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MentalEase

In partial fulfilment of the requirements for the degree of

Bachelor of Science in Computer Science

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C e r t i f i c a t e

We accept the work contained in the report titled

"Mental-Ease"

written by

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as a confirmation to the required standard for the partial fulfilment of the degree of Bachelor of Science in Computer Science.

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_____ (Signature)

05 June, 2025

DECLARATION

We hereby declare that this project report is based on our original work except for citations and quotations which have been duly acknowledged. We also declare that it has not been previously and concurrently submitted for any other degree or award at Bahria University or other institutions.

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Date: 05 June, 2025

Specially dedicated to
My beloved mother, and father
(DANIYAL SHAN RAO)
My beloved mother, and father
(HAFIZ MUNEEB IBRAHIM)

ACKNOWLEDGEMENTS

We would like to thank everyone who contributed to the successful completion of this project. We would like to express our gratitude to my research supervisor, Mr. JUNAID NASIR for his guidance, and his enormous patience throughout the development of the research.

In addition, we would also like to express our gratitude to our loving parents and friends who had helped and given us encouragement.

DANIYAL SHAN RAO
HAFIZ MUNEEB IBRAHIM

MentalEase

ABSTRACT

In the last few years, mental health issues such as anxiety, depression, and stress have been significantly increasing, both among the young and older people and also impacting their well-being and productivity. Even though education on mental health has increased, systematic impediments such as society prohibitions, lack of financial and other resources are significantly discouraging inhabitants from seeking professional assistance in time. In order to address these challenges, MentalEase has been developed as a cross-platform mobile app for the following reasons: to provide a first AI-powered diagnosis and to enable easy access to professional therapists. By applying machine algorithm such as Random Forest classification algorithm, the application analyzes users' responses to the DASS-42, TIPI-10 questionnaire in order to understand the level of mental health condition. Built using Flutter for cross-platform compatibility and Firebase for secure backend services, MentalEase offers features such as AI-based mental health diagnosis, therapist profile viewing, appointment booking, Realtime chat and payments. Under this system, privacy of the user gets protected, the resources for mental health become more accessible and the users get encouraged to seek support fear free of stigmatization. MentalEase is an advance in converting mental health care to more accessible, affordable and confidential using the technology.

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LIST OF SYMBOLS / ABBREVIATIONS

AI	Artificial Intelligence
UI	User Interface
UX	User Experience
ML	Machine Learning
FDD	Feature-Driven Development
DASS	Depression Anxiety Stress Scales
DASS-42	Depression Anxiety Stress Scales – 42 item version
SDK	Software Development Kit
IDE	Integrated Development Environment
API	Application Programming Interface
REST	Representational State Transfer
NoSQL	Non-relational Structured Query Language
ERD	Entity Relationship Diagram
DB	Database
CRUD	Create, Read, Update, Delete
UUID	Universally Unique Identifier
JWT	JSON Web Token

CHAPTER 1

INTRODUCTION

1.1 Background

The mental health state of a person has a lot of effects on their ability to think, feel, and act. The modern society is facing such issues as sharply increased workload, pressure from the society, high financial stress and some recent global events, which caused the spike in mental health issues. Mental health disorders such as anxiety depression and stress are equally rampant in a rapid manner destroying many people's wellbeing. The World Health Organization WHO report states that a problem of depression affects more than 264 million people in the world [1].

Although more exposure regarding mental health is available, the willingness to seek care has not changed because most cases experience barriers such as social stigma, lack of professionals in remote areas, and prohibitively high fees in seeking consultations. The traditional way of how mental health care is carried out many times requires booking appointments, making a trip to clinics, and enduring the prolonged waiting periods, deterring certain individuals from seeking help when needed.

Recent developments in mobile applications have made a practical way of providing timely, secure, and inexpensive mental healthcare to users possible. The demand for – technology based assessments to diagnose mental health and easy access to capable therapist remains increasing. MentalEase is a mobile application with an AI-powered first step evaluation, coupled with an easy to use platform for consulting therapists.

1.2 Problem Statements

Current trends in mental health awareness do not yet result in increased simplicity in access to timely diagnoses and correct access to professional therapists. The vast majority of the platforms are now concentrated on interrelationships related to Meditation and Chatbot, though in both cases such a feature as the Clinical screening or communication with professional therapists is seldom included. There is an urgent need for a platform that will be able to:

I. Do preliminary mental health diagnostics with the help of validated psychological sets of tools.
II. Tie users to qualified therapists for Realtime consultations.
III. Ensure data privacy, security, and make it easy for the users to interact.

In the absence of such integrated solution, the sufferers have to continue experiencing delays in seeking for help that could lead to deteriorating mental health conditions.

1.3 Aims and Objectives

The main aim of the MentalEase project is to create a secure, AI-powered mental health diagnostic and Tele-therapy mobile application that facilitates early detection, therapist engagement, and secure online consultations.

The objectives are:

- To develop a cross-platform Flutter-based mobile application compatible with Android and IOS.
- To use a trained AI model (Random Forest) on the DASS-42 dataset to diagnose mental health condition.
- To implement secure Firebase Authentication and encrypted database storage for users and psychologists.

- To allow users to view psychologist profiles, including experience, ratings, and real feedback, and book time slots.
- To support real-time chat functionality using Firebase Realtime Database.
- To prompt users for session-based feedback with a rating and comment system, updating the psychologist's average rating dynamically.
- To support an integrated payment gateway for premium sessions via Stripe API.
- To provide role-based dashboard features and feedback mechanisms for continuous system improvement.

1.4 Scope of Project

The scope of MentalEase covers the following areas:

- AI-based mental health diagnosis based on users' questionnaire responses.
- Therapist discovery, profile viewing, and direct appointment booking through the app.
- Integration of Realtime chat feature.
- Payment gateway integration for paid therapy sessions.

CHAPTER 2

LITERATURE REVIEW and SOFTWARE REQUIREMENT SPECIFICATIONS

2.1 Literature Review

Mental health applications have gained considerable attention over the past decade due to the growing mental health crisis worldwide. Many applications offer services such as mood tracking, meditation, chatbot-based therapy, and professional counseling. However, the integration of AI-based diagnosis with Realtime therapist connectivity is still limited. In this chapter, we analyze several existing mobile applications related to mental health, identifying their strengths, limitations, and how they compare to the proposed system, MentalEase.

2.1.1 Wysa

Wysa is an AI-driven mental health chatbot designed to offer emotional support and self-care techniques. It engages users in text-based conversations, helping them manage mental health conditions using cognitive behavioral therapy (CBT) principles [2].

Strengths:

- 24/7 availability for emotional support.
- Encourages positive behavioral habits through CBT exercises.

Limitations:

- Lack of human therapist intervention.
- No AI-driven formal diagnosis based on psychological assessments.
- Limited for users requiring professional therapy.

2.1.2 Youper

Youper is an artificial intelligence-based emotional health assistant that is for mood tracking, journaling support, and cognitive-behavioural interventions. It employs a conversational AI agent to have daily check-ins and monitor mental health from the users. [3].

Strengths:

- Focus on emotional monitoring and self-improvement.
- Personalized mental health guidance.

Limitations:

- No connection to real professional therapists.
- No AI-based clinical diagnosis like DASS-42 assessment.
- A self-help aid rather than a comprehensive mental healthcare system.

2.1.3 BetterHelp

BetterHelp is one of the largest web-based counselling services that put people in touch with licensed therapists at text, audio, and video sessions [4].

Strengths:

- Real therapist consultations available.
- Multiple modes of communication (text, call, video).

Limitations:

- No initial AI-driven mental health diagnosis.
- Therapist selection is sometimes random rather than fully user-controlled.
- Cost can be relatively high compared to AI-based diagnosis and affordable app models.

2.1.4 Calm

Calm is a popular app, which helps people develop mindfulness, relaxation and sleep quality. It mainly consist of meditation exercises, sleep stories, and breathing programs to help the users' lower their stress levels [5].

Strengths:

- High-quality meditation and relaxation content.
- User-friendly design and accessibility.

Limitations:

- Not focused on clinical mental health diagnosis.
- No therapist booking or chat/video consultation.
- Limited to relaxation and stress management.

2.2 Gap Analysis

From the review of existing solutions, the following gaps are identified:

- **No Integrated AI Diagnosis and Therapist Connectivity**
  Applications like Wysa and Youper provide chatbot support, but they do not offer formal psychological diagnosis or therapist appointments. BetterHelp provides therapy sessions but lacks AI-based pre-assessment.

- **Lack of Instant, Private Diagnosis**
  None of the reviewed applications offer an immediate, AI-driven preliminary diagnosis based on validated psychological questionnaires such as DASS-42.
- **Separation of Services**
  Current solutions either offer self-help support (like Calm, Wysa) or professional therapy (like BetterHelp), but rarely integrate both into one seamless experience.
- **Accessibility and Affordability Issues**
  Platforms like BetterHelp involve subscription fees, which can be costly for many users. Affordable, AI-supported initial diagnosis can reduce entry barriers.
- **Realtime Chat and Video Call**
  Most apps focus only on one form of communication. MentalEase plans to integrate chat and appointment booking all within a single platform.

2.3 Summary

Marked support is implemented by most mental health apps, but there is no single solution that effortlessly connects AI-based screening with availability of professional therapists, while remaining cost-efficient and easy to use for its consumers. By combining AI-lead mental health assessments with scheduling, instant messaging, payment processing, and virtual appointment, MentalEase attempts to fill this gap. With its comprehensive model, MentalEase aims to reduce roadblocks and provide users with an efficient accessible route to psychological care.

2.4 Software Requirements

In this section, everything important pertaining to the MentalEase applications are listed considering functional, non-functional hardware and software requirements. It provides the user types, details the use case models, and the system architecture, providing comprehensive insights on the specifications of the system.

2.4.1 Functional Requirements

The following are the main functional requirements of the system:

- **User & Therapist Registration/Login:** Role-based registration and authentication using Firebase Authentication.
- **Profile Management:** Users and therapists can edit personal and professional information.
- **AI Mental Health Diagnosis:** Users fill the DASS-42 questionnaire, and the AI (Random Forest/MLP) model provides a diagnosis.
- **Therapist Discovery & Appointment Booking:** Patients browse therapists, check availability, and book consultations.
- **Feedback & Rating System:** Patients can submit feedback after video calls. Ratings are averaged dynamically using previous and current entries.
- **Realtime Chat:** Secure in-app chat using Firebase Realtime Database.
- **Payment Gateway:** Stripe-based payment integration for session fees (Stripe Flutter SDK).
- **Notifications:** Firebase Messaging used for Realtime alerts and reminders (appointment updates, new messages, etc.).

2.4.2 Non-Functional Requirements

The non-functional requirements define the system's quality attributes:

- **Performance**
  Application should respond within 2–3 seconds for user actions.
- **Security**
  all user data (registration, diagnosis results, chats) must be encrypted and securely stored using Firebase security rules.
- **Scalability**
  System should handle growth in user base without performance degradation.
- **Portability**
  Application must be compatible across Android and IOS platforms.

- **Availability**
  The system should be available 24/7 with an uptime of at least 99.9%.
- **Maintainability**
  Modular and clean code structure must be maintained for easy future enhancements.

2.5 Hardware Requirement

Following is the hardware requirement for user side.

2.5.1 Client Side (Users)

- Android/iOS smartphone
- Minimum 2GB RAM
- Stable 3G, 4G, or Wi-Fi internet connection

2.6 Tools and Technologies

Relying on thoughtfully selected technologies, the MentalEase mobile application was developed to meet the cross-platform support, top performance, and secure data management requirements. The formulation of MentalEase required a multipurpose technology incorporating mobile application development, improvement of AI models, database structure, and secure users' authentication, as well as real-time communication support. Below, the overall technical components of MentalEase are reviewed.

2.6.1 Flutter

Google designed Flutter, which is open source and intended for building user interfaces. Flutter acted as the platform of creating the frontend of MentalEase. With

the use of Flutter, it is possible to create full fledge android and IOS apps from a single code base. The variety of customizable widgets and rapid development environment in this toolkit make it a great option for creating both strong and responsive user interfaces on both Android and IOS.

2.6.2 Dart

Dart is the programming language used in Flutter development. Dart helps developers write clean code due to the fact that it can write both object-oriented and functional code. In MentalEase, the entire user interface, the business logic, as well as state management is implemented using Dart.

2.6.3 Firebase Authentication

Provided by Google through Firebase Authentication, the authentication is well secured. In MentalEase, for this service, it was enacted to accommodate the sign-up and login in both patients and therapists. Firebase allows users to authenticate using multiple methods including email/password, Google sign-in, and others. The security of features such as scheduling, messaging, and consultations are only reserved for verified users exclusively.

2.6.4 Firebase Realtime Database

The Firebase Realtime Database, takes the role for hosting Realtime and quickly changing data such as chat interactions, call logs, and user feedback. Capability of syncing data in real time with low latency guarantees secure real time communication.

2.6.5 Stripe API

Stripe acts as the true back end that conducts all the secure payments within the app. It allows the users to make digital payments for therapy sessions and guarantees that users will instantly be able to provide payment verification and checkout the processes.

2.6.6 Python

Python was used for training and testing the machine learning model that performs mental health diagnosis. Its rich ecosystem of libraries for data science and machine learning made it the ideal choice for developing the AI model based on the DASS-42 dataset.

2.6.7 Random Forest Algorithm

Random Forest is a supervised machine learning algorithm used for classification problems. It was selected for predicting the user's mental health status specifically, based on the responses to the DASS-42 questionnaire. The algorithm provides high accuracy and works well with structured data [6] [7].

2.6.8 DASS-42 Dataset

The Depression Anxiety Stress Scales (DASS-42) dataset is a standard psychological questionnaire used to assess emotional states. This dataset was used to train the Random Forest model for accurate mental health prediction [7] [6].

2.6.9 Android Studio

Android Studio was used as the primary integrated development environment (IDE) for building and testing the MentalEase mobile application. It provided robust tools

for writing Flutter and Dart code, integrated device emulators, and plugin support for Firebase and version control. Android Studio's built-in debugger and real-device deployment capabilities made it suitable for developing a cross-platform app like MentalEase.

2.6.10 Google Colab

Training and testing of the machine learning model was conducted in Google Colab. It allowed GPUs in the cloud, significantly accelerating how fast models trained and which accelerated faster experimentation. With the help of AI models and libraries in the Colab environment, we performed data processing and trained a Random Forest model on the DASS-42 dataset, estimating the model's accuracy. Having trained, the model was saved and set for integration into the mobile application.

2.6.11 Random Forest Classifier

Random Forest is a supervised learning method employed for classification tasks. In this project, it was employed to foretell the mental health state of the user as Normal, Moderate, or Severe. The model has been trained on a pre-processed dataset from a public source, using a total of 60 features. The Random Forest technique was opted due to its robustness, the ability to handle non-linear data, and the relative performance it provides in terms of accuracy.

Some major advantages are:

- High accuracy and generalization.
- Over-fitting resistant.
- Good for high-dimensional datasets.

2.6.12 Multi-Layer Perceptron

As part of experimentation, we also implemented a Multi-Layer Perceptron (MLP) - a type of feedforward artificial neural network. Highlighted for comparative analysis with Random Forest, MLP was trained using the very same dataset. Key learning features are:

- Deep learning model with at least one hidden layer.
- Learns complex nonlinear relationships.
- Flexible modeling approach.

However, Random Forest performed better with respect to our data and got selected for final integration.

2.6.13 Flask API

To build a light REST API for our trained AI model we have used Flask which is a micro-web framework in Python. The mobile application sends the user's filled questionnaire data in JSON format as a POST request to the Flask server with a response containing the predicted mental health state.

Functionality in Project:

- Holds the trained AI model and scaler.
- Accepts JSON input and returns prediction output.

2.6.14 Git & GitHub

Git was used for version control, and the project repository was put online in GitHub. Therefore, the development team could follow revisions and update code versions as well as protect the entire range of their work.

2.7 User Classes and Characteristics

There are three primary user types for the MentalEase system:

- **Patients/Users:**
  - Register/login securely.
  - Complete questionnaires.
  - View AI diagnosis results.
  - Search and book therapists.
  - Chat with therapists.
- **Therapists/Doctors:**
  - Register and submit professional profiles.
  - Manage availability and appointments.
  - Communicate with patients via chat.
- **Admin:**
  - Approve therapist accounts.
  - Manage patient and therapist databases.
  - Review feedback and handle revenue reports.

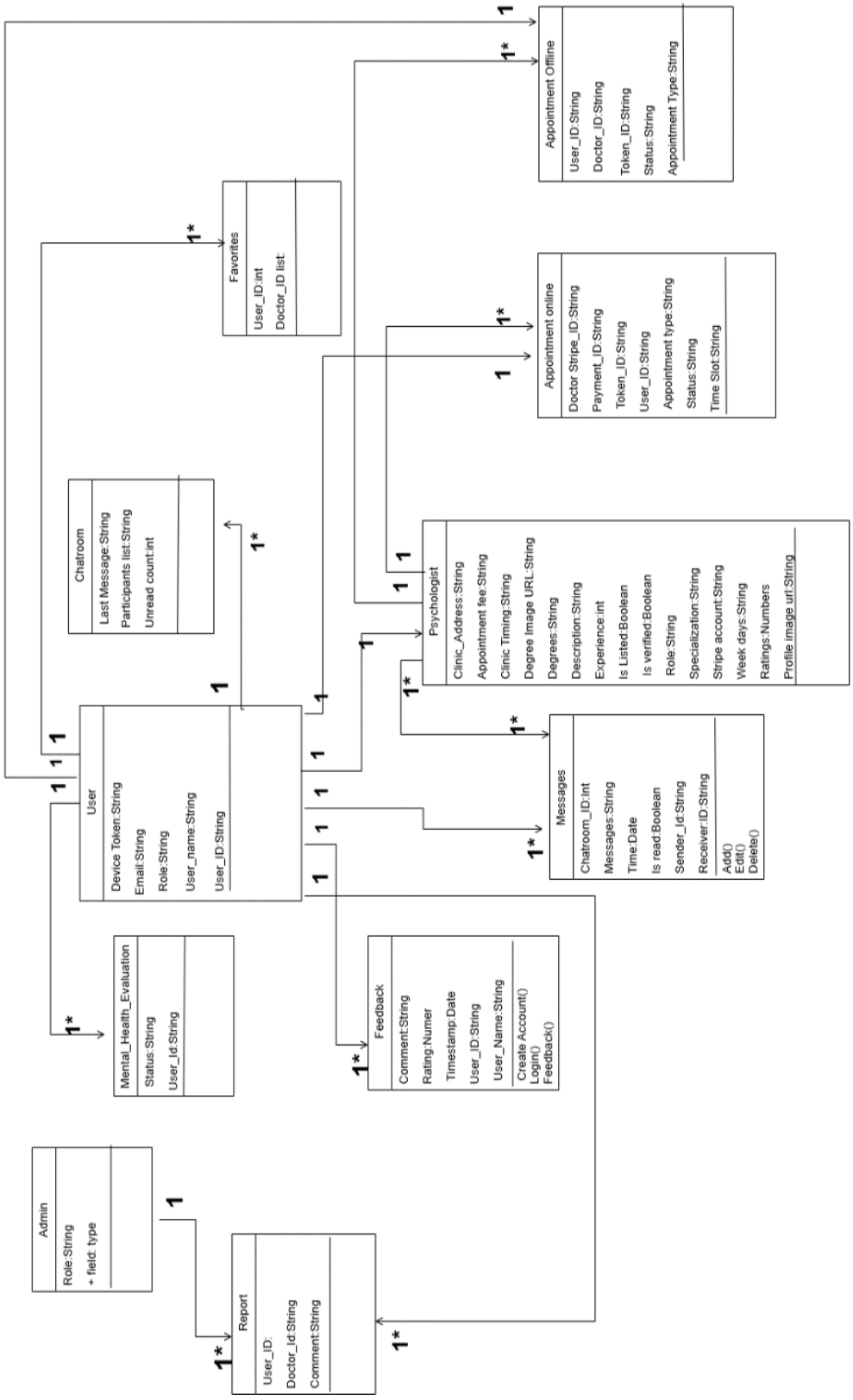


Figure 2-1: Class Diagram

2.8 System Architecture Overview

The MentalEase application follows a layered architecture:

- **Presentation Layer:** Flutter frontend with dynamic UI and platform-specific controls.
- **Authentication & Role Layer:** Firebase Auth with secure role-based login (user, therapist, admin).
- **AI Layer:** Pre-trained Random Forest and MLP classifiers.
- **Data Layer:** Firebase Firestore (static data), Firebase Realtime Database (chat/feedback data).
- **Communication Layer:** Firebase Cloud Messaging (for push notifications).
- **Payment Layer:** Stripe SDK integrated for session fee collection and digital invoicing.
- **Feedback Layer:** After-call prompts for rating and feedback, stored in Realtime Database and reflected in doctor profile.

CHAPTER 3

DESIGN AND METHODOLOGY

3.1 Feature Driven Development

The development of MentalEase followed the **Feature-Driven Development (FDD)** model, which is a lightweight agile methodology focused on building and delivering features in short, iterative cycles. FDD was chosen because it is ideal for complex systems that involve distinct and independent features like diagnosis, appointment booking, chat, video call (in progress), and admin management.

- **Develop Overall Model**
  Initial planning involved identifying major entities (User, Therapist, Admin, Appointment, Diagnosis, Chat) and defining the app's core features.
- **Build Feature List**
  Features were broken down into small units such as Register/Login, Fill Questionnaire, View Diagnosis, Book Therapist, Start Chat, Video Call(in progress), etc.
- **Plan by Feature**
  Features were prioritized and scheduled — for example, basic registration was implemented first, followed by diagnosis, and then therapist modules.
- **Design by Feature**
  UI designs, Firestore data structures, and API plans were made for each feature.
- **Build by Feature**
  Development was done feature-by-feature, allowing easier debugging, focused testing, and fast progress tracking.

This iterative approach helped ensure continuous delivery, fast updates, and better adaptability during testing and feedback.

3.2 System Flow

The system flow of MentalEase application is structured in a modular, role-based manner that takes three important user's roles: Patients, Therapists (psychologists), and Admin are the roles identified. The system is organized in such a way that each actor always completes duties in a given sequence, relevant to his or her specific responsibilities. The process proceeds in this way:

3.2.1 User Flow

- User has to register or login through the Firebase Auth service before proceeding.
- After registration, the user will receive a mental health questionnaire to answer.
- The results of the Mental Health questionnaire tests are forwarded to a pre-trained AI model (Random Forest) which will analyze the user's results and provides mental health condition.
- Utilizing the findings, users can search through a directory of registered therapists, their details, the details on what they charge, ratings, and specialization.
- User can contact the therapist immediately through chat.
- Once the user selects a therapist, they book available appointment.
- After the session, users have an opportunity to rate and leave comments.

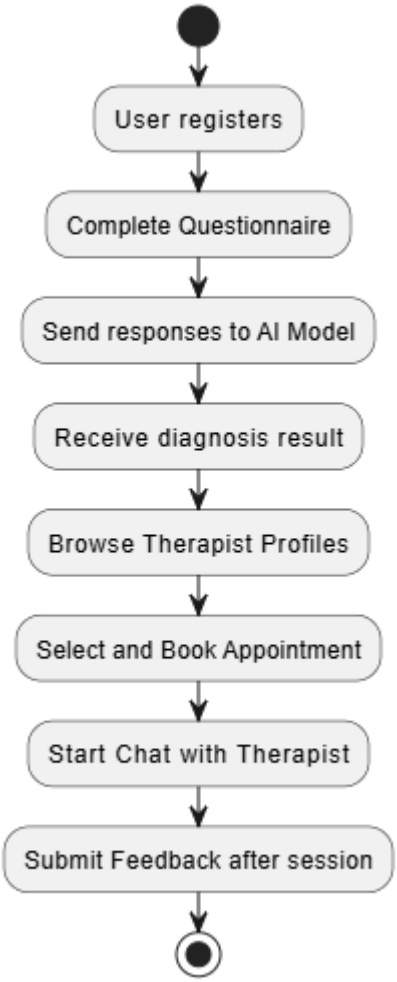


Figure 3-1: User Flow Diagram

3.2.2 Therapist Flow:

- When once therapists have completed registering, they post their professional credentials that include their degree, area of expertise and clinic schedule.
- Therapists are only listed in the directory after the admin has approved their registration.

- Once approved, therapists can:
    - View and manage appointment bookings.
    - Communicate with patients via chat screen.
    - Change the time of their availability for appointments and update their profile details.
    - Read and recognize the evaluation and feedback from clients.

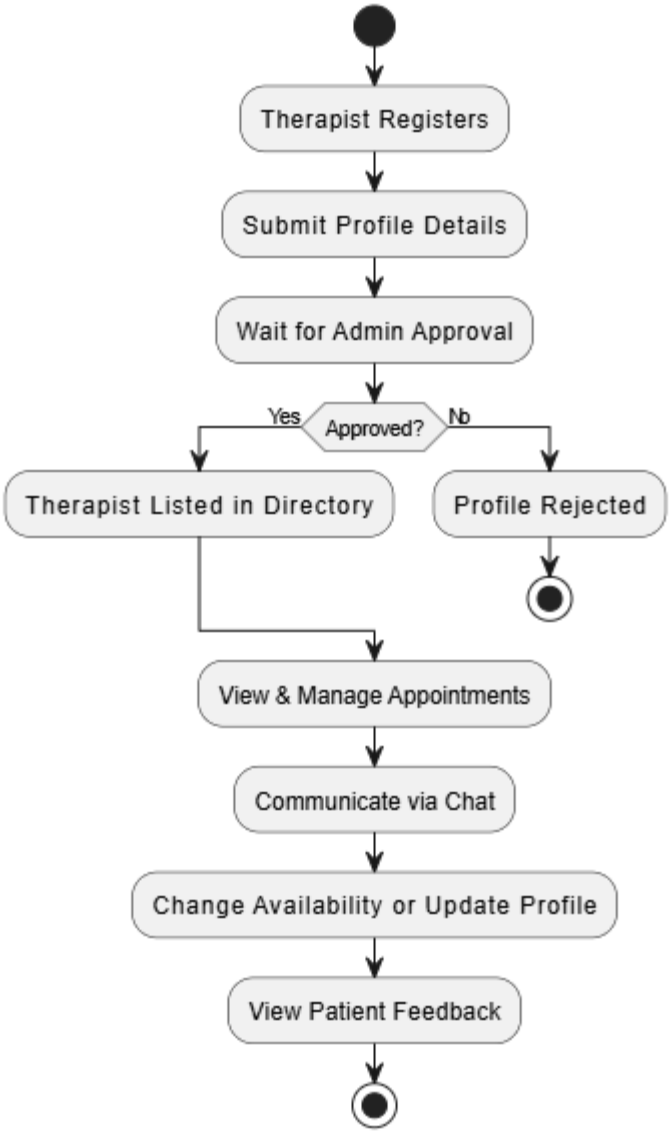


Figure 3-2: Therapist Flow Diagram

3.2.3 Admin Flow

- An admin logs into the web/admin area of the line.
- Admin actions include:
    - Approving or rejecting therapist applications.
    - Reviewing registered users and therapists.
    - Processing of financial reports.
    - Inactivating suspect user and therapist accounts when necessary.

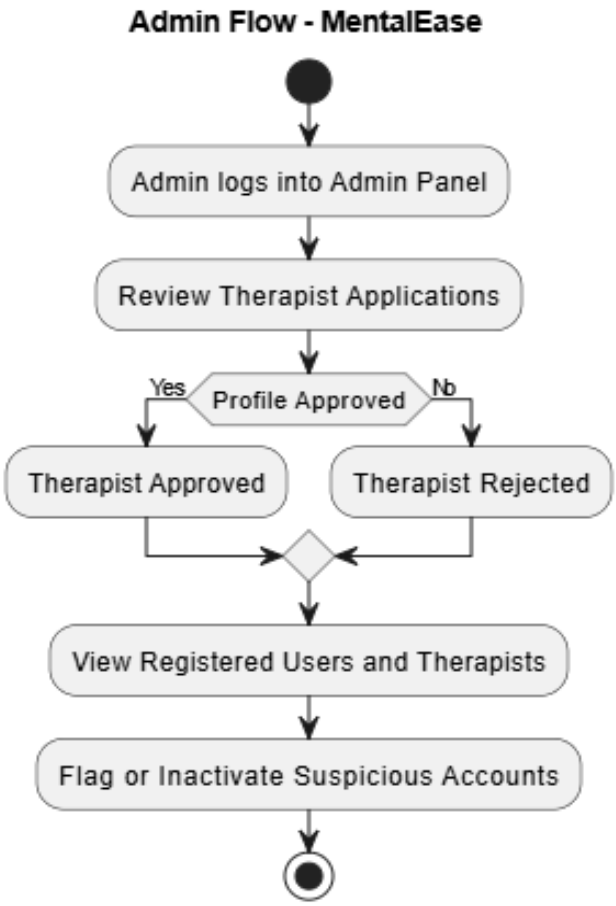


Figure 3-3: Admin Flow Diagram

3.3 Sequence Diagrams

Sequence diagrams show the detailed interactions between different components during key operations.

3.3.1 User Sequence Diagrams

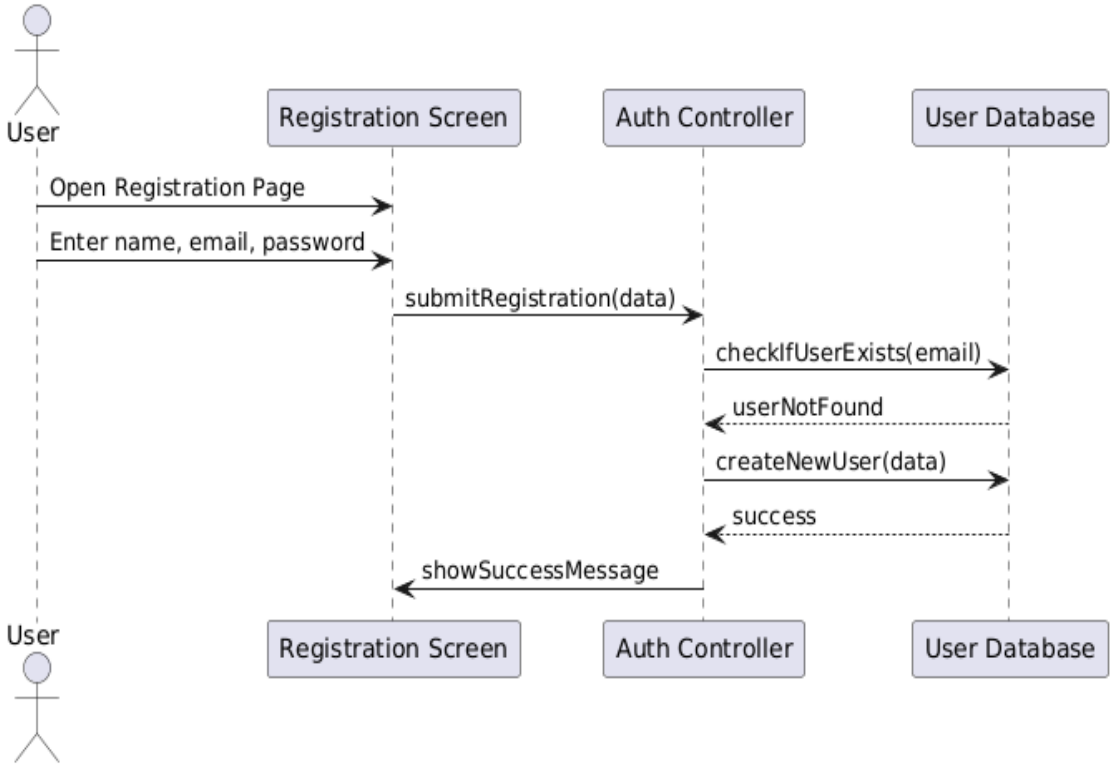


Figure 3-4: User Registration Sequence Diagram

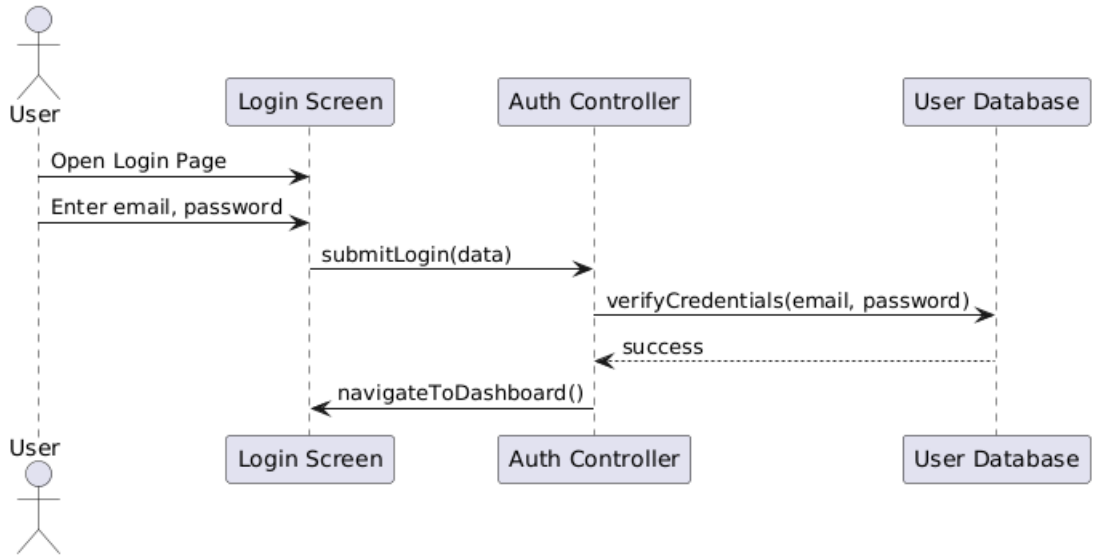


Figure 3-5: User Login Sequence Diagram

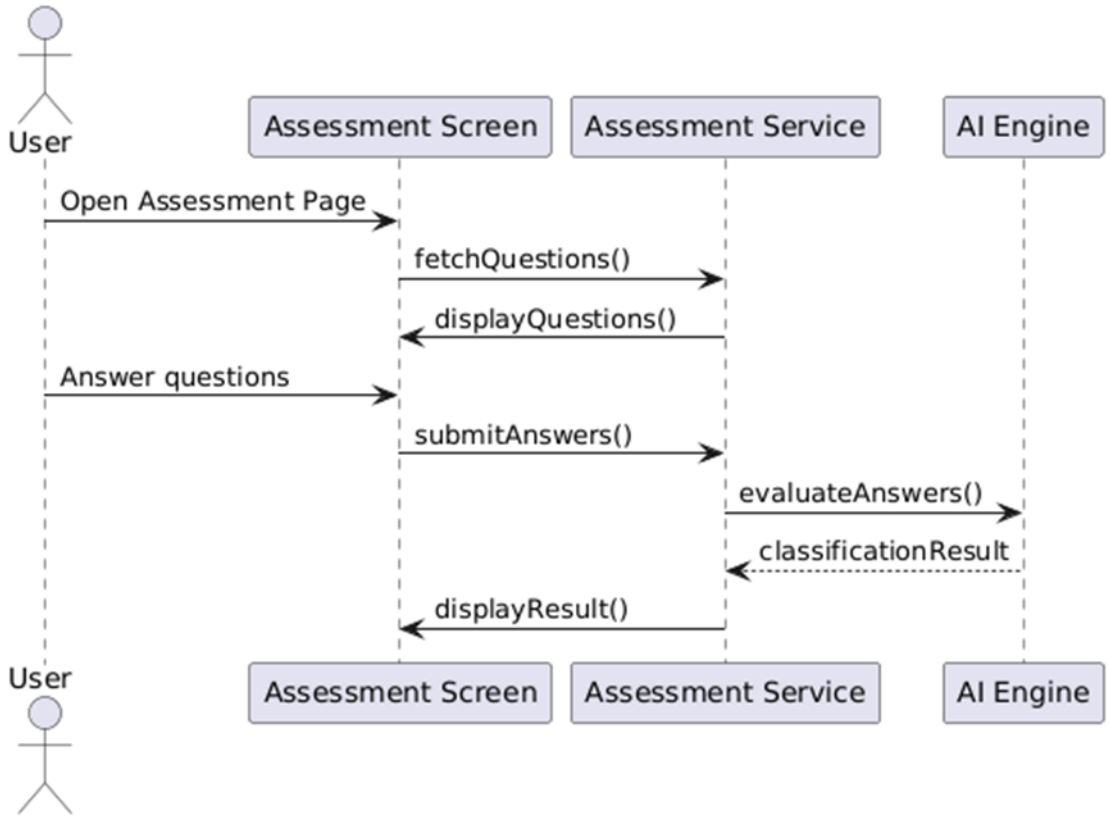


Figure 3-6: User Assessment Sequence Diagram

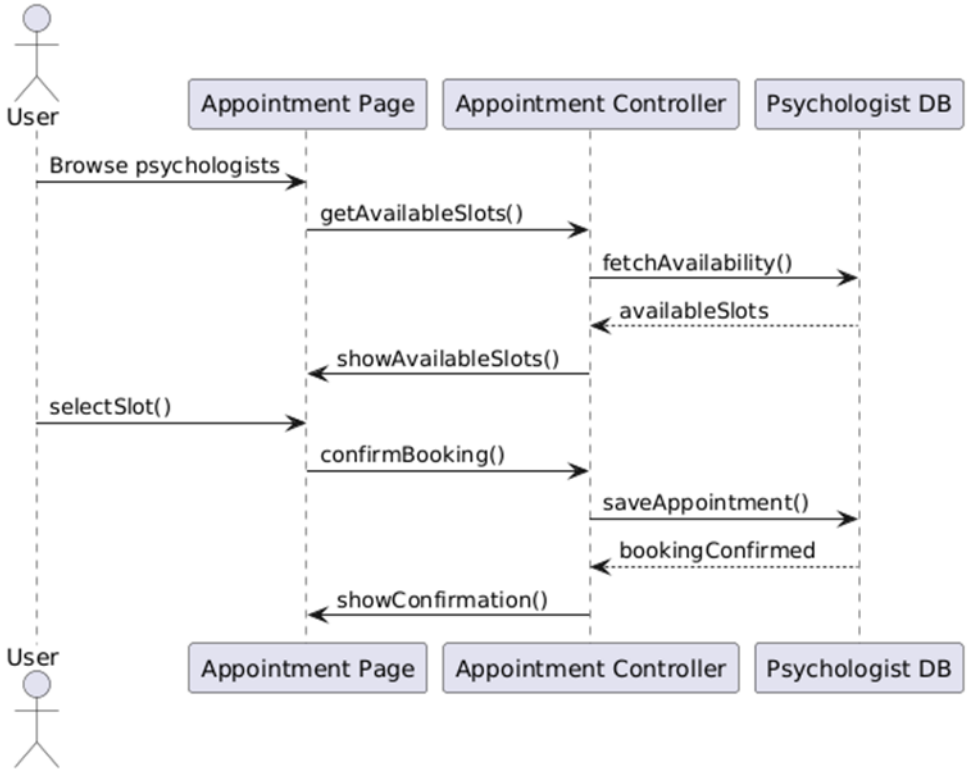


Figure 3-7: Booking Appointment Sequence Diagram

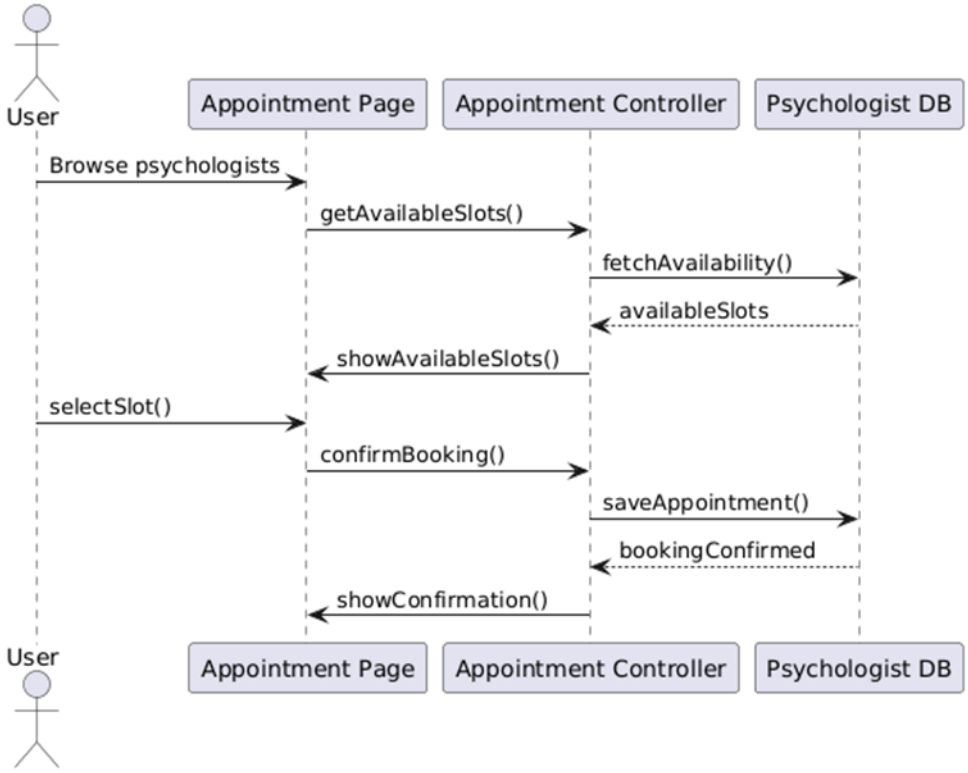


Figure 3-8: Make Payment Sequence Diagram

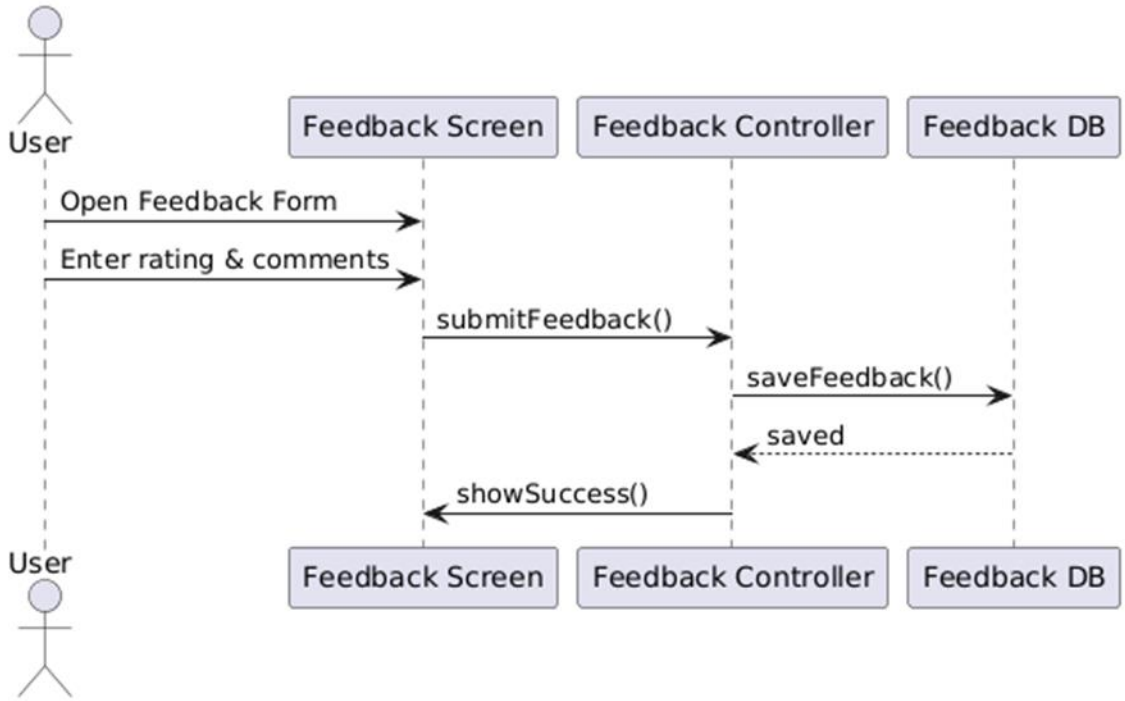


Figure 3-9: User Feedback Sequence Diagram

3.3.2 Psychologist Sequence Diagrams

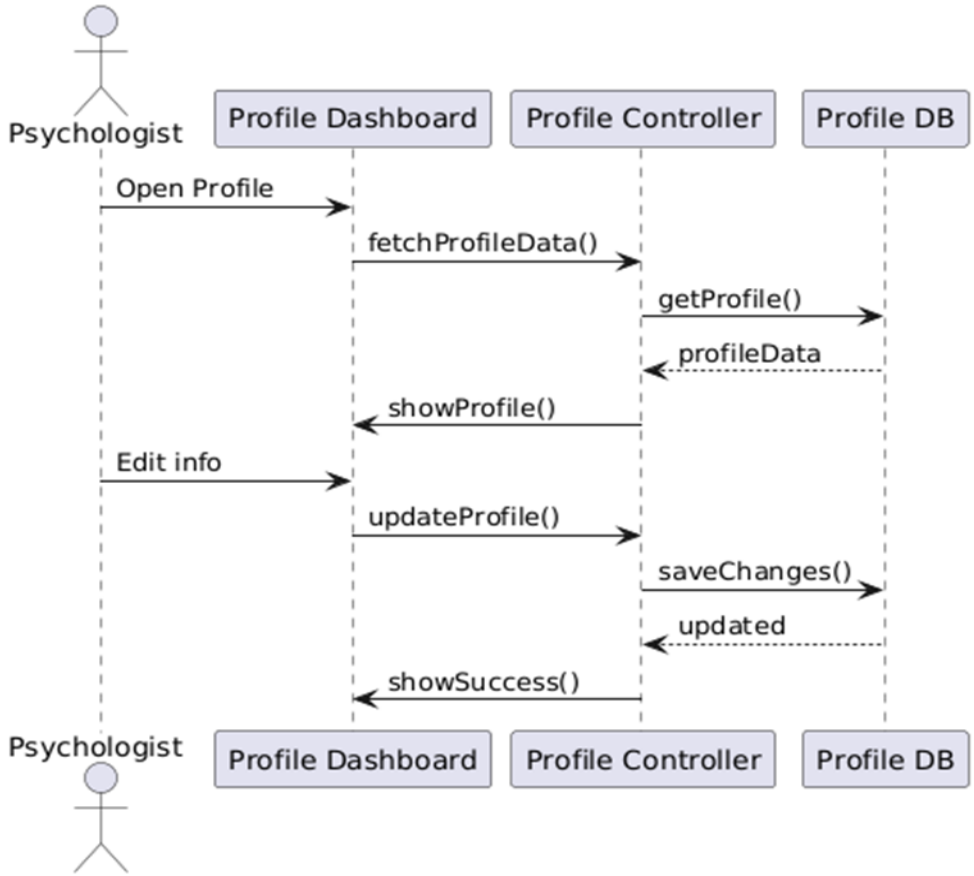


Figure 3-10: Manage Psychologist Sequence Diagram

3.3.3 Admin Sequence Diagram

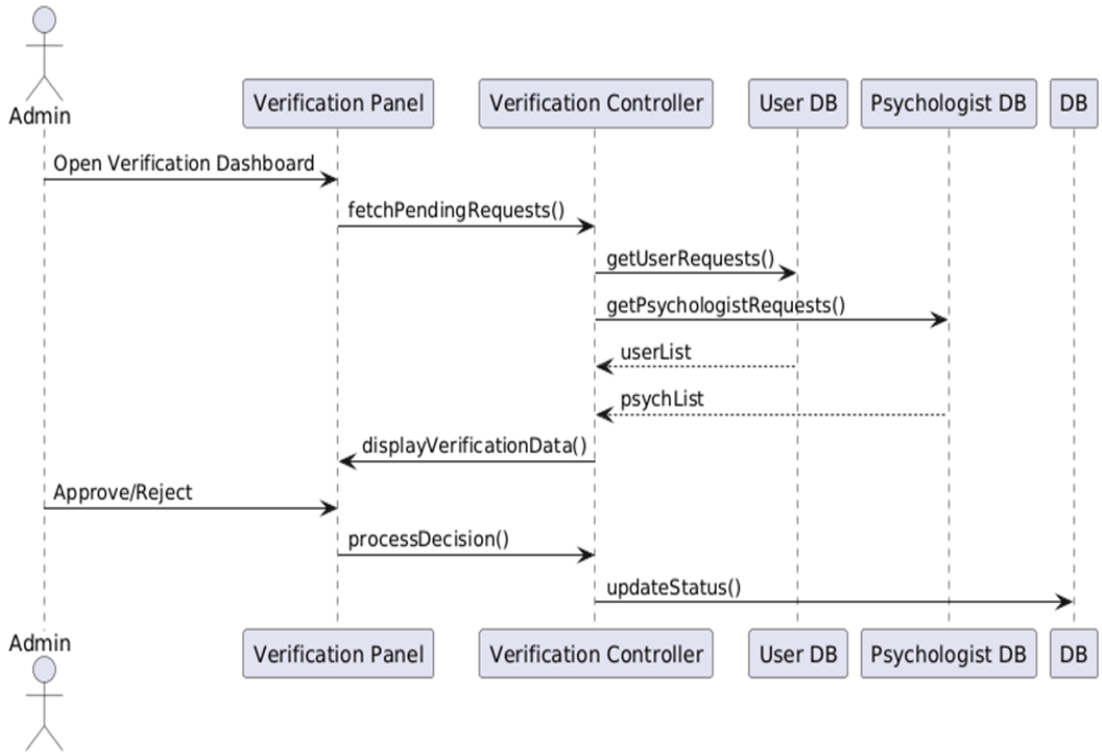
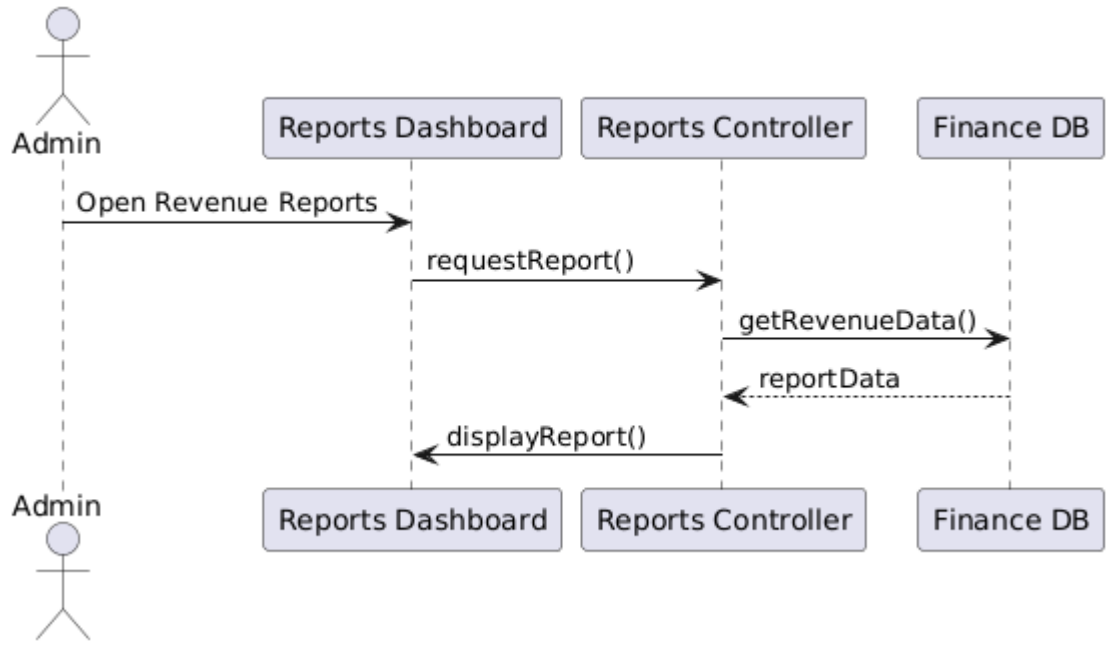


Figure 3-11: User/Psychologist Approval Sequence Diagram



3.4 Use Case

Use case breakdown by user type:

Figure 3-12: Manage Revenue Sequence Diagram

1. **Patient/User:** Register, Login, Update Profile, Take Assessment, Find Therapist, Book Appointment, Chat, Submit Feedback
2. **Therapist:** Register, Login, Create Profile, Update profile, Manage Availability, Chat, View Feedback
3. **Admin:** Login, Manage Therapist and User Profiles, View revenue reports.

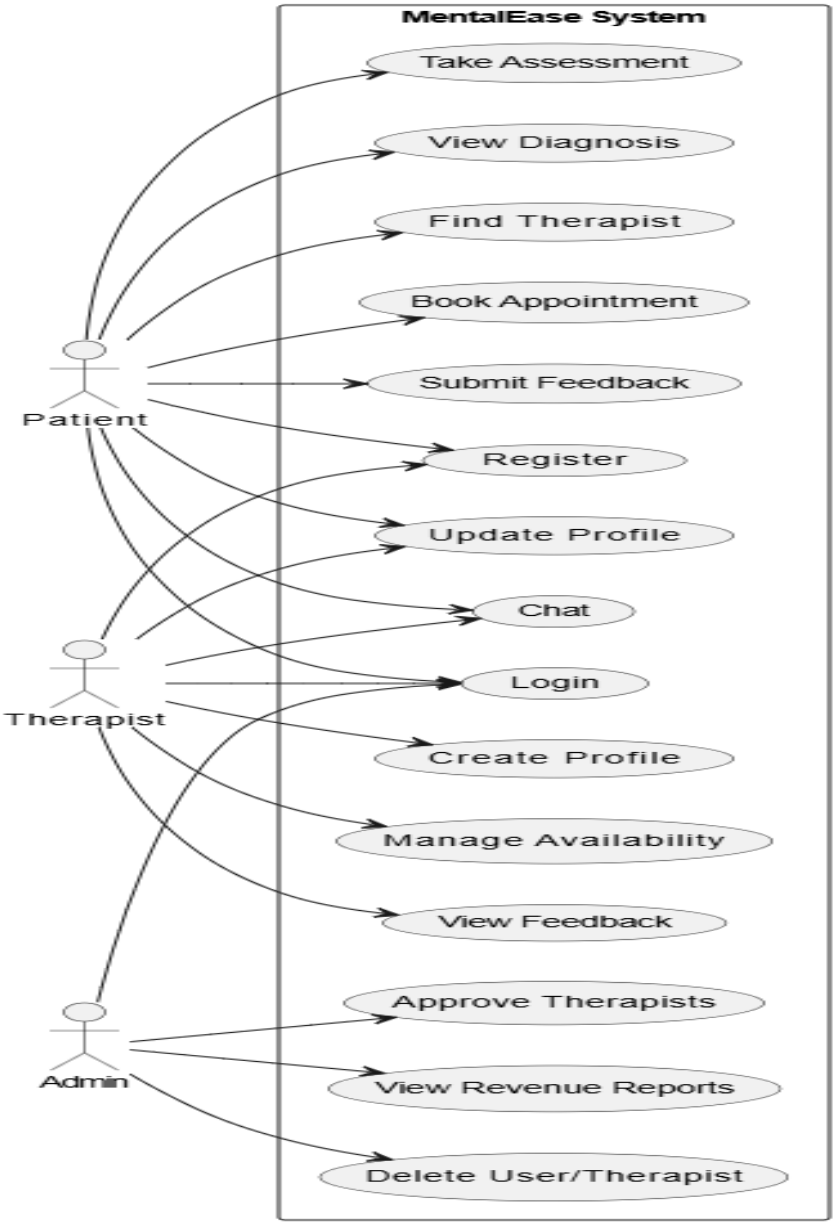


Figure 3-13: Use Case Diagram

3.4.1 Registration

A user shall be able to create an account to access the Mental Ease platform.

Table 3-1: Registration

Name	Registration
Unique identifier	UC-001
Objective	To allow Users and Psychologists to sign up their profiles.
Priority	High
Actors	User, Psychologist
Basic Flow	1. User or Psychologist open MentalEase app. 2. Clicks on "Sign Up". 3. Enters name, email, password, and select role. 4. Account is created and route to login screen.
Alternative flow	1. If any of the input is empty error message is shown. 2. If existing email is entered error message is shown. 3. If user provides invalid format of email or password, system shows error message.
Preconditions	Internet Connectivity
Postcondition	Account is created.

3.4.2 Complete Profile

Psychologist must complete their profile providing all credentials so their profile can be approved by admin and listed on user side.

Table 3-2: Create Profile

Name	Create Profile
Unique identifier	UC-002
Objective	To allow Psychologist to complete their profile.
Priority	High
Actors	Psychologist
Basic Flow	1. Psychologist open MentalEase app. 2. Login to account. 3. Complete their profile by providing all credentials. 4. Profile is submitted for approval by admin. 5. If admin approves profile is listed on user side.
Alternative flow	1. If any of the input is empty error message is shown.
Preconditions	1. Internet Connectivity. 2. Psychologist must be registered and logged in.
Postconditions	1. Profile is submitted for approval by admin. 2. If approved profile is listed on user side.

3.4.3 Update Profile

User and psychologist can update their profiles in future also.

Table 3-3: Update Profile

Name	Update Profile
Unique identifier	UC-003
Objective	To allow User & Psychologist to update their profiles.
Priority	Medium
Actors	User & Psychologist
Basic Flow	1. User/Psychologist logs in 2. Navigates to Profile section 3. Updates information 4. Taps update 5. Updates are stored in Firebase Realtime Database
Alternative flow	If credentials are invalid, system displays an error.
Preconditions	User must be Logged in.
Postcondition	Profile is updated.

3.4.4 Login

User and Psychologist should be able to log into the platform using valid credentials.

Table 3-4: Login

Name	Login
Unique identifier	UC-004
Objective	To allow User, Psychologist and Admin to login into their accounts.
Priority	High
Actors	User ,Psychologist and Admin
Basic Flow	1. User/Psychologist opens app and the login screen. 2. User/Psychologist enters email and password. 3. Admin enters admin id and password 4. System validates credentials. 5. System logs the user in.
Alternative flow	If credentials are invalid, system displays an error.
Preconditions	1. User must be registered. 2. Admin credentials must be pre-saved
Postcondition	User is logged into the application to their respective dashboards.

3.4.5 User Assessment

User will fill out questionnaire as an assessment for mental health condition.

Table 3-5: Take Assessment

Name	Take Assessment
Unique identifier	UC-005
Objective	To allow User to give a mental health assessment and result based on the responses.
Priority	Medium
Actors	User
Basic Flow	1. User selects the assessment option. 2. System displays assessment questions. 3. User submits answers. 4. System evaluates and displays result.
Alternative flow	If credentials are invalid, system displays an error.
Preconditions	User must be logged in.
Postcondition	Assessment result is generated and displayed.

3.4.6 Book Appointment

After the diagnosis user shall be able to browse available psychologists and schedule an appointment.

Table 3-6: Book Appointment

Name	Book Appointment
Unique identifier	UC-006
Objective	A user shall be able to browse available psychologists and schedule an appointment.
Priority	High
Actors	User
Basic Flow	1. User browses available psychologists. 2. User selects a time slot. 3. System confirms slot availability. 4. Pay fee. 5. Appointment is scheduled.
Alternative flow	If slot is already booked, system prompts for new time.
Preconditions	User must be logged in.
Postcondition	Appointment is successfully scheduled.

3.4.7 Chat

User can chat with doctor by messaging.

Table 3-7: Chat

Name	Chat
Unique identifier	UC-007
Objective	Enable secure text chat between user and therapist after appointment
Priority	High
Actors	User, Psychologist
Basic Flow	1. User books a session 2. Enters chat screen for messaging 3. Firebase Realtime DB updates live messages
Alternative flow	If not booked can’t chat
Preconditions	Appointment booked
Postcondition	Messages stored in Firebase Realtime database

3.4.8 Submit Feedback

After the video session ends user can give feedback to therapist.

Table 3-8: Submit Feedback

Name	Submit Feedback
Unique identifier	UC-008
Objective	To collect patient feedback post-session
Priority	Medium
Actors	User
Basic Flow	1. Video call ends 2. Prompt appears for feedback 3. User gives rating and comment 4. Stored in database
Alternative flow	User skips then no feedback saved
Preconditions	Session must be completed
Postcondition	Feedback stored and visible to therapist

3.4.9 Manage Therapist & User Profiles

Admin has authority to approve and reject therapist profile.

Table 3-9: Manage Therapist & User Profiles

Name	Approve Therapists
Unique identifier	UC-010
Objective	To allow admins to manage Therapists & Users accounts on the platform.
Priority	High
Actors	Admin
Basic Flow	Admin logs into the admin dashboard Admin navigates Therapist profiles Admin can manage Therapist & User Profiles Changes are saved and reflected on the platform
Alternative flow	None
Preconditions	Admin must be logged in
Postcondition	Therapist & User profiles are managed accordingly

3.4.10 View Revenue Reports

Admin can review revenue reports which includes payment done by patients.

Table 3-10: View Revenue Reports

Name	View Revenue Reports
Unique identifier	UC-011
Objective	To allow admins to view revenue reports.
Priority	High
Actors	Admin
Basic Flow	Admin logs into the admin dashboard Admin navigates review revenue
Alternative flow	Show message if no data appears
Preconditions	Admin must be logged in
Postcondition	Revenue report is displayed

3.5 ER Diagram of MentalEase

MentalEase uses **Firebase Realtime Database**, a structured NoSQL solution optimized for Realtime communication and live updates. The structure consists of:

- **Users:** Stores authentication info, roles (user, therapist, admin), and profile details.
- **Appointments:** Includes appointment ID, patient ID, therapist ID, time slot, and status (booked, completed, canceled).
- **Chats:** Stores message threads between patient and therapist, nested under appointments.
- **Feedbacks:** Collected under each therapist node after video sessions, including rating, comment, user ID, and timestamp.
- **Admin_controls:** Used to record thrapist approvals and flag reports (optional).

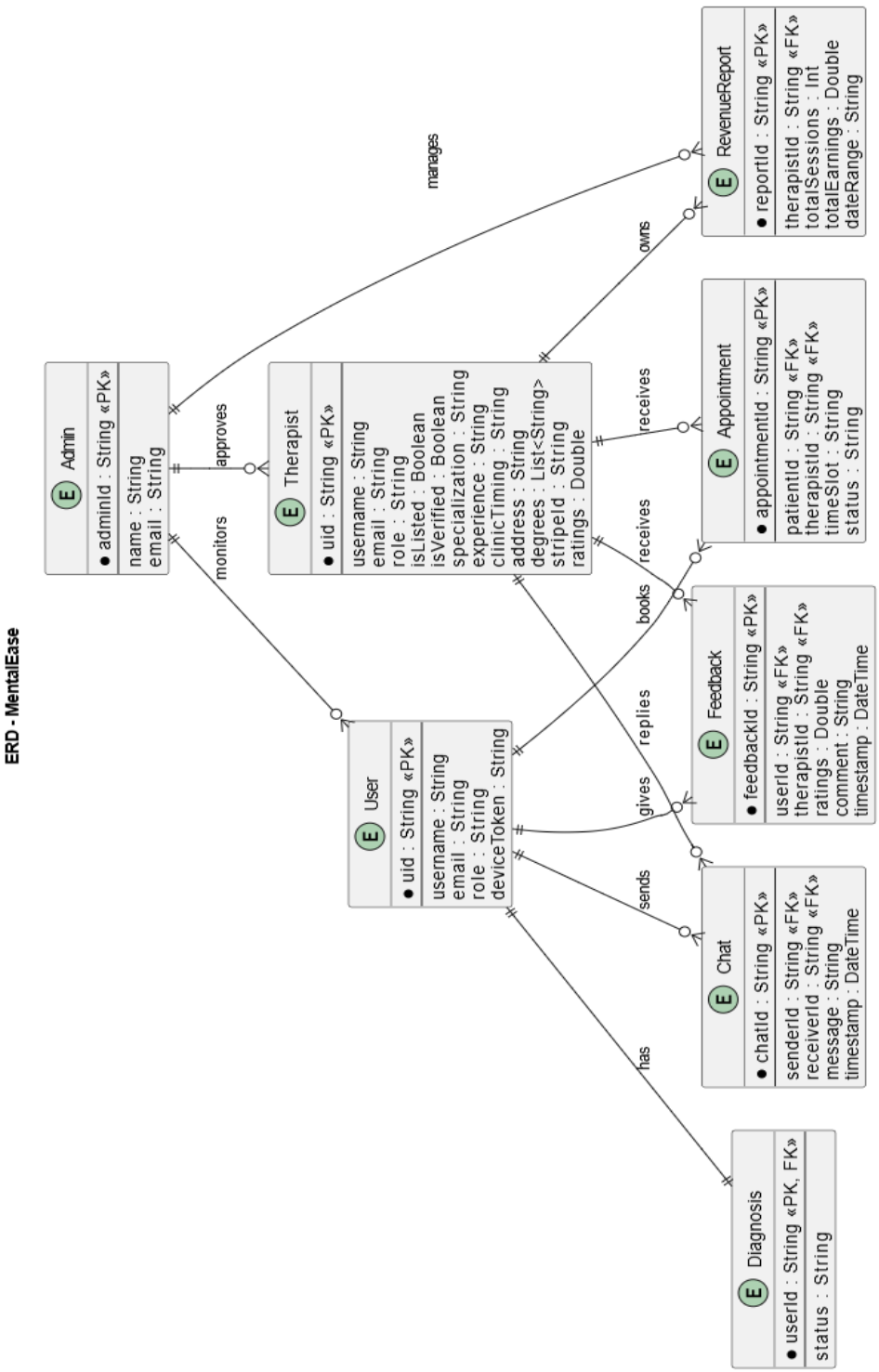


Figure 3-14: Entity Relationship Diagram

CHAPTER 4

IMPLMENTATION

4.1 Implementation

The implementation phase involves translating the design into a working software system. For MentalEase, this phase includes building the mobile application using Flutter, integrating Firebase as the backend, implementing the machine learning model for mental health diagnosis, and adding Realtime communication features such as chat. This chapter explains the technologies used, the architectural flow, and the integration process for each core component.

4.2 Frontend Implementation

The frontend of the application was developed using **Flutter**, which enables cross-platform development using a single codebase for both Android and iOS devices.

- **Home Screen**
  Provides a quick overview and navigation options for diagnosis, booking, and therapist search.
- **Registration & Login Screen**
  Connected with Firebase Authentication to enable secure login/sign-up for both patients and therapists.
- **Diagnosis Questionnaire Screen**
  Contains 42 questions based on the DASS-42 scale. Users responds to each question by selecting one of the option.

- **Diagnosis Result Screen**
  Displays the predicted levels of mental health condition returned by the AI model.
- **Find Therapist Screen**
  shows a list of approved therapists with their profiles, specializations, fees, and availability.
- **Book Appointment Screen**
  Allows users to choose a time slot and confirm a session with a selected therapist.
- **Chat Screen**
  Enables Realtime communication between users and therapists after appointment confirmation.

4.3 Backend Implementation

The backend implementation is listed and discussed below.

4.3.1 Firebase Authentication

Used to manage user registration and login. It supports:

- Email/password authentication
- Session management
- Role-based access (patient, therapist, admin)

4.3.2 Firebase Realtime Database

Firebase Realtime Database served as the main NoSQL database to store:

- **User Data:** Name, email, age, gender, diagnosis results

- **Therapist Profiles:** Experience, fees, ratings, available slots
- **Appointments:** Time, status (booked, completed, cancelled)
- **Chats:** Realtime messaging history between patient and therapist
- **Feedback:** User-submitted feedback about sessions
- **Admin Records:** Therapist approvals, revenue reports handled

4.4 AI Model Integration

To enable automatic diagnosis of mental health conditions within the app, a machine learning model was trained using the DASS-42 dataset. The **Depression Anxiety Stress Scales (DASS-42)** is a standardized and validated psychological questionnaire consisting of 42 questions.

The model training and integration process involved the following key steps:

- **Development Environment**:
  - Model was trained using **Google Colab**.
  - Utilized Python libraries: **Pandas**, **Scikit-learn**, and **Numpy**.
- **Preprocessing Techniques**:
  - Encoding of categorical values.
  - Normalization of numerical inputs.
  - Splitting of dataset into **training and testing** subsets.
- **Model Used**:
  - **Random Forest Classifier** was selected due to:
    - High accuracy.
    - Robustness.
    - Ability to handle imbalanced data.
- **Prediction Output**:
  - The model classified results into the following severity levels:
    - Normal
    - Moderate
    - Severe

- **Accuracy Achieved**:

  Final accuracy on test data: **95%**.

- **Integration with Flutter App**:

  Two methods were used/planned for integration:

  - Model deployed using a **Flask-based REST API server**.
  - Questionnaire responses sent from app to API and prediction results returned.

A secondary model using **Multilayer Perceptron (MLP)** was also explored and tested to potentially improve diagnosis accuracy, but the Random Forest model remained primary due to its better performance on the current data.

4.5 Realtime Chat Feature

To enable private communication between users and therapists:

- **Firebase Realtime Database** was used to store chat messages in Realtime.
- Chats were stored in subcollections under appointment IDs to maintain context.
- Messages were end-to-end encrypted using Firebase rules.

4.6 Feedback System

After the end of a therapy session, patients are asked to rate their experience and provide optional written feedback. This system helps in:

- Improving therapist recommendations.
- Building trust for new users.
- Helping therapists enhance their service.

Each feedback entry includes:

- Rating (1 to 5)
- Comment (optional)
- User ID and Username (retrieved from Firebase)
- Timestamp

Feedback is stored in **Firebase Realtime Database**, and the therapist's average rating is recalculated dynamically based on new and existing feedback entries.

4.7 Admin Module

The Admin section was implemented as a restricted-access interface.

Admin Capabilities:

- Approve or reject therapist registrations after profile review.
- View reports or complaints submitted by users.
- Deactivate fraudulent or inactive therapist accounts.
- Access analytics such as number of active users, sessions booked, or feedback summaries.

CHAPTER 5

RESULTS AND USER MANUAL

5.1 System Results

The MentalEase mobile application was successfully developed with core functionalities including AI-based mental health diagnosis, therapist discovery, appointment booking, Realtime chat, and role-based access (User, Therapist, Admin). Screenshots of major functionalities are included below to demonstrate successful implementation.

5.1.1 Signup / Login Pages

Users and Psychologists can register and login securely using Firebase Authentication.

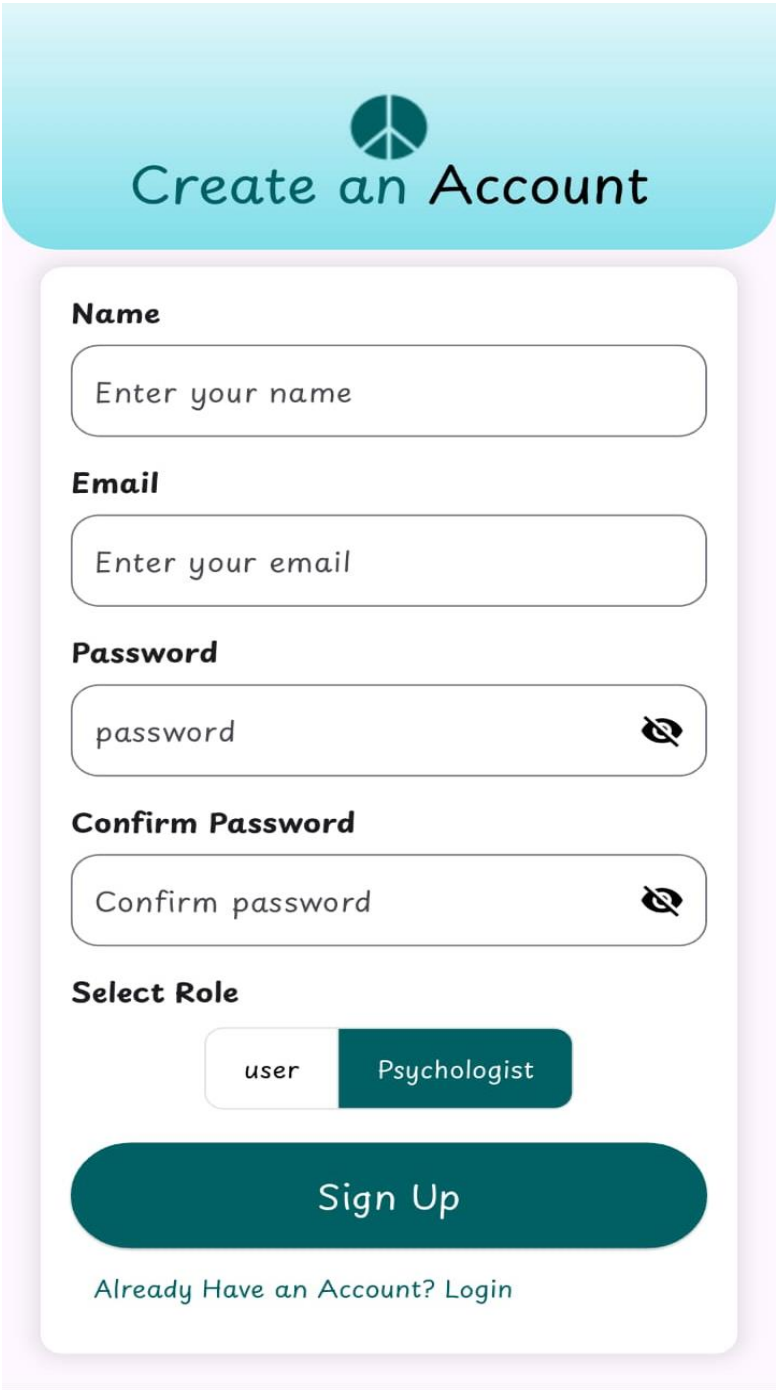


Figure 5-1: Psychologist Signup

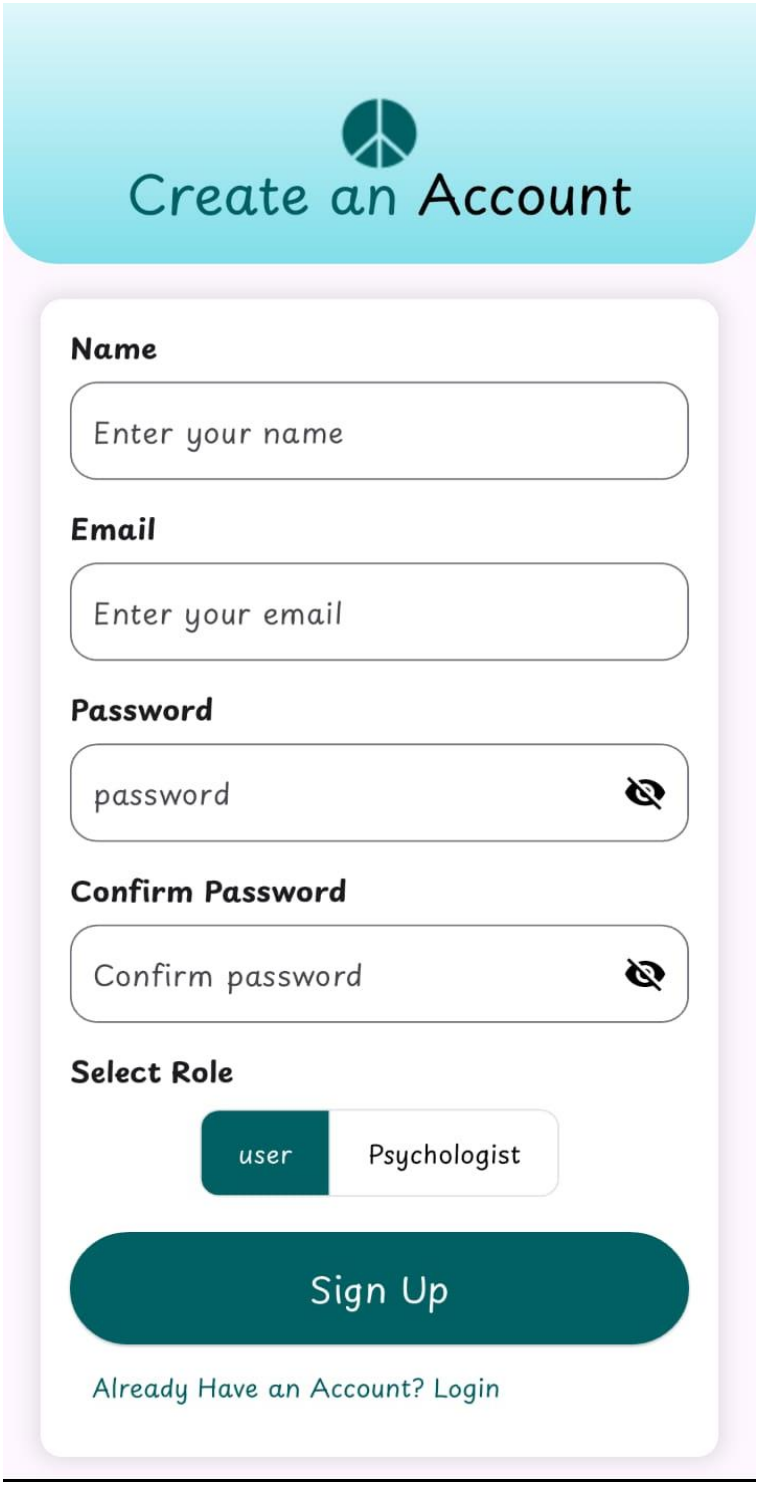


Figure 5-2: User Signup

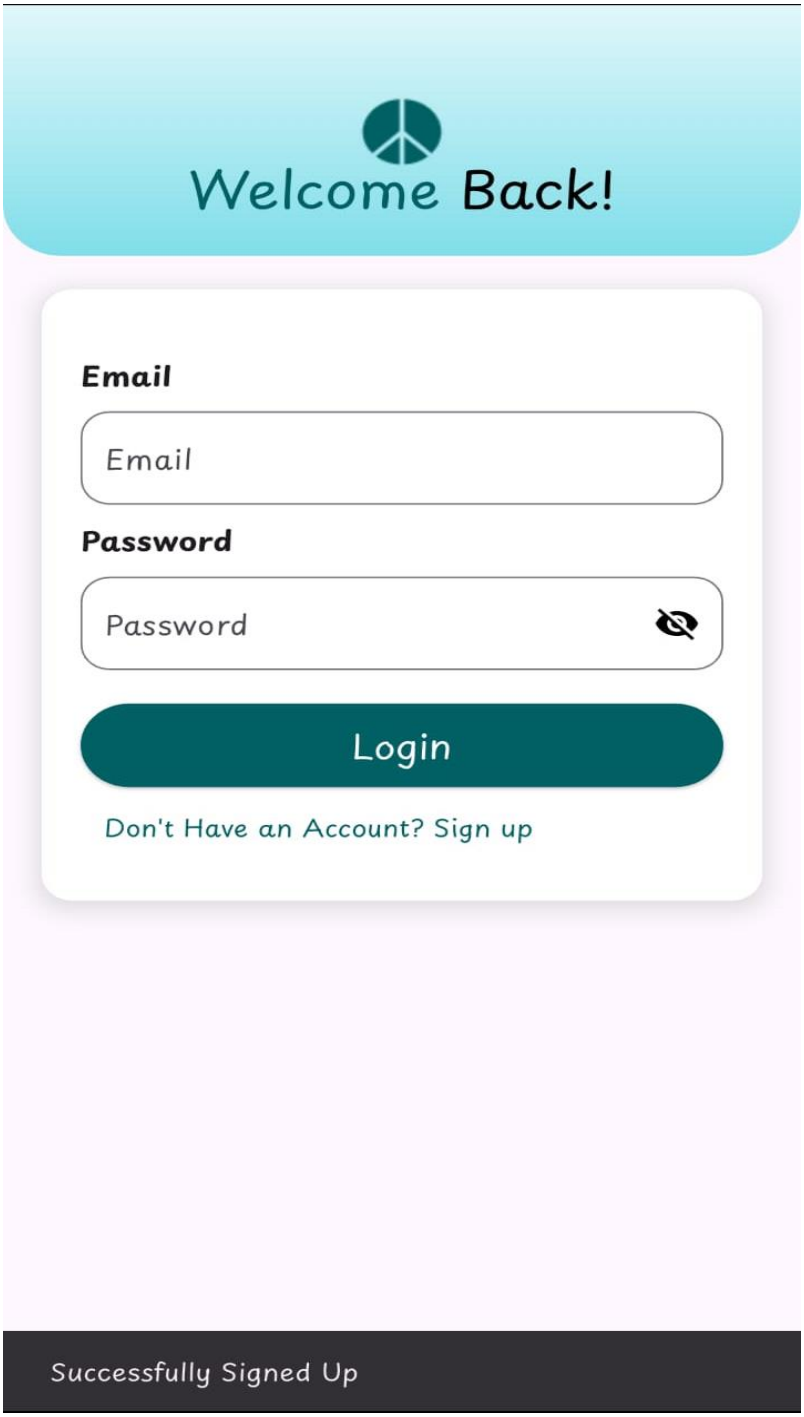


Figure 5-3: User / Psychologist Login Screen

5.1.2 Psychologist Screens

Therapists must complete profile details and wait for admin approval before being listed.

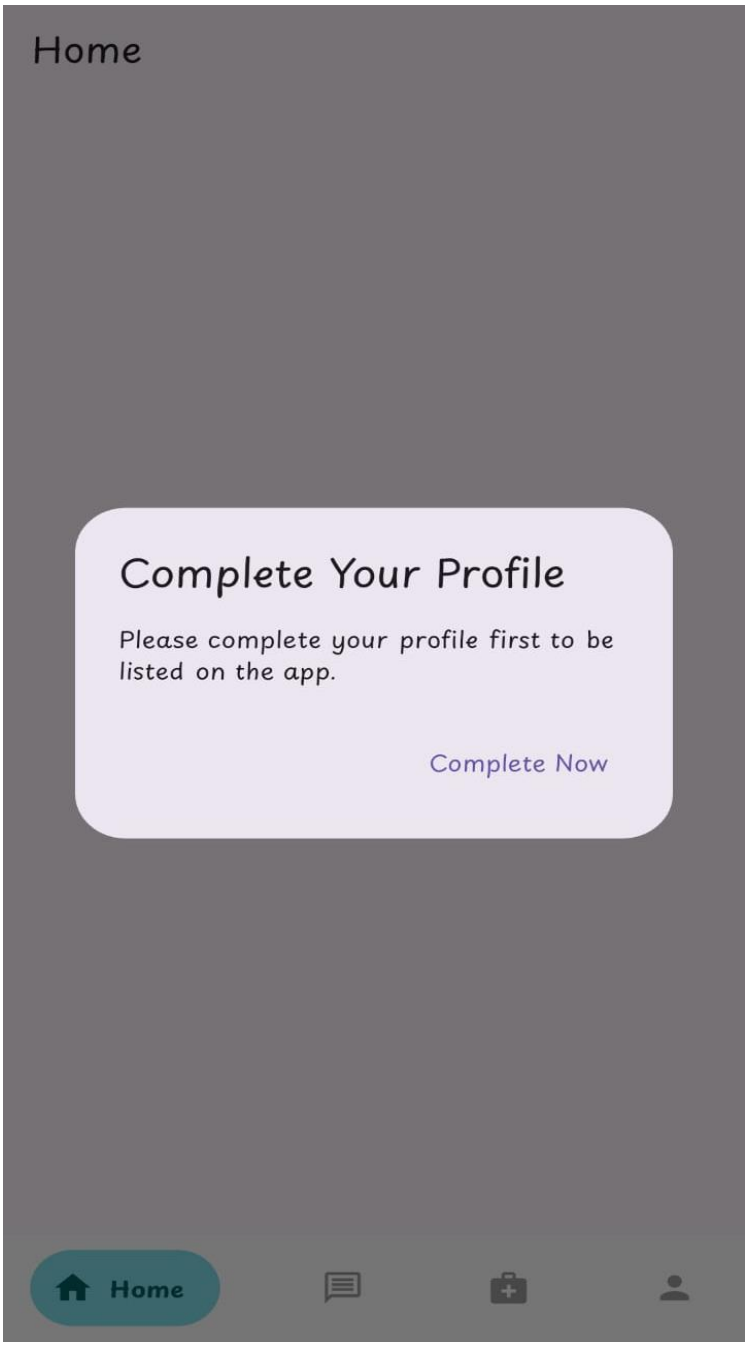


Figure 5-4: Psychologist Home Screen.

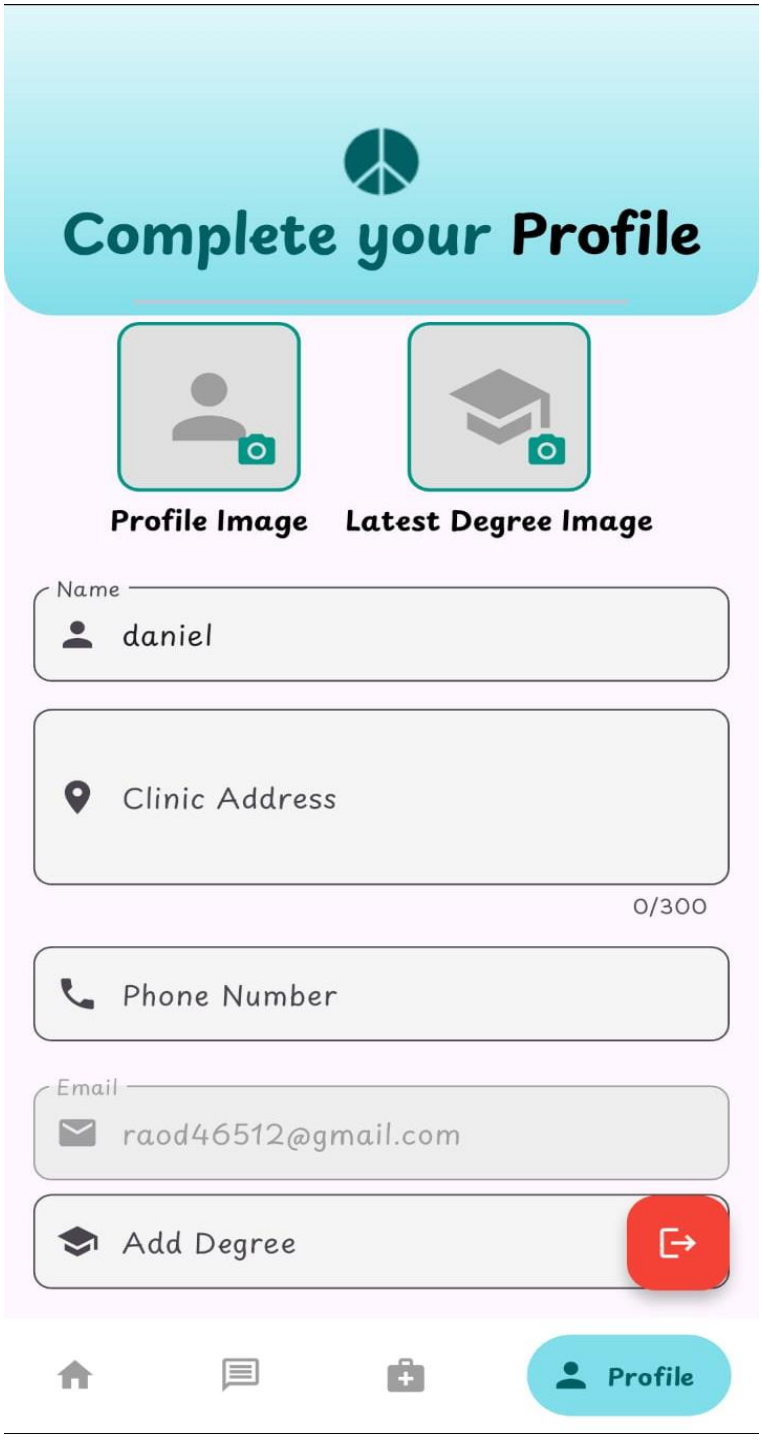


Figure 5-5: Psychologist Profile creation

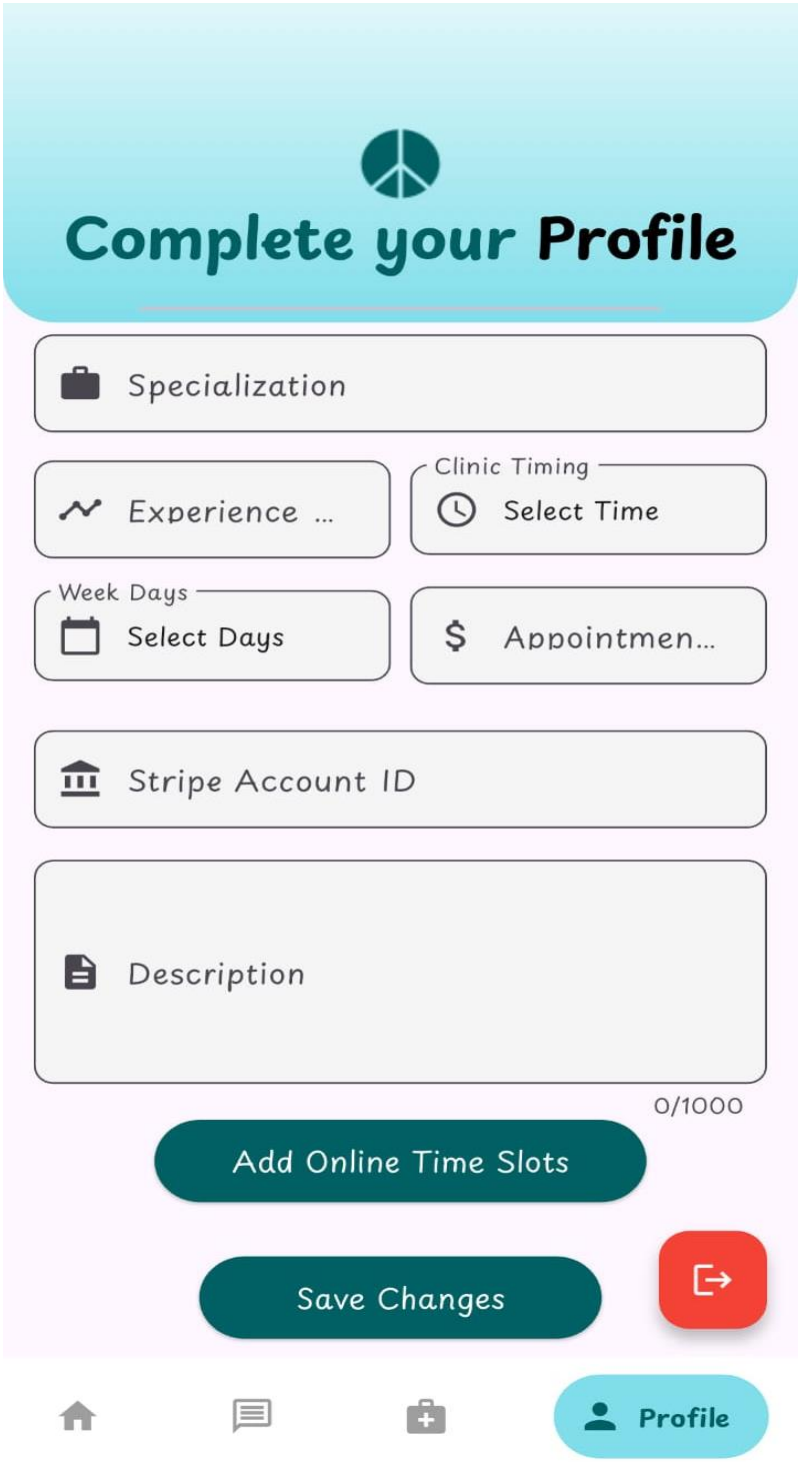


Figure 5-6: Psychologist Profile creation

5.1.3 User Screens

Users can complete a 42-question form or consult doctor by visiting doctors listing screen.

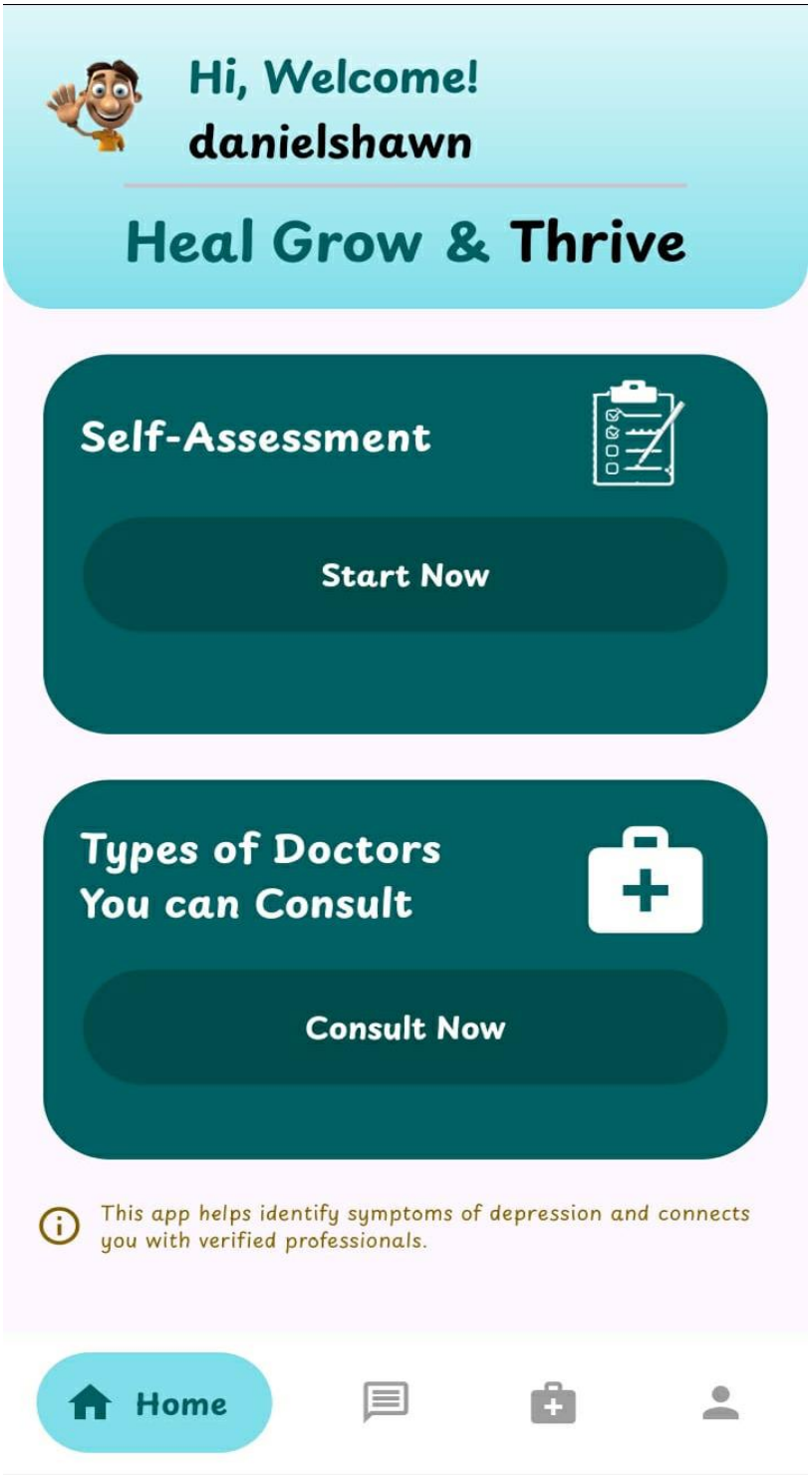


Figure 5-7: User Home Screen

In assessment page screen user can start assessment by filling questionnaire and can also view their previous assessment history.

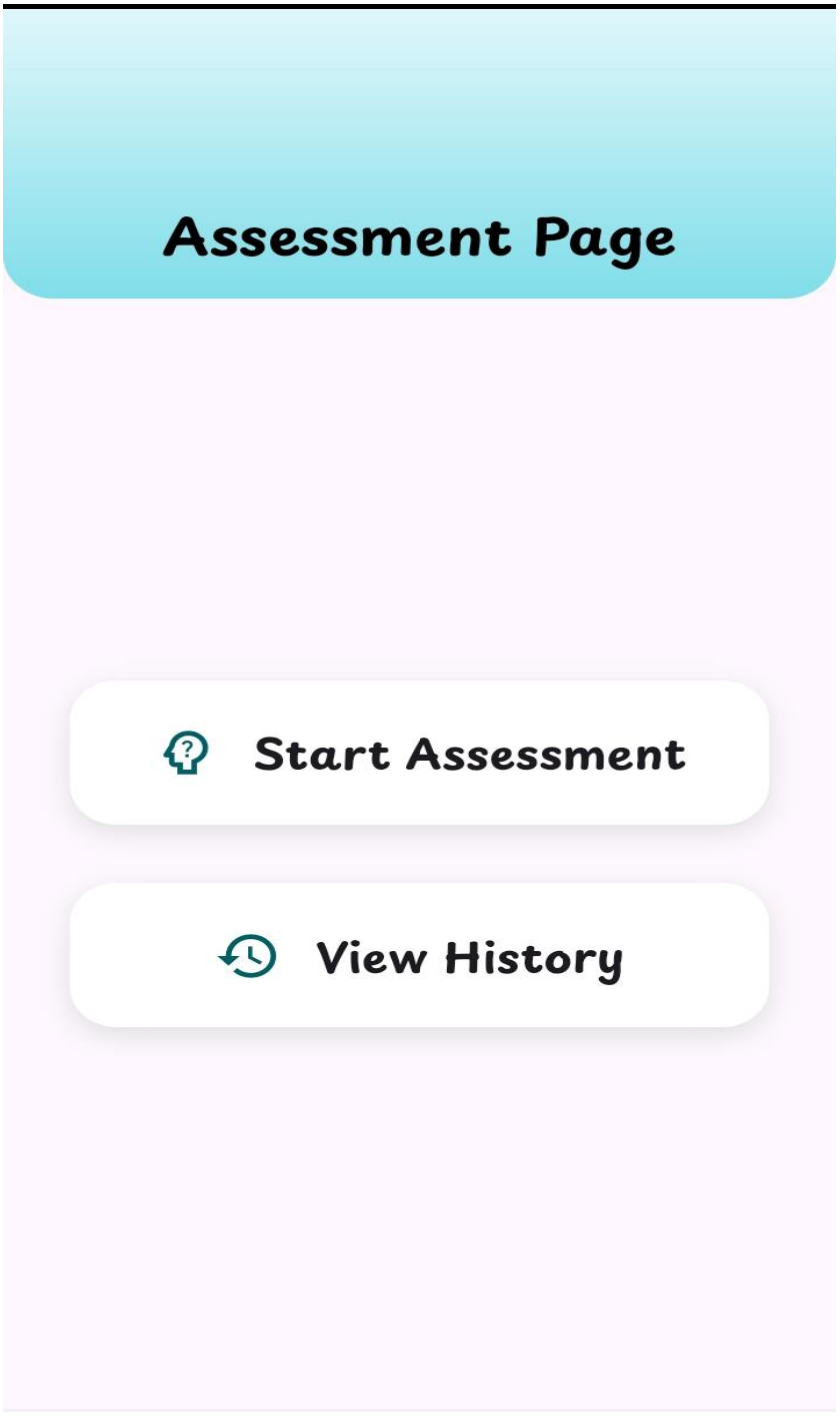


Figure 5-8: Assessment page

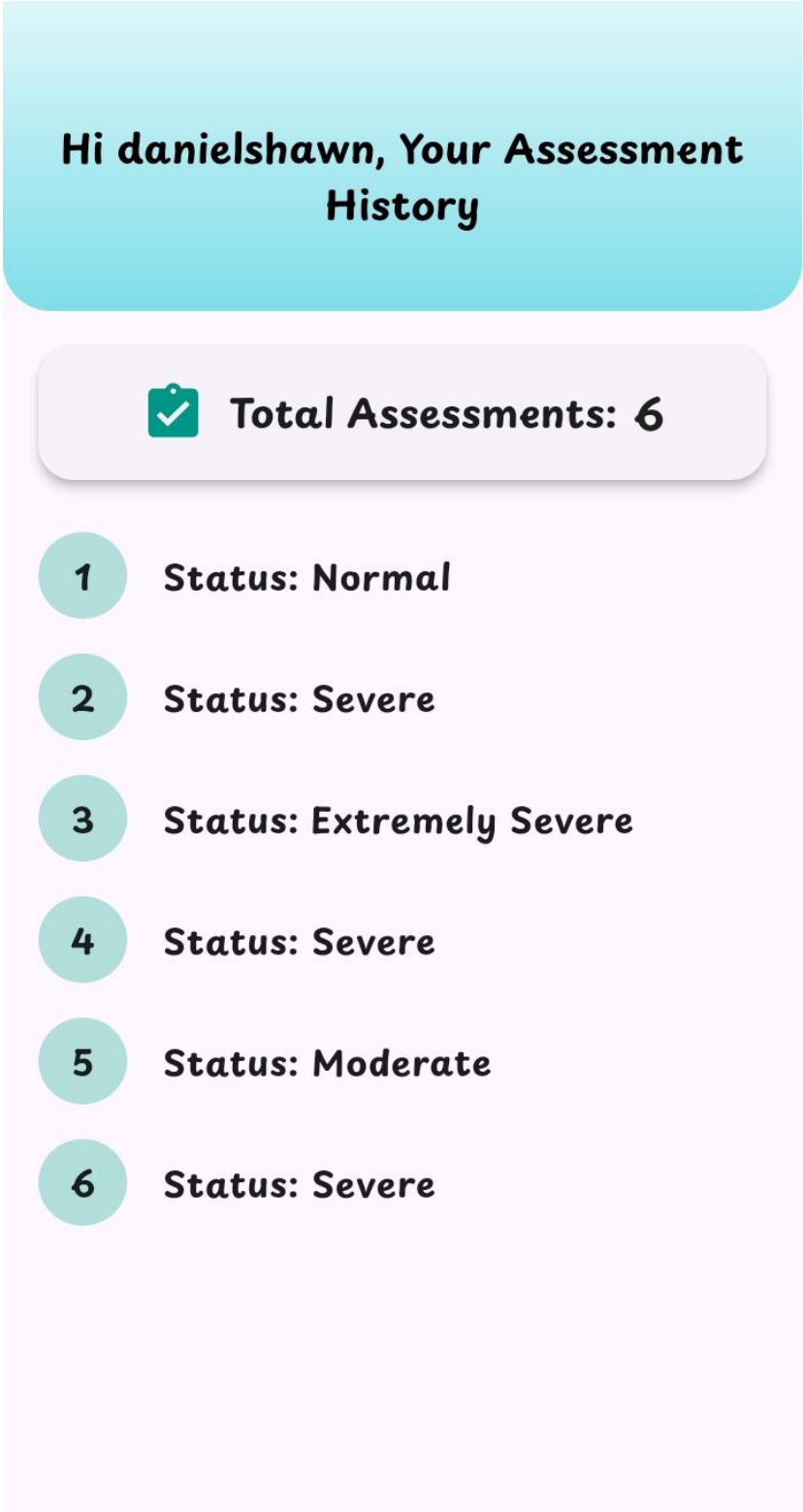


Figure 5-9: View Assessment History

User can choose one of the option and move to next question. User can also update previous response by going back to previous question.

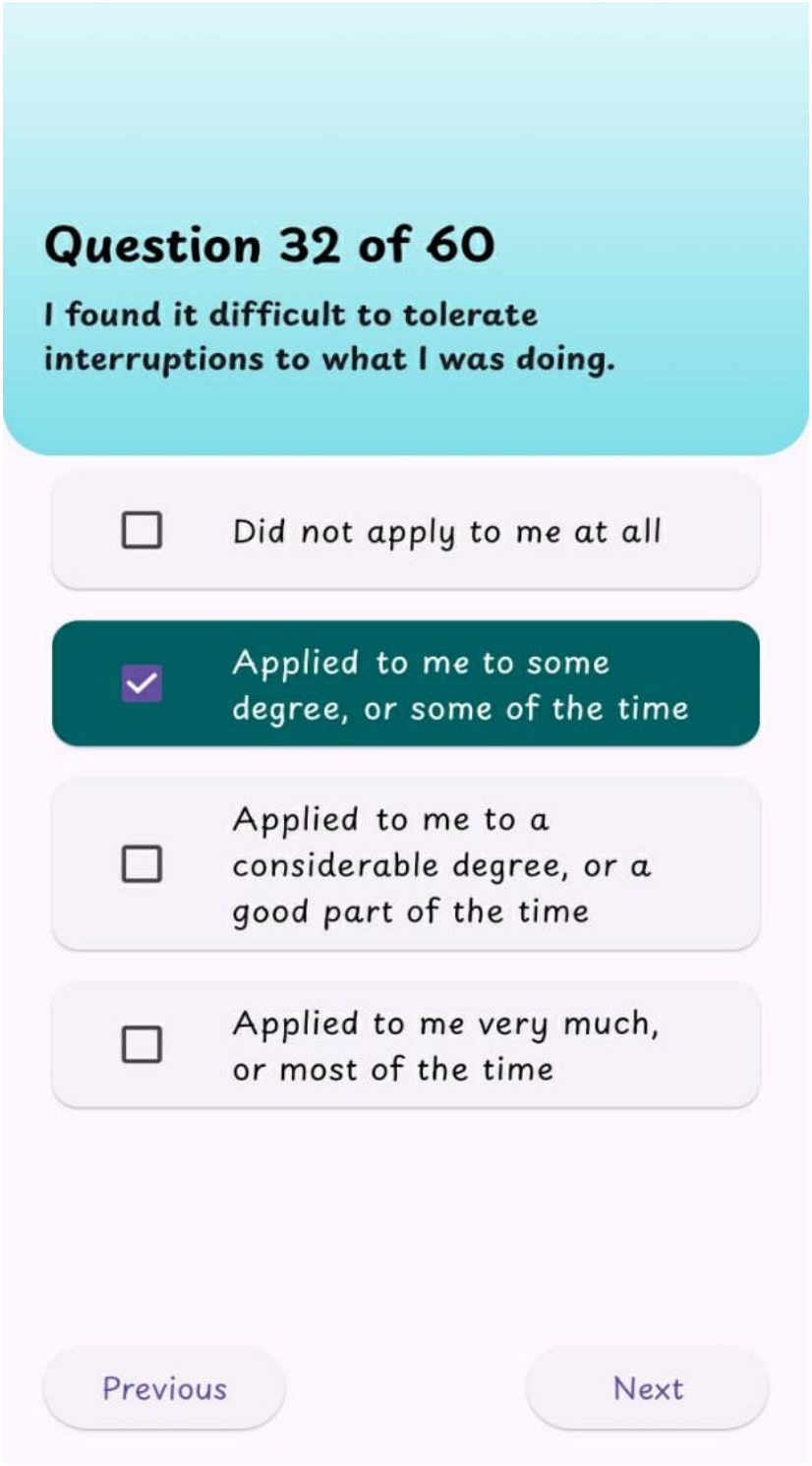


Figure 5-10: User Assessment Screen

Users can explore therapist listings, view specialization, fees, reviews, rating and availability.

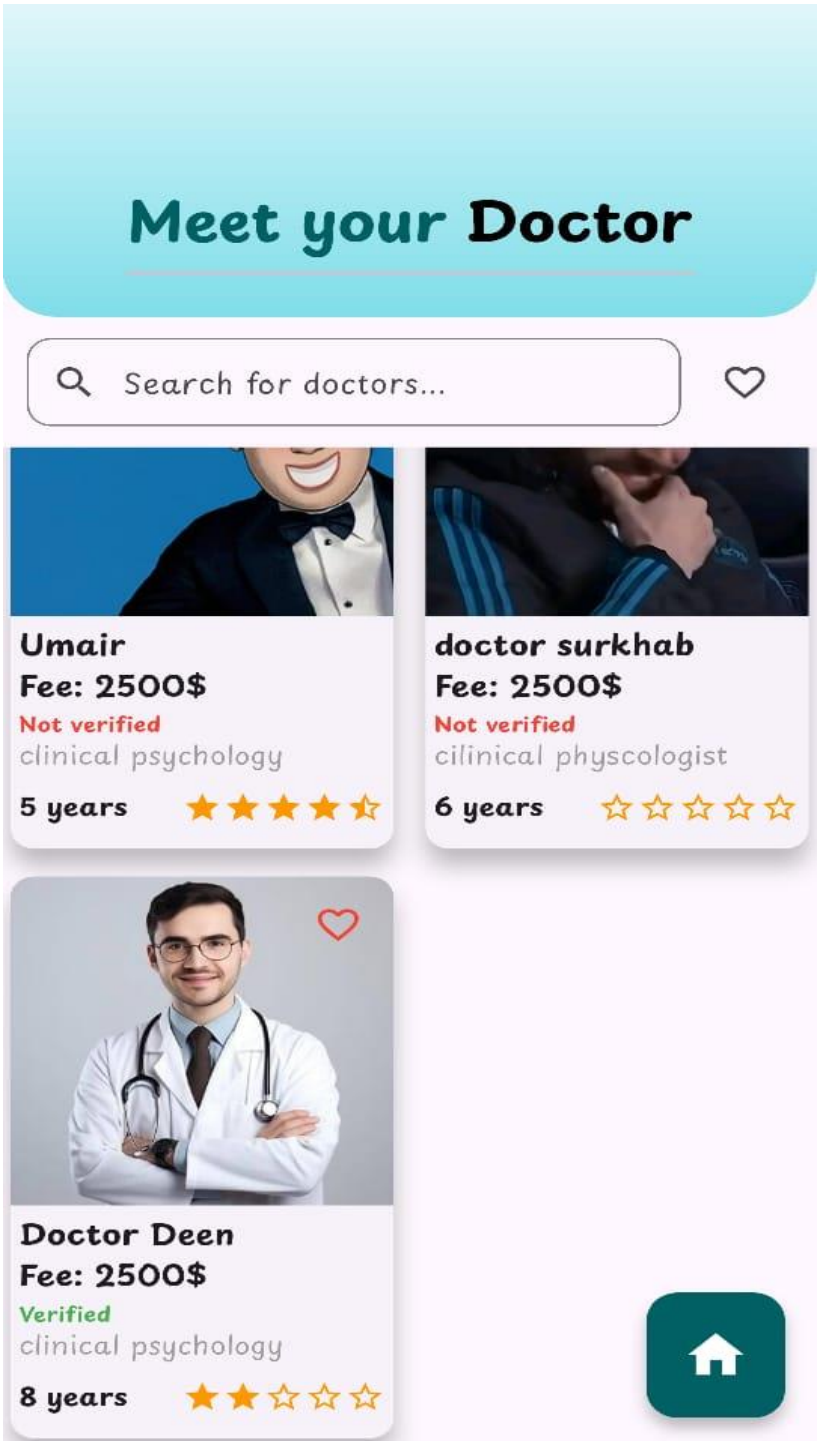


Figure 5-11: Doctors listing

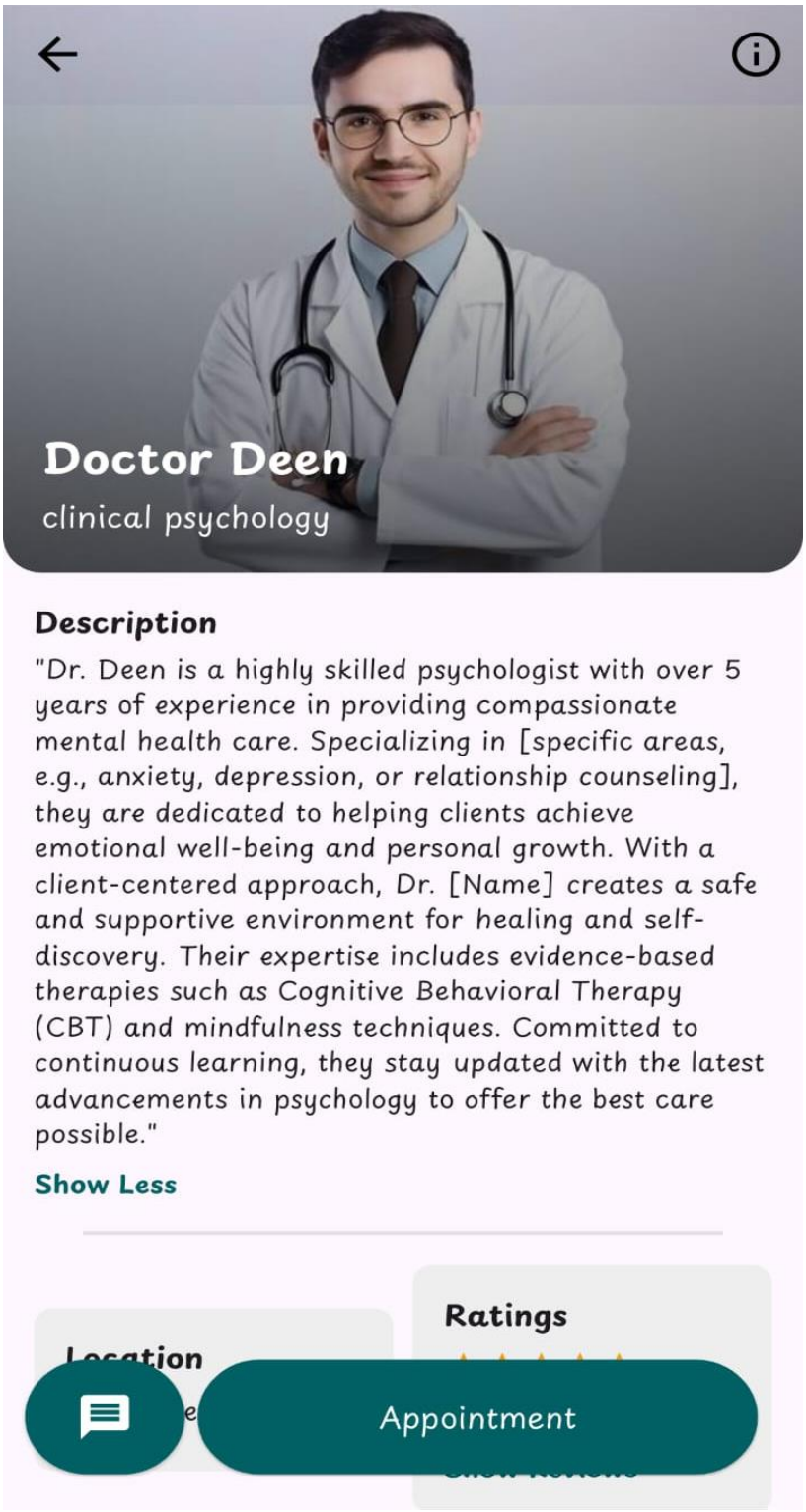


Figure 5-12: Psychologist Profile Screen

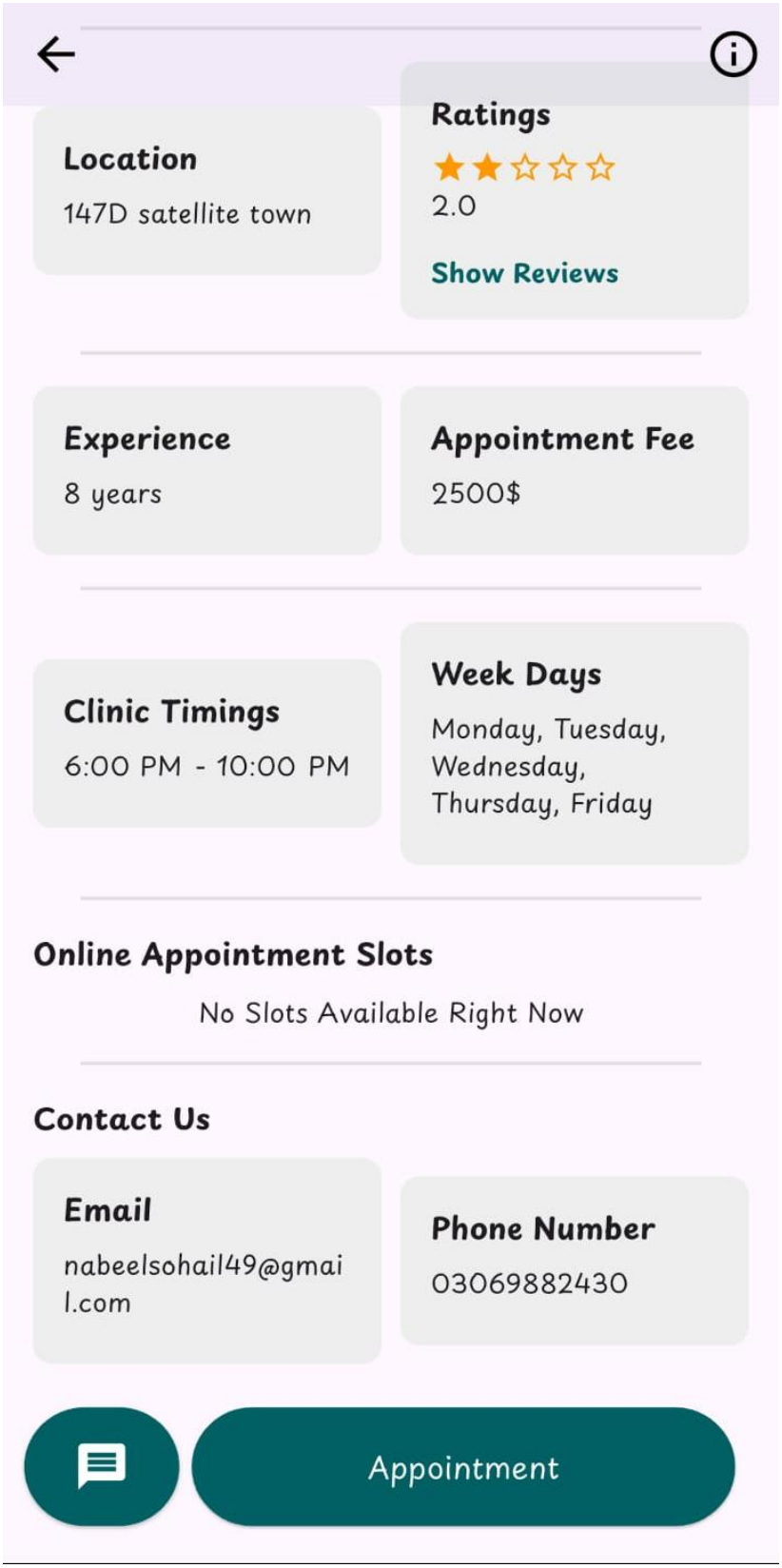


Figure 5-13: Psychologist Profile Screen

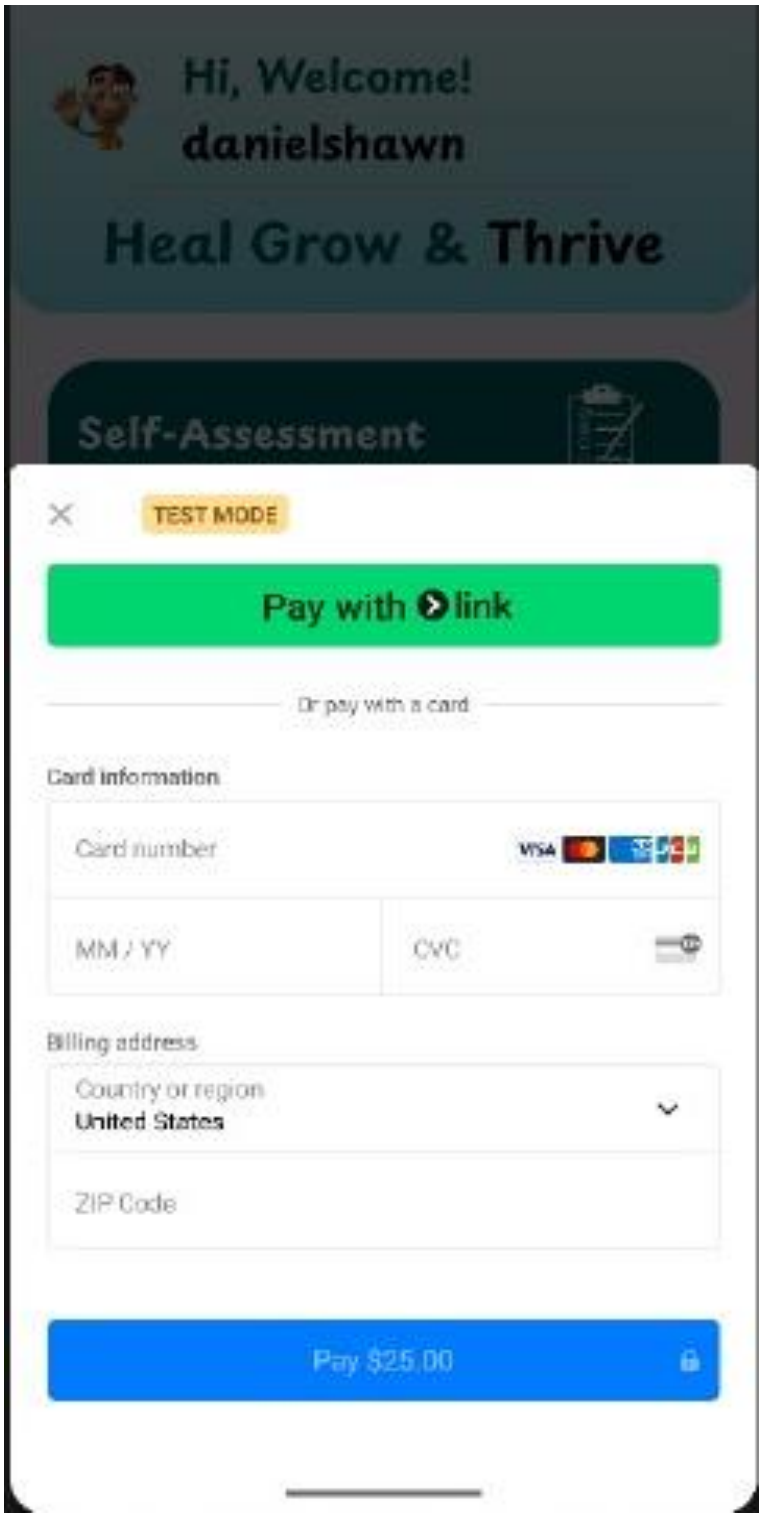


Figure 5-14: Payment Screen

Chat functionality available for user to do chat with doctor by messaging.

Figure 5-15: Inbox

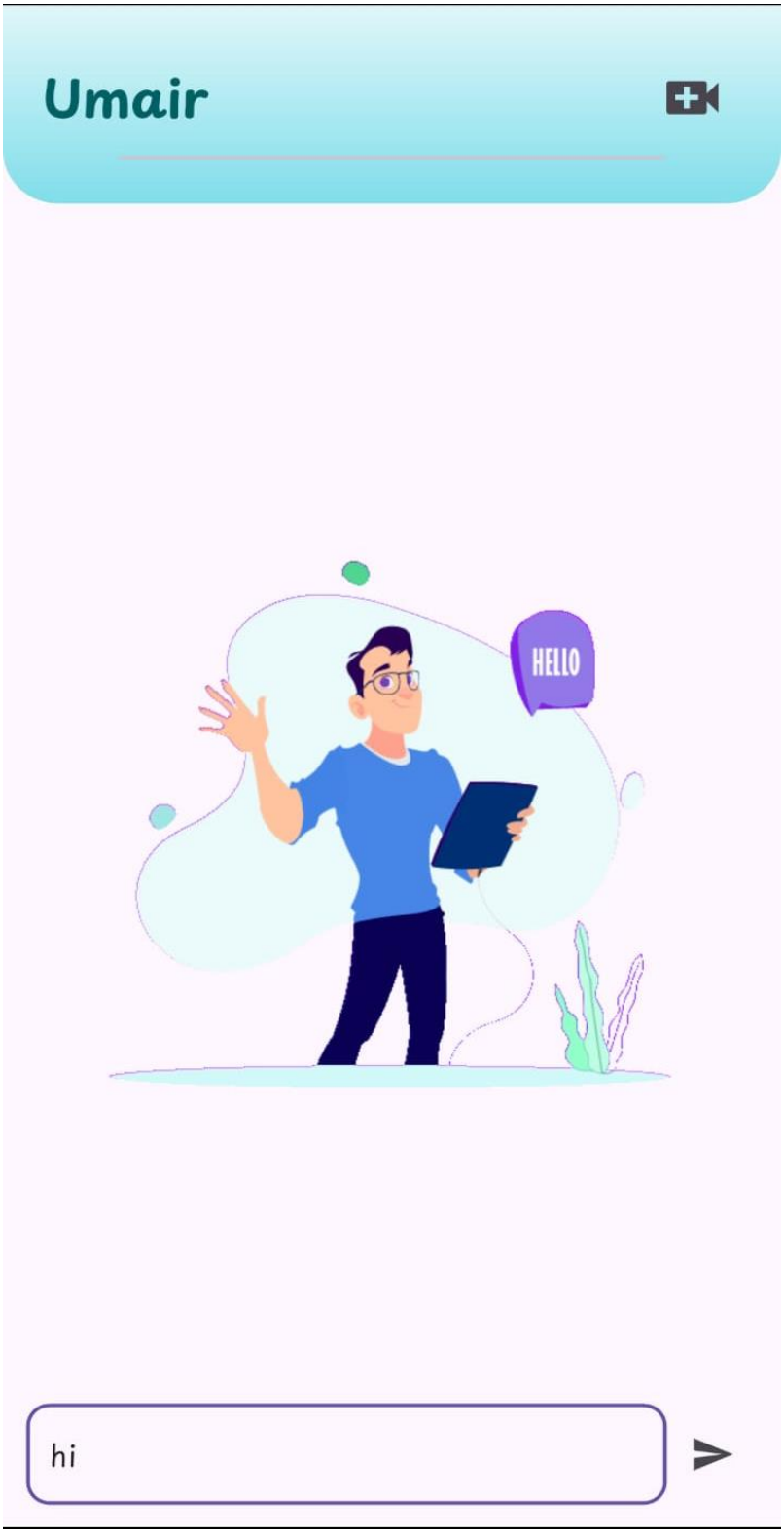


Figure 5-16: Chat Screen

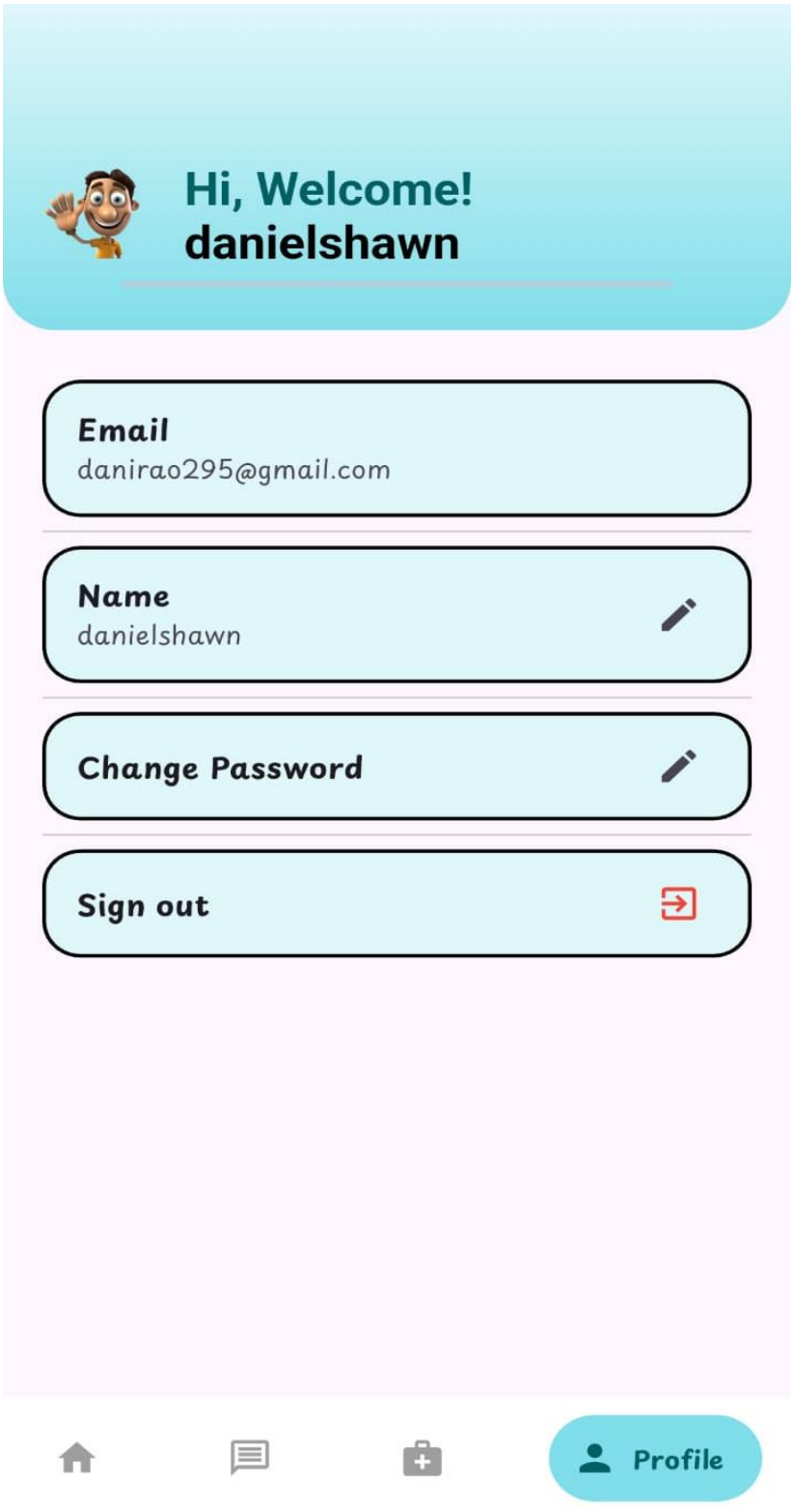


Figure 5-17: User Profile

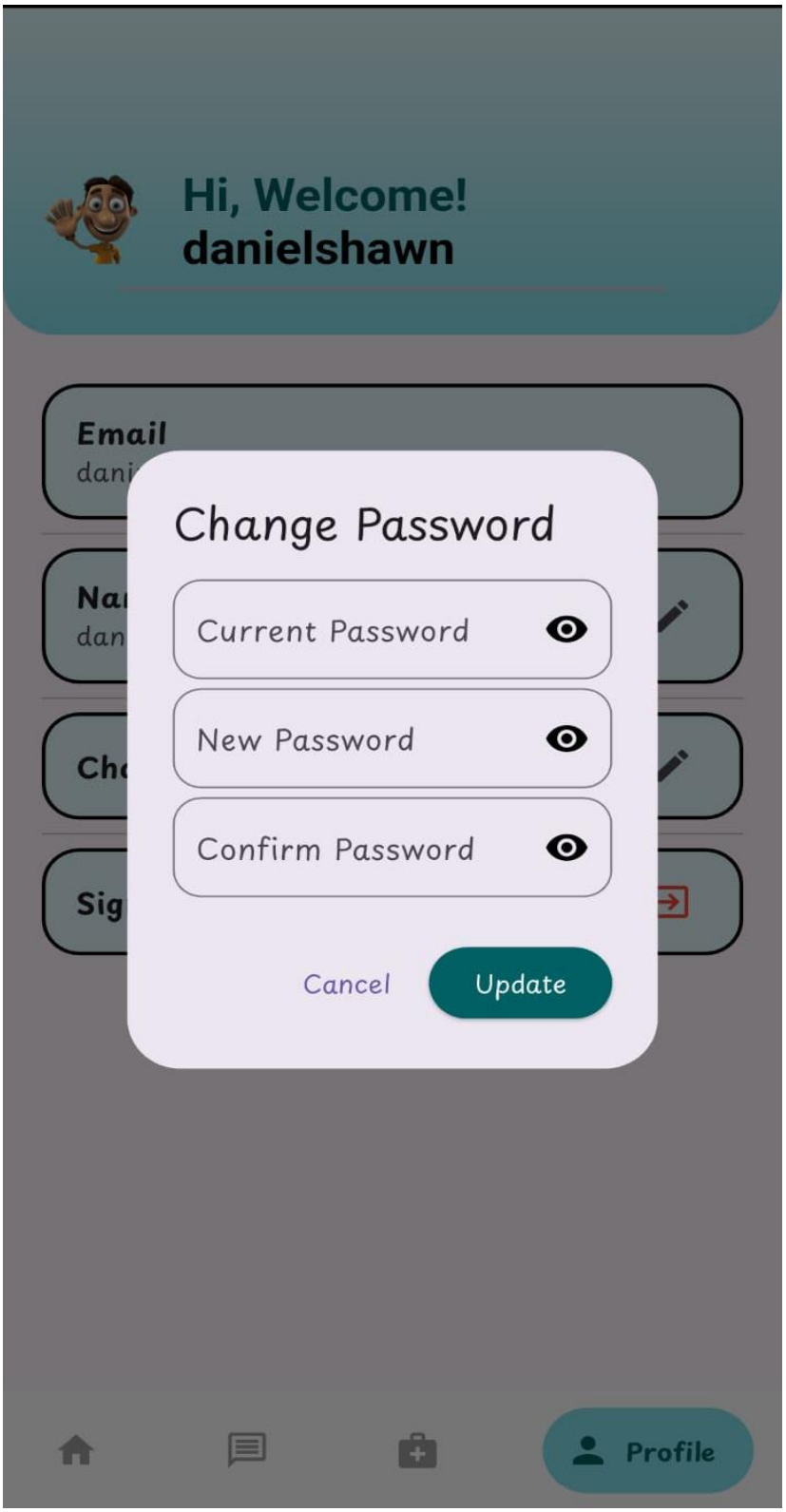


Figure 5-18: Change Password screen

5.2 User Manual

The following section serves as a guide for users of different roles in MentalEase.

5.2.1 Patient/User

- **Registration/Login**
  Open the app and register using your email and password. Then login.
- **Fill Questionnaire**
  Navigate to the assessment screen and answer all 42 DASS-42 questions honestly.
- **View Diagnosis**
  After submission, you will receive an AI-based prediction of your mental health status.
- **Browse Therapists**
  If any mental health issue is diagnosed go to "Find Therapist" and view available psychologists.
- **Book Appointment**
  Select a time slot and confirm booking with your preferred therapist.
- **Chat**
  Use the chat feature to message the therapist.
- **Feedback**
  After Therapy session patient can give feedback by rating 1-5 stars and reviews.

5.2.2 Psychologists / Therapists

- **Register and Complete Profile**
  Register as a psychologist and complete your profile with credentials, experience, and fee.

- **Approval Process**

  Wait for admin approval before your profile becomes visible to users.

- **Manage Appointments**

  View confirmed bookings and interact with patients via chat.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

MentalEase was developed as a mobile-based solution to address the growing challenges in accessing mental health care services. The application integrates an AI-driven diagnostic model trained on the DASS-42 dataset, allowing users to receive a preliminary assessment of their mental health condition directly through the app. By combining this with therapist discovery, appointment booking, chat, video calling, and payment features, the platform bridges the gap between mental health diagnosis and treatment in a seamless, user-friendly interface.

From a technical standpoint, the project successfully utilized tools like Flutter for cross-platform development, Firebase for authentication and Realtime database storage, and Python with the Random Forest algorithm for predictive diagnosis.

The implementation of Realtime chat and video calls enhanced the interactivity between patients and therapists, and role-specific functionality for users, therapists, and admins ensured clear access control and usability.

Overall, the project met its primary goals of creating a mobile application that facilitates early mental health assessment and connects users with licensed therapists in a private, efficient manner. It demonstrates a strong use of AI and cloud technologies to solve a real-world problem.

6.2 Recommendations

Following are the recommendations for upgrading application by adding more functionalities and better for user and Therapists.

6.2.1 General Therapy Exercises and Mental Health Resources

Include simple self-help exercises like breathing techniques, journaling prompts, and guided CBT activities that users can perform between sessions.

6.2.2 Progress Tracking

Introduce short follow-up surveys to help users and therapists track mental health improvements over time.

6.2.3 Doctor-Centric Session File Management System

Introduce a secure in-app system for therapists to upload, save, and manage therapy-related documents, worksheets, and session notes directly within their profile. This feature would allow doctors to:

- Store personalized treatment plans, worksheets, or progress reports for each patient.
- Access these documents during live chat or video sessions without relying on external files or paperwork.
- Review previous session notes before a new appointment, enabling better continuity and personalization.
- Keep all records securely within the app — encrypted and accessible only by the therapist who created them.

This will reduce dependency on physical files and improve the flow of therapy sessions. Privacy can be ensured by implementing strict role-based access control,

ensuring that only the assigned therapist can view, edit, or upload documents for their patients.

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APPENDICES

Append1ix A: Languages Links

Flutter: https://flutter.dev/

Dart: https://dart.dev/

Python: https://www.python.org/

Appendix B: Tools Used

Android SDK: https://developer.android.com/

Google Colab: https://colab.research.google.com/

Firebase: https://firebase.google.com/