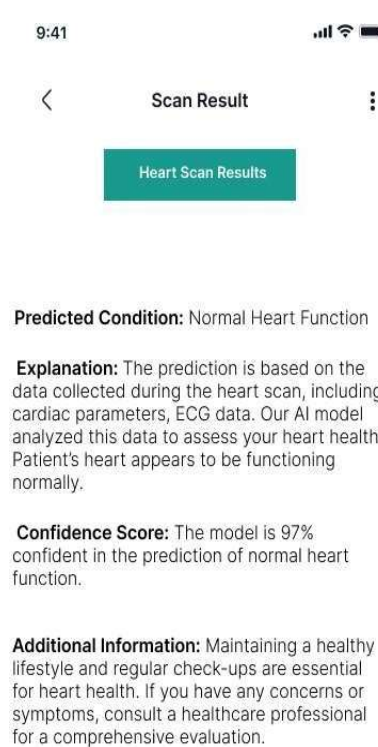
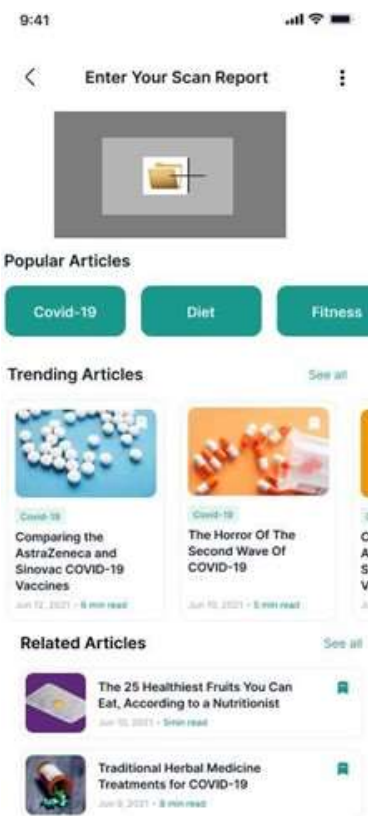
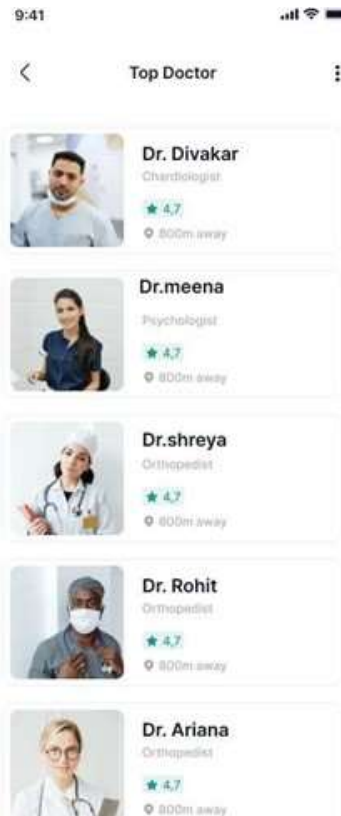
The core objective of the project is to democratize healthcare by providing timely and accurate diagnostic services, particularly targeting underserved communities where access to healthcare is limited. Beyond disease diagnosis, the platform integrates appointment scheduling functionalities, streamlining the patient-doctor interaction process and enhancing accessibility for users across diverse geographical locations.

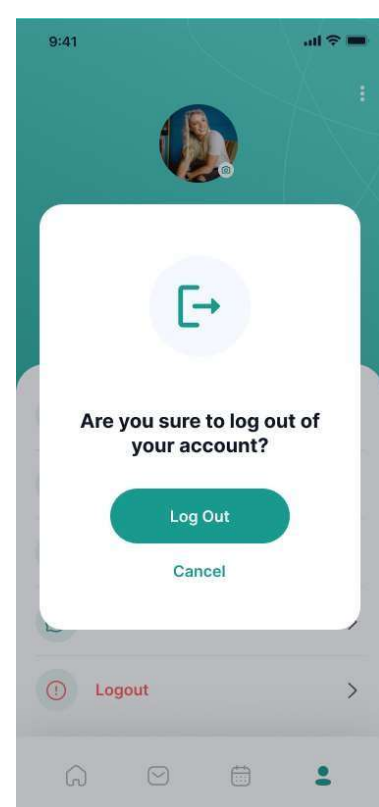
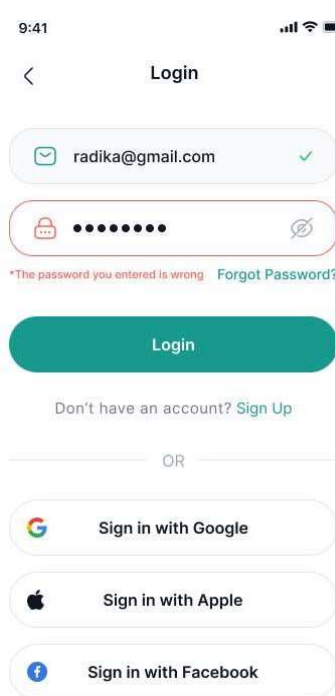
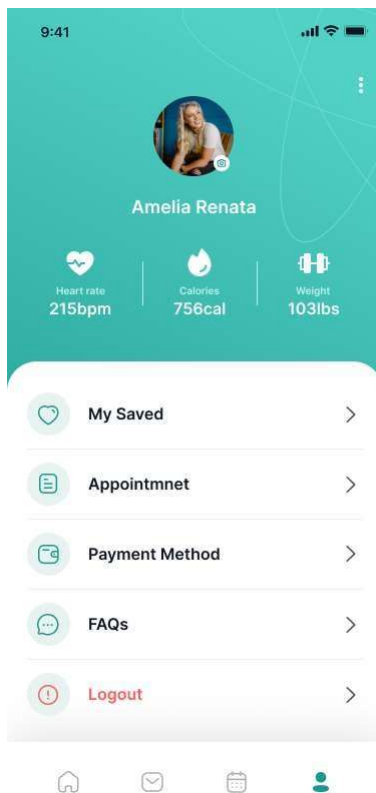
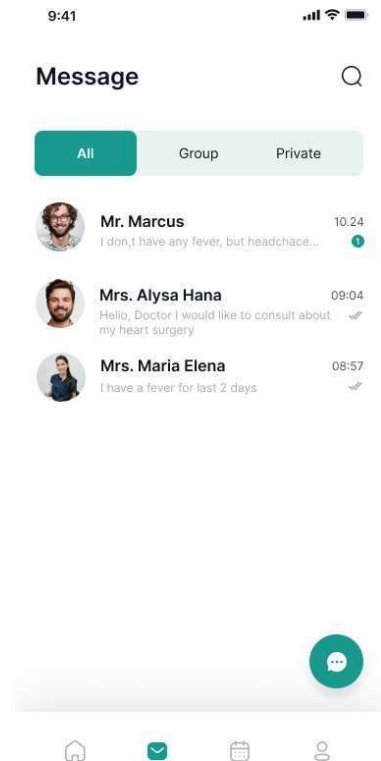
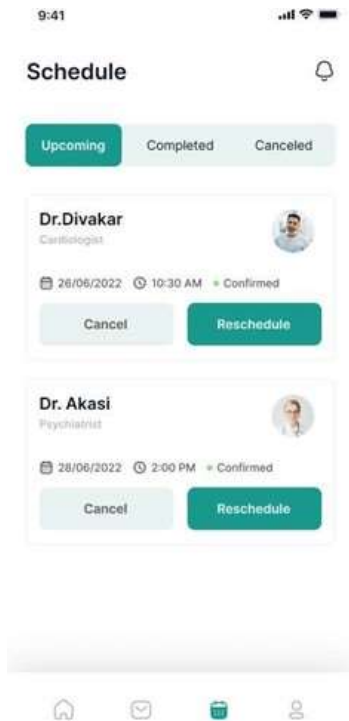
A key highlight of the developed project is its robust medical record management system, empowering healthcare providers with access to patients' complete medical histories. This feature facilitates informed decision-making, improves diagnostic accuracy, and enables personalized treatment plans tailored to individual patient needs. Furthermore, by centralizing diagnostic services and appointment booking within a single platform, the project enhances the overall healthcare experience, making it easier for individuals to access quality care.

Built upon insights from successful applications of AI and ML in healthcare, the project represents a culmination of meticulous planning, dedicated effort, and innovative problem-solving. Moving forward, it holds the promise of making a profound impact on healthcare delivery, improving health outcomes, and enhancing the well-being of individuals and communities alike. This abstract encapsulates the journey and significance of the developed project, paving the way for continued innovation and excellence in healthcare services.

1.PROTOTYPE







2.IMPLEMENTATION

2.1 Technology Stack

Frontend Technology Stack:

1. Flutter:

- **Description:** Flutter is a versatile UI toolkit developed by Google for building natively compiled applications across mobile, web, and desktop platforms. Its single codebase approach enables developers to create responsive and visually appealing user interfaces.
- **Role:** Flutter will serve as the primary frontend framework for the healthcare application, ensuring smooth and intuitive user experiences across various devices.

2. Flutter Packages:

- **Description:** Flutter packages offer pre-built modules of code to enhance application functionalities. Essential packages such as `firebase_core`, `firebase_auth`, `cloud_firestore`, and `tflite_flutter` will be utilized to seamlessly integrate Firebase backend services and machine learning capabilities into the application.
- **Role:** These packages enhance the healthcare application by enabling features such as user authentication, real-time data storage, and integration of machine learning models for accurate disease diagnosis.

Backend Technology Stack:

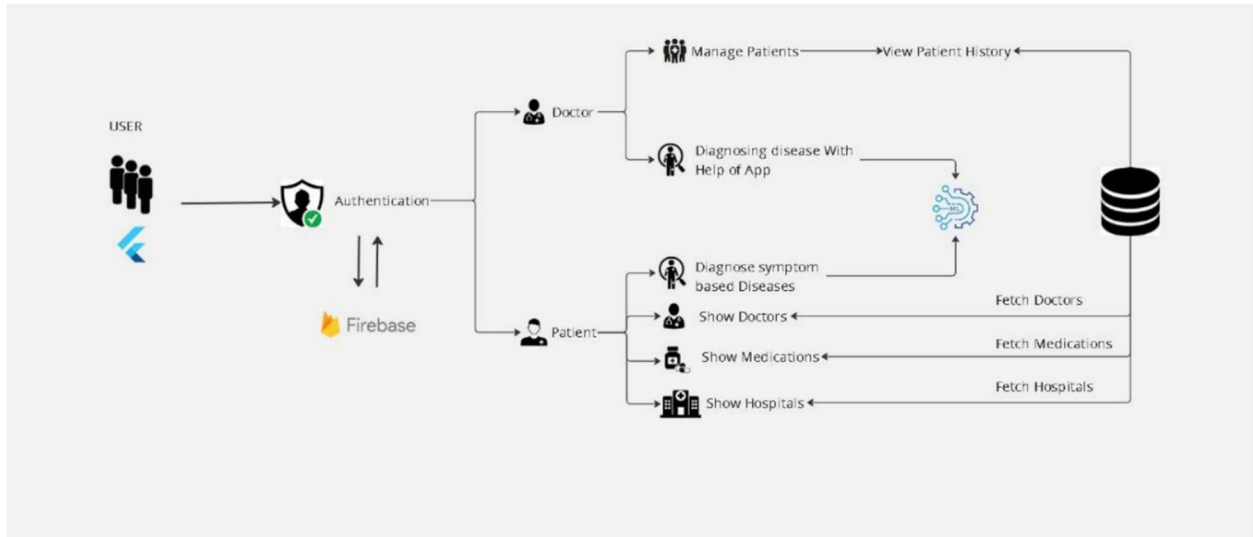
1. Firebase:

- **Description:** Firebase is a comprehensive mobile and web application development platform provided by Google. It offers backend services like real-time database, user authentication, and cloud storage, simplifying the development of scalable applications.
- **Role:** Firebase will handle crucial backend functionalities such as user authentication, data storage, and real-time synchronization, ensuring seamless communication between the frontend and backend components of the healthcare application.

2. Machine Learning (ML):

- **Description:** Machine learning (ML) techniques utilize algorithms and models to analyze large datasets and extract insights. In the healthcare application, ML will be used to improve disease diagnosis accuracy by analyzing medical data and identifying patterns indicative of various illnesses.
- **Role:** ML algorithms will assist healthcare providers in making informed diagnoses and treatment decisions, ultimately enhancing patient care and outcomes.

2.2 System Architecture



System Users Patients: The application empowers patients to manage their health information. Patients can access features like viewing their medical history. **Doctors:** Doctors can leverage the application for diagnosing illnesses and prescribing medications. They can access a patient's medical background to aid diagnosis. **Authentication** A secure login process is implemented to restrict access to unauthorized users. The specific authentication mechanism employed is not depicted within this diagram.

Data Flow

Patient Data: Patient health information is stored securely (storage mechanism not specified) and can be retrieved via the application. **Doctor-Patient Interaction:** Doctors can access a patient's medical history, enabling informed diagnoses. **Prescription Management:** Doctors can prescribe medications through the application, presumably with clear communication to the patient. **Backend as a Service (BaaS)** Firebase, a backend cloud service, is likely utilized for user data management (patients and doctors) and potentially medical history information storage.

Note: This document presents a simplified architectural overview of the mobile healthcare application. While it offers a foundational understanding of the system's components and interactions, it excludes in-depth details regarding the application's technical aspects.

2.3 Module Description

1. TensorFlow Lite Flutter Plugin (tflite_flutter):

- **Description:** This plugin allows Flutter apps to use TensorFlow Lite models for machine learning tasks.
- **Dependency:** tflite_flutter

2. Flutter Splash Screen:

- **Description:** Flutter Splash Screen simplifies the process of implementing splash screens in Flutter apps.
- **Dependency:** flutter_splash_screen

3. Animated Splash Screen:

- **Description:** Animated Splash Screen offers animated splash screen transitions for Flutter apps.
- **Dependency:** animated_splash_screen

4. Image Picker:

- **Description:** Image Picker provides functionality for selecting images from the device's gallery or camera.
- **Dependency:** image_picker

5. Firebase Core:

- **Description:** Firebase Core is a Flutter plugin for Firebase services, providing core functionalities like initialization and configuration.
- **Dependency:** firebase_core

6. Firebase Authentication:

- **Description:** Firebase Authentication plugin enables user authentication using Firebase services such as email/password, phone number, and social logins.
- **Dependency:** firebase_auth

7. Cloud Firestore:

- **Description:** This plugin integrates Cloud Firestore into Flutter apps
- **Dependency:** cloud_firestore

8Get (State Management):.

- **Description:** Get is a state management library for Flutter that simplifies state management and navigation.
- **Dependency:** get

2.4 Testing Methodologies

Exploratory Testing:

- **Test Description:** Explored various features and functionalities of the healthcare application to evaluate its usability and performance.
- **Steps Taken:**
 1. Navigated through patient profiles, medical history, and diagnosis interfaces.
 2. Entered different types of medical data, including symptoms, conditions, and treatments.
 3. Interacted with UI elements to assess responsiveness and ease of navigation.
- **Observations:**
 - UI was intuitive, making it easy to find relevant information.
 - Application responded promptly to user inputs without lag.
 - Overall, the application provided a smooth and user-friendly experience.

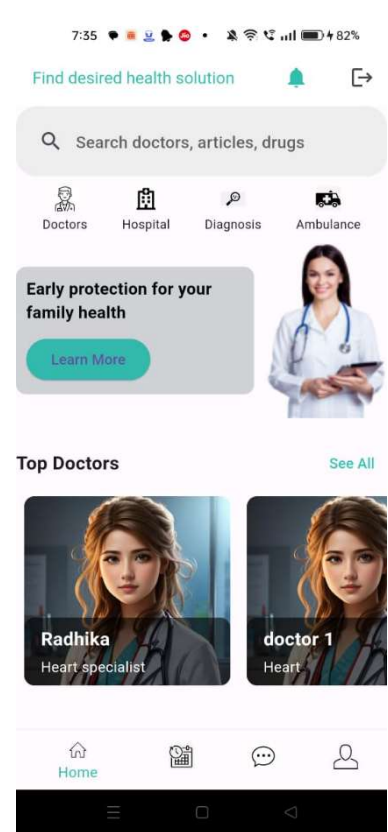
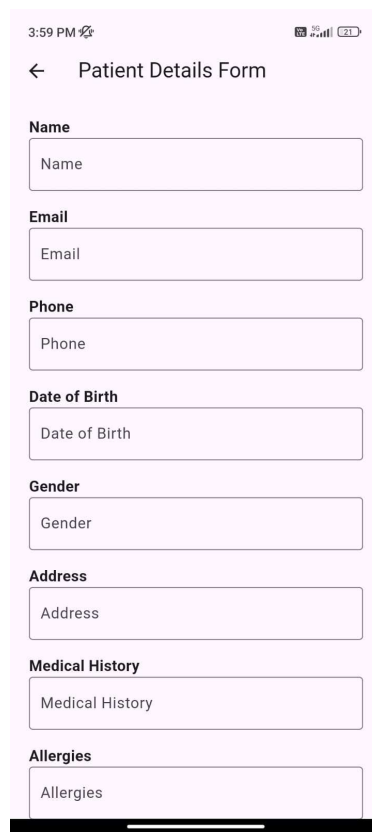
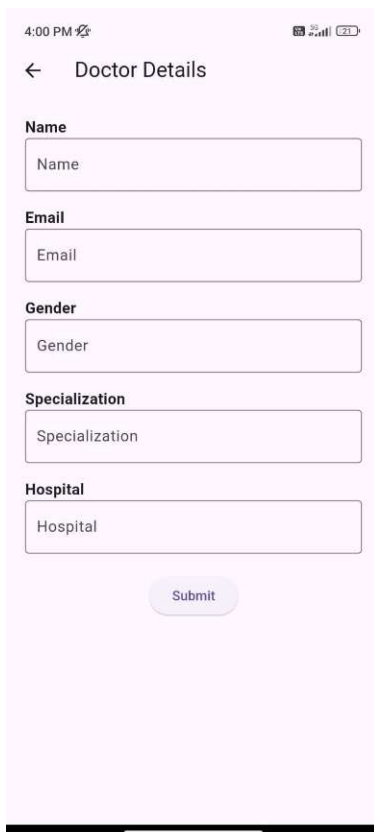
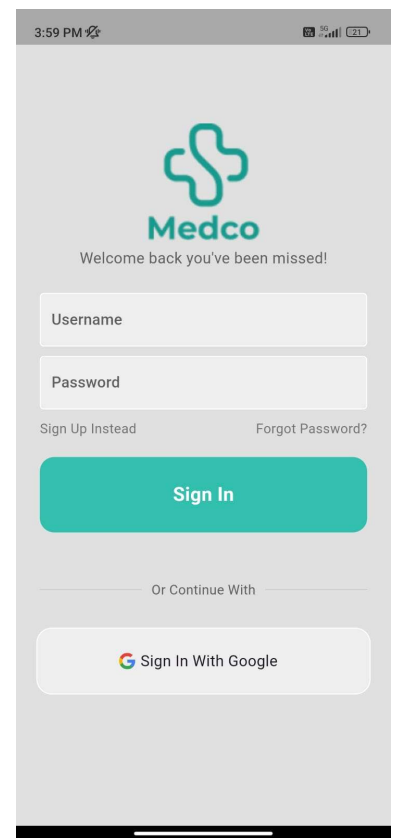
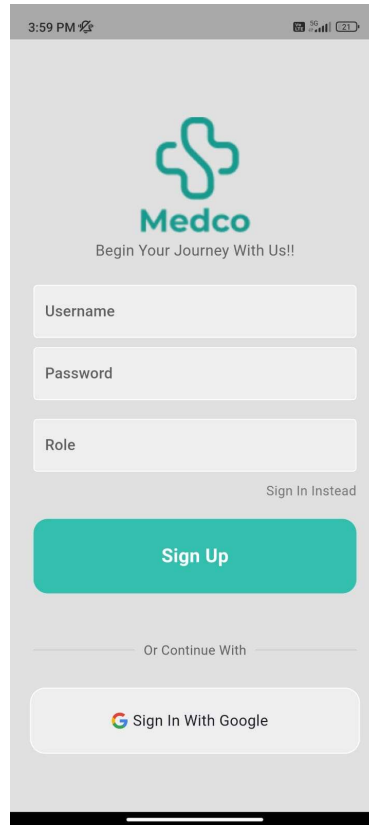
Ad Hoc Testing:

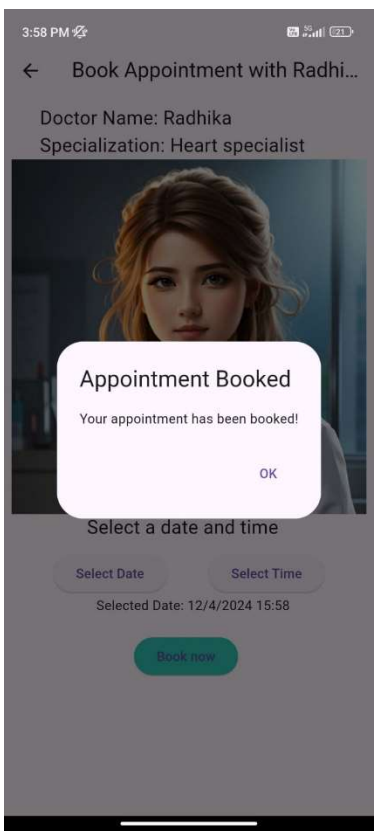
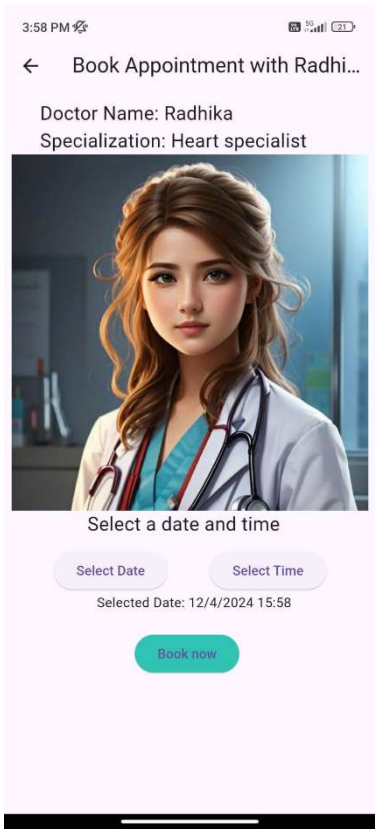
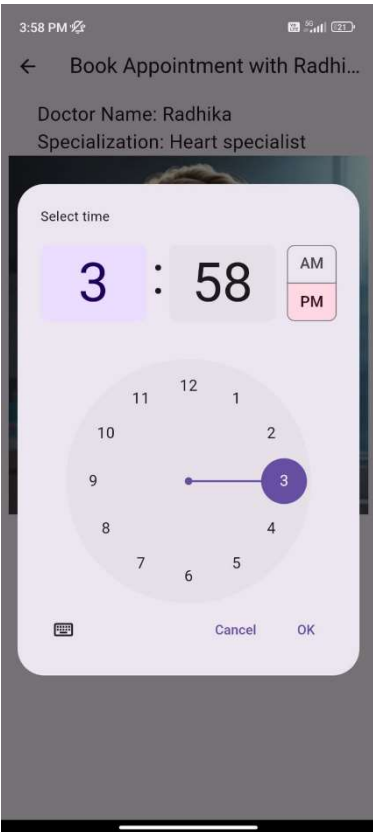
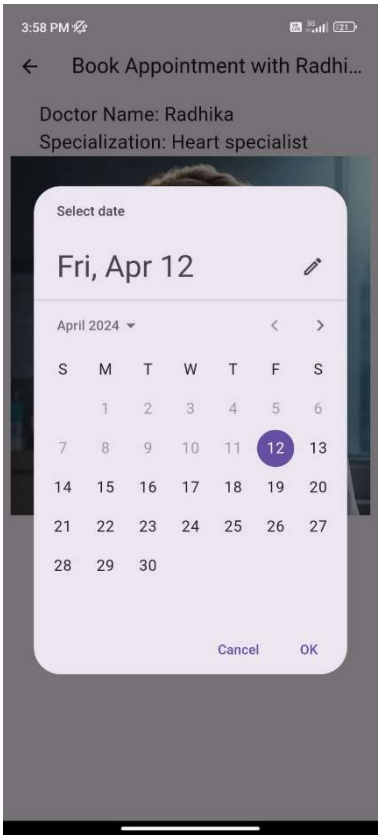
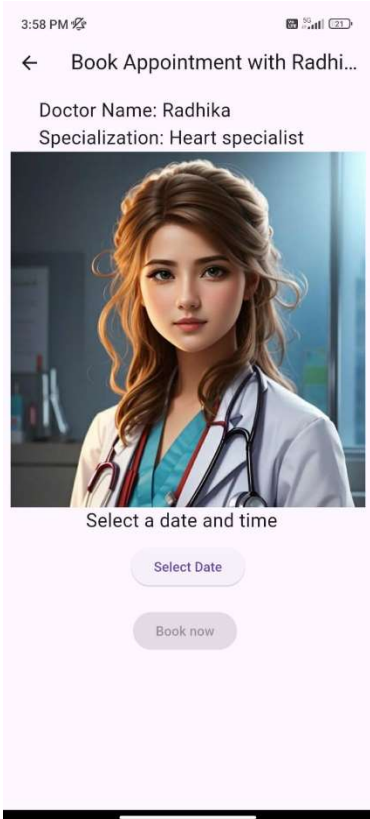
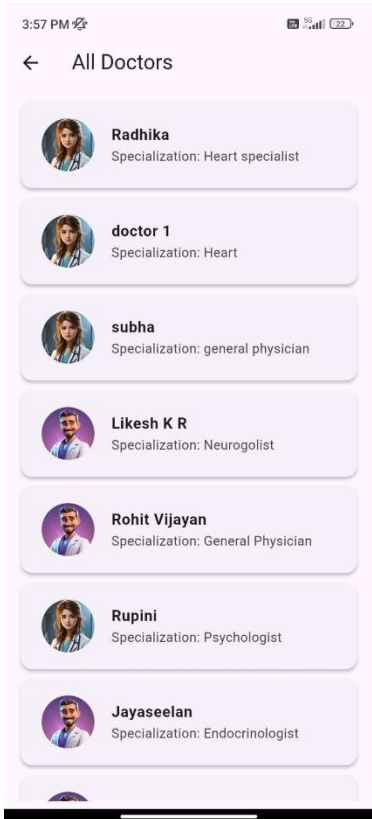
- **Test Description:** Tested the healthcare application using unconventional methods and data inputs to identify potential issues.
- **Steps Taken:**
 1. Entered rare medical conditions and unusual symptoms into the diagnosis interface.
 2. Tried unconventional data inputs in appointment scheduling.
 3. Interacted with UI elements in unexpected sequences to see how the application handled them.
- **Observations:**
 - The application successfully processed medical conditions and provided accurate diagnoses.
 - Prescription management and appointment scheduling functionalities remained robust even with unconventional inputs.
 - UI elements adapted well to unexpected interactions, maintaining usability.

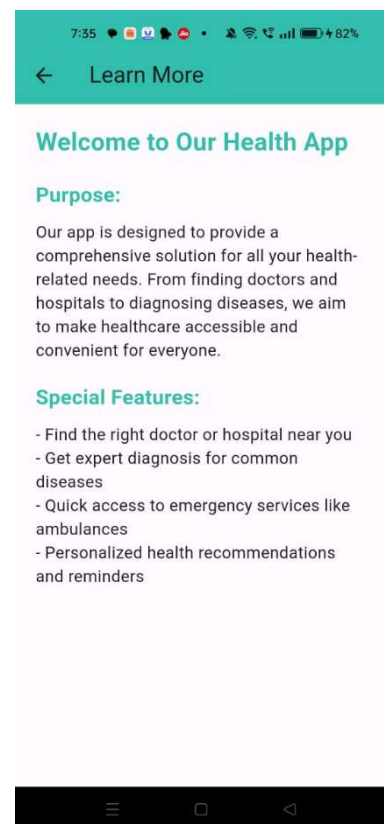
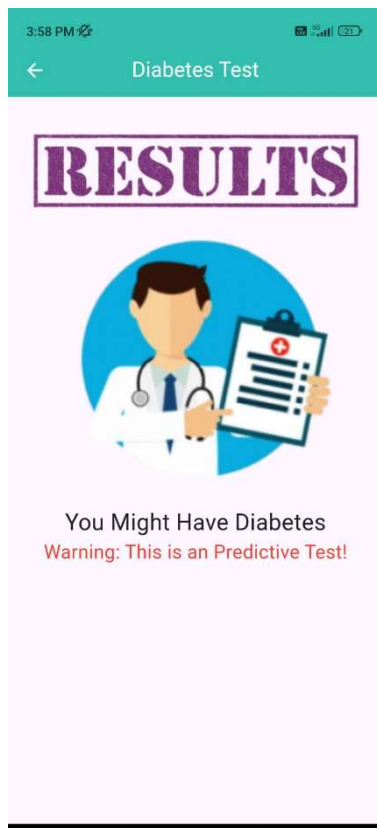
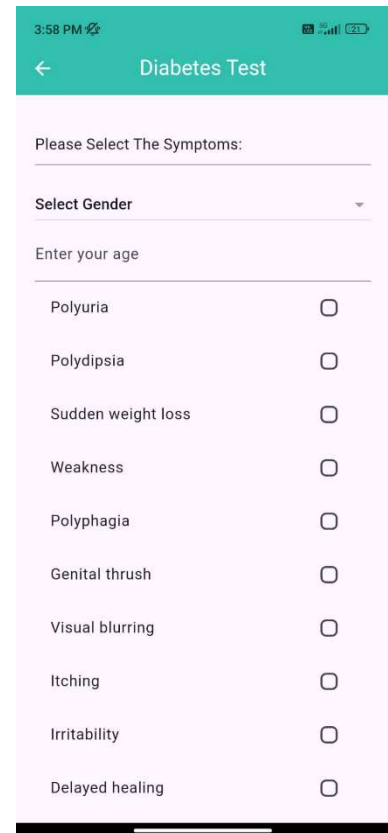
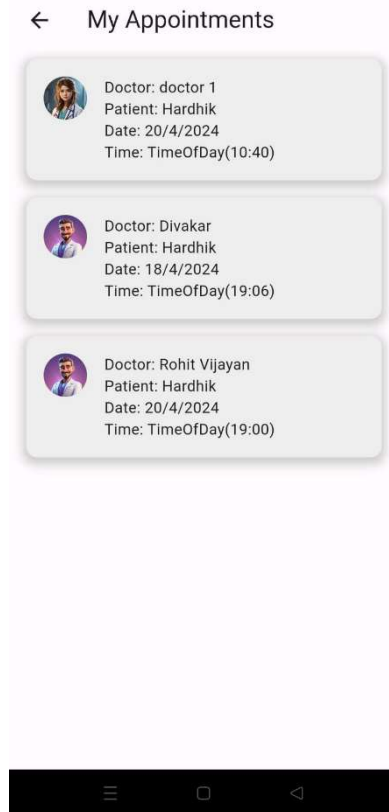
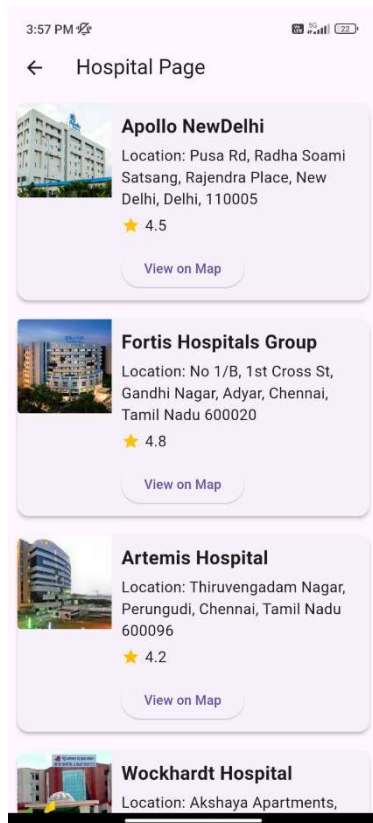
User Scenario Testing:

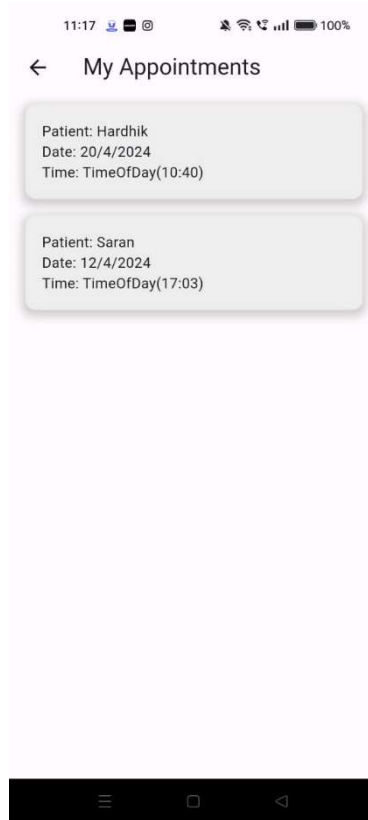
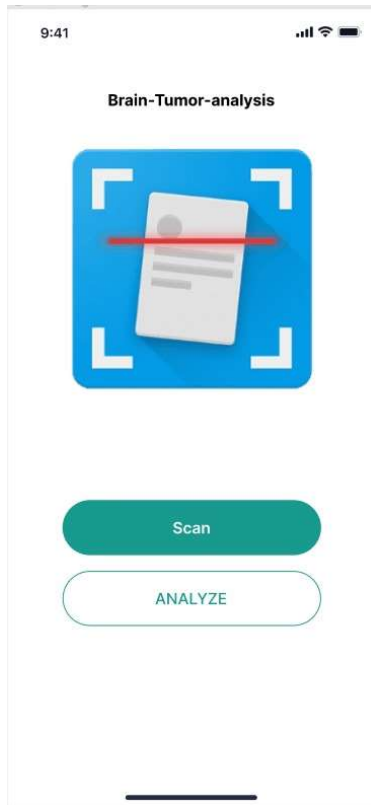
- **Test Description:** Simulated common user scenarios to evaluate the application's performance and usability in real-world usage scenarios.
- **Steps Taken:**
 - Defined user scenarios, such as a patient scheduling an appointment or a doctor reviewing a patient's medical history.
 - Asked testers to simulate these scenarios and observe how smoothly the application handled each step.
 - Documented any issues encountered during scenario testing and assessed their impact on user experience.
- **Observations:**
 - The application successfully handled common user scenarios without major issues.
 - Minor usability issues were identified during scenario testing, such as unclear instructions or navigation paths.
 - Overall, the application provided a satisfactory user experience in typical usage scenarios.

2.5 Results/Screenshots









3.Product/Process Outcome

The product outcome of the "Medco" project encompasses the successful development of a Flutter-based mobile application integrated with Firebase backend services and machine learning capabilities for disease diagnosis. Through the collaborative efforts of the development team and adherence to a structured development process, the project has achieved the following outcomes:

1) Direct Disease Diagnosis for Patients:

- Patients can diagnose small diseases directly through the app, enabling them to receive timely medical guidance and advice without the need for immediate physical consultation.

2) Comprehensive Disease Diagnosis for Doctors:

- Doctors have access to a wide range of diseases and can utilize the app to diagnose various medical conditions, leveraging machine learning models integrated into the application.

3) Access to Patient History for Doctors:

- With appointments booked through the app, doctors have complete access to patients' medical history. This enables them to make informed diagnoses and provide personalized treatment plans based on the patient's health background.

4) Support for Rural Healthcare:

- The application can be particularly beneficial in rural areas where doctors may lack expertise in certain medical fields. By incorporating machine learning models, the app assists doctors in better diagnosing diseases, improving healthcare outcomes in underserved areas.

5) Future Scope for Expansion:

- The app's future scope includes expanding its functionality to cover a wide range of fields within the medical industry. This includes incorporating additional features, such as telemedicine consultations, health monitoring, and comprehensive medical records management, to create a holistic healthcare solution.

4.Conclusion

The development of the product has reached a significant milestone, marking its completion or a stage of readiness for deployment. Throughout the development process, various features, functionalities, and enhancements have been meticulously designed, implemented, and tested to ensure the product meets its intended objectives and delivers value to its users. With this accomplishment, the product is poised to fulfill its purpose, whether it's providing a service, solving a problem, or offering a unique experience. Further iterations and refinements may follow, but this milestone signifies a crucial step forward in bringing the product to fruition.