VITALSTEP

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By

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Under the supervision of

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Project report submitted in partial fulfilment

of the requirements for the award of degree of BCA (Computer Applications), CHRIST (Deemed-to-be University)

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CERTIFICATE

This is to certify that the report titled **VitalStep** is a bona fide record of work done

by **Pranav Srinivasan (2241149) and Soravich Pinrat (2241158)** of CHRIST

(Deemed to be University), Bangalore, in partial fulfilment of the requirements

of VI Semester BCA during the year 2025.

Head of the Department   **Project Guide**

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<u>CONTENTS</u>

ABSTRACT

VitalStep is a web-based counsellor management platform designed to simplify the workflows of mental health professionals while enhancing patient outcomes. It offers a comprehensive solution for managing appointments, patient records, session notes, and therapy plans, empowering counsellors to deliver more efficient care. The integration of machine learning (ML) enhances the platform by offering predictive analytics, sentiment analysis, and personalized therapy recommendations, providing counsellors with insights to track patient progress and adjust therapy plans. Unique features such as an interactive patient portal, self-assessment tools, and progress reports offer patients greater involvement in their therapy process. By addressing the inefficiencies of traditional systems, VitalStep provides a secure, user-friendly, and data-driven platform designed to streamline mental health care. The platform is built using modern technologies such as HTML/CSS, React, and PHP for the frontend and server-side functionality, while Python libraries like scikit-learn and TensorFlow are employed for ML-based predictions and data modelling. With a dynamic calendar, session tracking tools, and scalable architecture, VitalStep is designed to support both individual counsellors and larger clinics. One of the standout features of VitalStep is its ability to combine administrative management with advanced ML tools, offering both efficiency and personalized care. Ultimately, VitalStep aims to improve the effectiveness of counselling practices, ensuring better engagement for patients and streamlined operations for mental health professionals.

1.1 Problem Statement: Mental health professionals face significant challenges in managing counselling workflows due to reliance on manual processes, lack of technological integration, and limited access to data-driven insights. Traditional methods, such as paper-based records and appointment tracking, are time-consuming, error-prone, and hinder scalability. Existing digital solutions, including practice management software and telehealth platforms, often lack advanced features like machine learning-driven analytics, sentiment analysis, and personalized therapy recommendations. Additionally, there is a gap in fostering active patient engagement through tools like self-assessments and progress tracking. The proposed platform aims to address these limitations by offering a comprehensive, user-friendly, and intelligent system that streamlines workflows, enhances patient outcomes, and empowers mental health professionals with actionable insights.

1.2 Key Objectives

1. Streamline Counselling Workflows
2. Integrate Machine Learning for Insights
3. Enhance Patient Engagement
4. Predictive Analytics for At-Risk Patients
5. Facilitate Progress Monitoring
6. Promote Accessibility

1.3 Existing Systems:

In-Person Counselling Practices:

These involve face-to-face therapy sessions with manual tools like paper-based records, appointment books, and personal follow-ups. While traditional, they are time-consuming and prone to errors.

Community Mental Health Centres:

Public or non-profit organizations providing therapy services to underserved populations. Often underfunded and reliant on basic tools, these centres struggle to scale effectively.

TheraNest:

A software solution offering scheduling, billing, secure telehealth, and session documentation. Designed to simplify administrative tasks but lacks advanced ML tools for personalized therapy.

SimplePractice:

Provides tools for appointment scheduling, patient portals, and billing. It is popular among solo practitioners but lacks active patient engagement features and predictive analytics.

BetterHelp:

An online therapy platform connecting users with licensed therapists through video, phone, or messaging. Focused on accessibility but lacks tools for tracking long-term progress or providing personalized therapy recommendations

1.4 Limitations of Existing System:

In-Person Counselling Practices:

Manual processes lead to inefficiencies and errors.

Requires physical presence, limiting accessibility.

Community Mental Health Centres:

Limited resources and scalability.

Reliance on basic systems for record-keeping.

TheraNest and SimplePractice:

Lack of advanced ML-driven tools.

Costs may not be feasible for small practices.

BetterHelp:

Focuses on connectivity rather than practice management.

Does not integrate tools for progress tracking or therapy adjustments.

2. Proposed Project Idea:

VitalStep is a comprehensive web-based platform tailored for mental health professionals. It integrates machine learning to analyse session notes, provide therapy recommendations, and track patient progress. The platform offers tools for dynamic scheduling, patient management, and data-driven visualizations. Unique features include sentiment analysis of session notes, predictive analytics to identify at-risk patients, and self-assessment tools for patient engagement. Designed for scalability, it caters to individual counsellors and large clinics alike.

2.1 Description of Functionalities:

Dynamic Calendar:

Color-coded sessions indicating upcoming, completed, and missed appointments.

Automated reminders for both counsellors and patients.

Patient Management:

Comprehensive records, including therapy plans, session notes, and progress analytics.

Self-Assessments:

Interactive questionnaires with automated scoring and analysis.

Progress Tracking:

Visual charts and insights to monitor patient improvement over time.

ML Features:

Sentiment analysis of session notes.

Predictive analytics for at-risk patients.

Therapy adjustment recommendations based on historical data.

Patient Portal:

Access to self-assessments, therapy summaries, and curated resources.

Notifications:

Automated alerts for appointments and self-assessment submissions.

2.3 Description of Modules:

User Registration	The registration module will capture user details such as name, contact information, role (counsellor or patient), and additional information like specialization for counsellors or health history for patients.
Secure Login	Users will be able to log in securely using their email and password.
Appointment Management	Allows patients to schedule, reschedule, and cancel therapy sessions efficiently, preventing conflicts and optimizing counsellor availability. Future integration with Google Calendar can enhance reminders.
Session Notes & Reports	Counsellors can document session details, track progress, and ensure continuity in therapy. These notes help in adjusting treatment plans and improving patient care.
AI-Powered Chatbot	Provides instant responses to patient inquiries, offers self-help resources, and reduces the workload on counsellors by acting as a virtual assistant.
Patient Review & Feedback	Patients can rate counsellors and provide feedback, helping analyse satisfaction levels. Future AI-driven

	sentiment analysis will score counsellors based on reviews.
Resource Depository	The platform will include a repository of curated resources, such as articles and videos to enhance mental health literacy and support therapy.
Counsellor Profile Generator	Automatically updates counsellor profiles based on session history and patient feedback, helping users choose the right therapist.
Session Summarizer	An AI-powered summarizer extracts key insights, making it easier to review past sessions quickly.

2.4 Advantages of the Proposed idea:

Efficiency:

Automation of administrative tasks reduces workload for counsellors.

Data-Driven Insights:

ML-powered analytics provide actionable insights for therapy planning.

Enhanced Patient Engagement:

Interactive tools like self-assessments and progress reports foster active participation.

Accessibility:

Designed for both technical and non-technical users with a user-friendly interface.

Scalability:

Supports individual practitioners and large clinics with collaborative features.

2.5 Technical Stack:

Frontend:

HTML, CSS, JavaScript, React.js.

Backend/ Database:

Flask API (for ML integration), MySQL (via XAMPP for local development).

Google Calendar API (for scheduling integration), Chart.js (for visualizations).

Machine Learning:

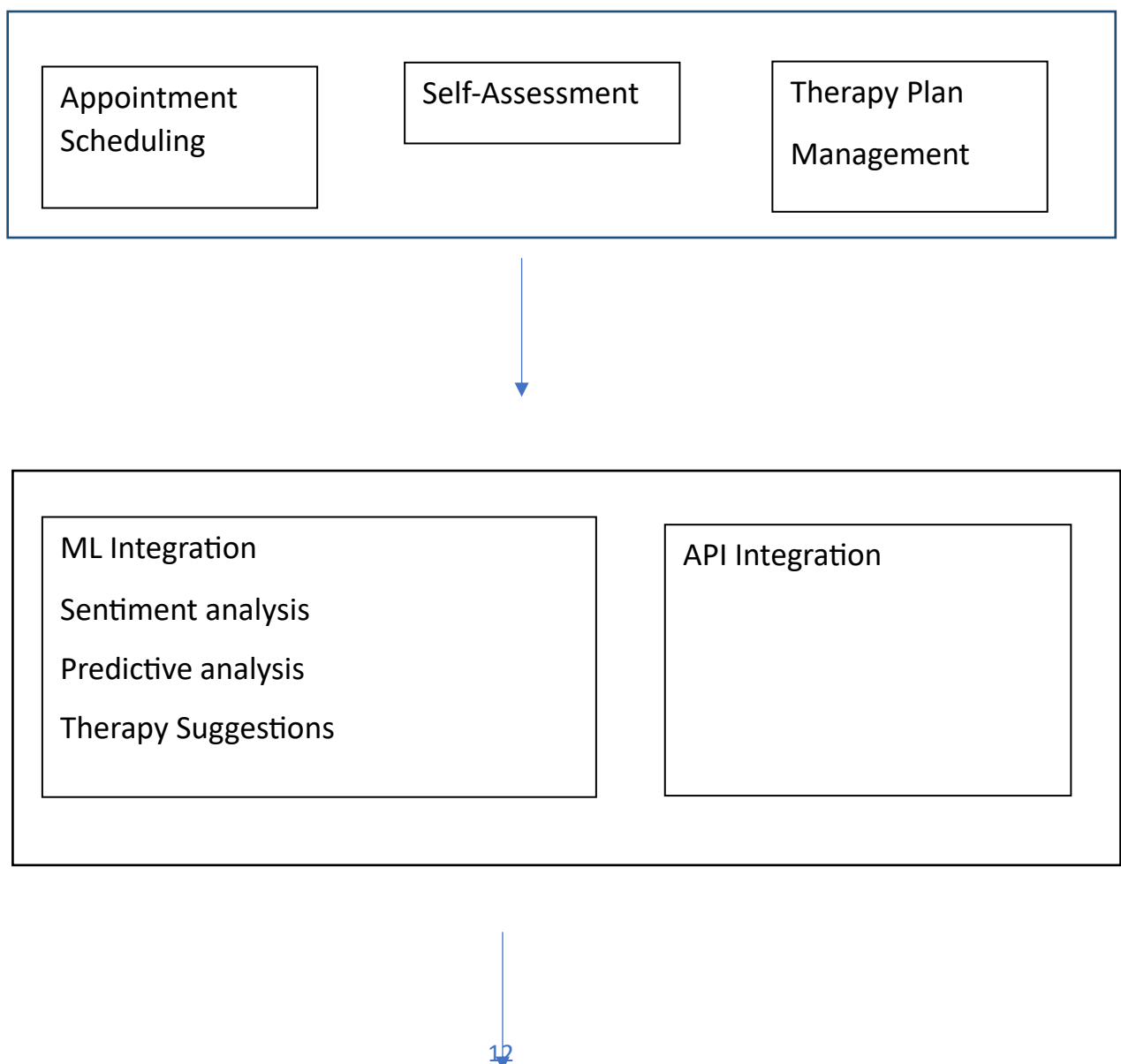Python with libraries like scikit-learn, TensorFlow, and pandas.
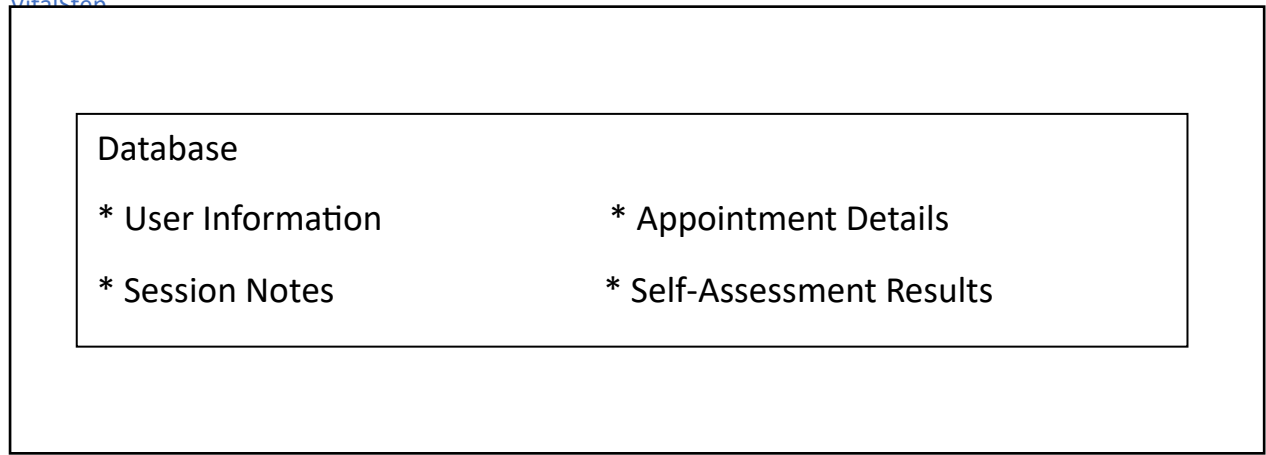
SYSTEM DESIGN AND DEVELOPMENT

3. System Architecture

3.1 System Perspective

After finalizing the gathered requirements, the system design is carried out based on the analysis and feasibility study from the earlier development phases. The following designs have been accepted as the foundation of the system. These diagrams provide a comprehensive overview of the entire VitalStep platform, including its structure, workflows, and key components, ensuring a clear understanding of how the system will be developed and function.

3.2 Architecture

```
┌─────────────────────────────────────────────────────┐
│   ┌─────────────────────────────────────────────┐   │
│   │  Database                                    │   │
│   │                                              │   │
│   │  * User Information      * Appointment Details│   │
│   │                                              │   │
│   │  * Session Notes         * Self-Assessment Results│   │
│   │                                              │   │
│   └─────────────────────────────────────────────┘   │
│                                                     │
└─────────────────────────────────────────────────────┘
```

3.2.1 Fig- Mental Health Management Platform

The above figure depicts a high-level architecture of the mental health platform. The first level contains various modules, such as user management, therapy management, and analytics, offering core functionalities to users. The middle layer, the business logic layer, acts as an interface between the top-level modules and the backend, processing user requests and managing workflows. The bottom layer comprises the backend database and external APIs, ensuring data storage, retrieval, and seamless integration for delivering accurate and efficient results.

3.3 Module Design

a. Therapy Management:

This module provides functionalities to manage therapy plans and session details. Therapists can create and update therapy plans, record session notes, and set therapy goals and recommendations. Machine learning algorithms integrated into this module analyze session notes to extract insights, identify patterns, and suggest interventions. The main complexity lies in ensuring the seamless integration of the therapy plans with the ML analysis and updating the patient's therapy progress effectively.

b. Appointment Scheduling and Management:

This module facilitates the management of appointments, allowing counsellors and patients to schedule, reschedule, and cancel sessions. The system includes features such as time slot allocation, calendar view, and reminders. The complexity of this module lies in synchronizing schedules

between counsellors and patients while integrating with external tools like Google Calendar for better accessibility.

c. Patient Information Management:

This module handles all patient-related data, including registration, therapy history, and self-assessment results. Sub-modules such as Patient Registration and Therapy Progress Tracking enable the storage and retrieval of personal and health-related data. This is a critical part of the system, as it ensures data accuracy and supports personalized therapy plans based on historical data. It also ensures patient confidentiality and compliance with data protection laws.

d. Resource Library and Notifications:

This module serves as a repository for curated educational resources, such as mental health articles, videos, and exercises. It provides users with personalized recommendations to improve mental health literacy. Notifications are sent via email and in-app alerts for upcoming sessions, missed appointments, and therapy progress updates. This module is linked to other system components to provide timely and relevant information.

3.3.1 Sub-Modules

i. Login Module:

Provides secure access to users, including counsellors and patients, with role-specific privileges. Supports multi-factor authentication for enhanced security.

ii. Chatbot:

Acts as a medium to help counsellors retrieve any guides, or ways to give advice to their patients through the interface.

iii. Text Summariser:

Allows to choose from previous session notes entered by the counsellor to summarize for easier reading.

iv. Appointment Manager:

Offers functions for scheduling, rescheduling, and cancelling appointments.

v. Reviews:

Allows patients to see the counsellors they have attended sessions with, and allows them to leave reviews.

vi. Resource Library:

Hosts curated content such as articles, exercises, and videos tailored to individual user needs. Helps in mental health literacy and provides support between therapy sessions.

vii. Counsellor Profile:

Summarises reviews left by patients about the counsellor to give a concise profile of the counsellor along with the strengths and areas of improvement.
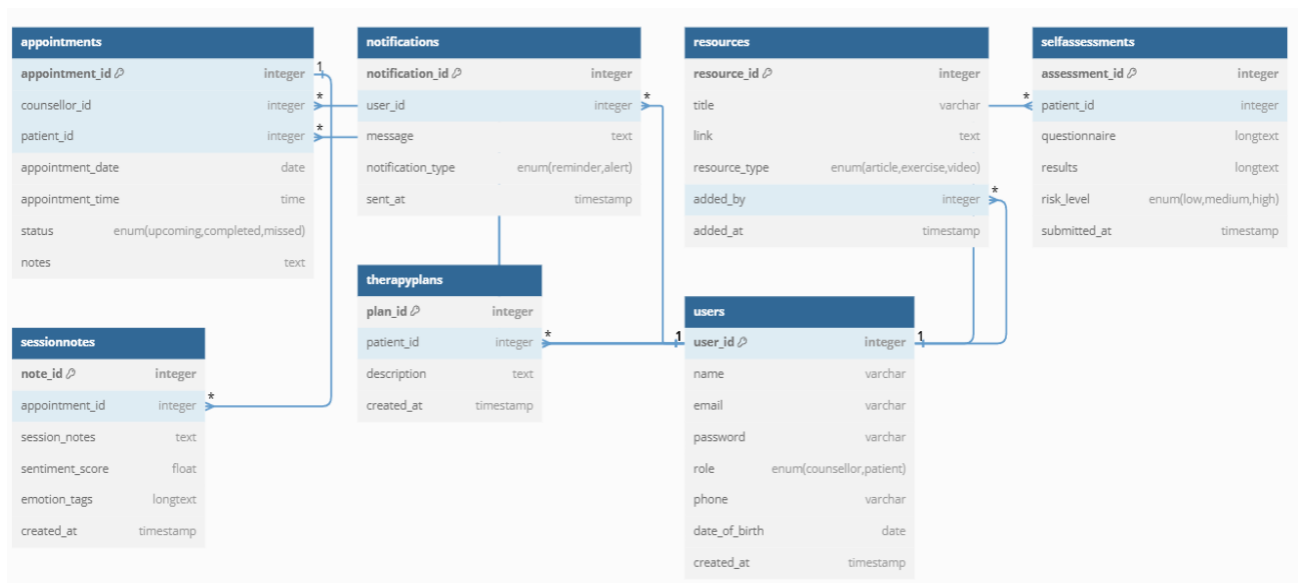
APPOINTMENTS

Field	Data Type	Length	Constraint
Appointment_id	Integer		PRIMARY KEY
title	varchar	255	NOT NULL
start	Datetime		CURRENT TIMESTAMP
status	enum		NOT NULL
notes	Text		
created_at	Timestamp		
Patient_id	Int		
User_id	int		FOREIGN KEY

RESOURCES

Field	Data Type	Length	Constraint
resource_id	Integer		PRIMARY KEY
title	varchar	255	NOT NULL
url	text		NOT NULL
Resource_type	enum		NOT NULL
created_at	timestamp		default

SESSION NOTE

Field	Data Type	Length	Constraint
note_id	Integer		PRIMARY KEY
appointment_id	integer		FOREIGN KEY
Session_notes	text		NOT NULL
Sentiment_score	float		NOT NULL
Emotion_tags	longtext		NOT NULL
created_at	timestamp		default

REVIEWS

Field	Data Type	Length	Constraint
uid	Integer		NOT NULL
cid	integer		NOT NULL
review_text	varchar		NOT NULL
rating	int		NOT NULL

USERS

Field	Data Type	Length	Constraint
id	Integer		PRIMARY KEY
First_name	varchar	255	NOT NULL
Last_name	varchar	255	NOT NULL
password	varchar	255	NOT NULL
user_type	Enum		NOT NULL
email	date		UNIQUE

3.4 Interface Design and Procedural Design

3.4.1 User Interface Design

The VitalStep Mental Health Management System is designed to cater to various healthcare roles within the mental health domain, offering specific user interfaces that allow role-based access to functionalities and tasks. This system incorporates tailored interfaces for each user group, ensuring that the user experience is streamlined for their respective duties.

a. Mental Health Professional (Counsellor/Therapist):
The counsellor or therapist is the primary user of the VitalStep system. This user accesses the system to manage patient appointments, record session notes, assess mental health, and provide therapy plans. The application enables therapists to track patient progress through session logs, access external resources, and create personalized therapy plans based on patient needs. The interface is designed to include:

- **Appointment Scheduling:** View and manage patient appointments.

- **Session Notes:** Record session notes and track the emotional sentiment of each session.

- **Therapy Plans:** Generate therapy plans based on ongoing assessments, providing the therapist with insights to guide patient treatment.

b. Patient:

Patients access the VitalStep system with limited functionality, designed to help them manage their mental health progress and interact with their therapist. The patient interface provides:

- **Reviews:** Fill out feedback about the session and counsellor they have attended with, which would be used for further analysis.

- **Counsellor Management:** View their counsellor profiles, which includes their strengths, areas of improvement and summary of all the reviews they have received.

d. External Integrations and Communication:

The VitalStep system also integrates with other healthcare applications and data sources to ensure seamless communication and efficient patient care.

i. Mental Health Data Repository:

VitalStep connects with external mental health databases to retrieve up-to-date research articles, treatment methods, and resources to support therapist decision-making. This integration helps ensure that therapists can access the latest information to guide their practice.

IMPLEMENTATION

4.1 Implementation Approach:

The implementation of VitalStep involved multiple phases, overcoming challenges in system analysis, development, and integration of various technologies. An Agile development approach was adopted to ensure continuous feedback, adaptability to changing requirements, and iterative delivery of functional modules. Rigorous testing at different development stages ensured a high-quality system, improving efficiency in managing mental health care.

The implementation followed these key stages:

Requirement Gathering & UI Development: Initial system requirements were refined, and UI architecture was designed. Forms and features were structured based on mental health professionals' needs.

Business Logic Development: Parallel to UI development, the business logic was framed for handling appointments, session notes, and assessments.

Database Integration: Patient records, appointments and session notes were stored in MySQL, ensuring seamless data management and retrieval.

Module Integration: All components (UI, logic, database) were integrated into a cohesive system.

Testing & Refinements: The system underwent multiple testing phases, including unit testing, module testing and system testing to validate functionality and ensure reliability.

4.2 Coding Standards:

VitalStep was built using a combination of frontend, backend, and database technologies:

a. Frontend (HTML, CSS, JavaScript)

- Used for designing a **user-friendly** and **responsive UI** for mental health professionals.

- Form validations and real-time updates for appointment scheduling, session notes, and self-assessments.

b. Backend (Python & Flask API)

- Python was used to handle the core business logic, including:

    - Appointment scheduling and modifications.

    - Storing and analysing session notes.

    - Managing patient self-assessments.

    - Implementing machine learning models for personalized patient insights.

- Flask API facilitates communication between the frontend and database.

c. MySQL (Database Management System)

- **VitalStep** uses MySQL for securely storing and retrieving patient records, including:

    - **Appointments** (counsellor, patient, date, time, status).

    - **Session Notes** (text notes, sentiment analysis, and emotion tags).

    - **Self-Assessments** (responses, calculated risk levels).

- Indexing and optimization ensure **fast data retrieval**.

d. Machine Learning

- NLP (Natural Language Processing) is used to analyse **session notes** and **generate counsellor profiles.**

- Machine learning models also help by summarizing selected session notes to make them shorter and easier to read when referring.

4.3 UI Features:
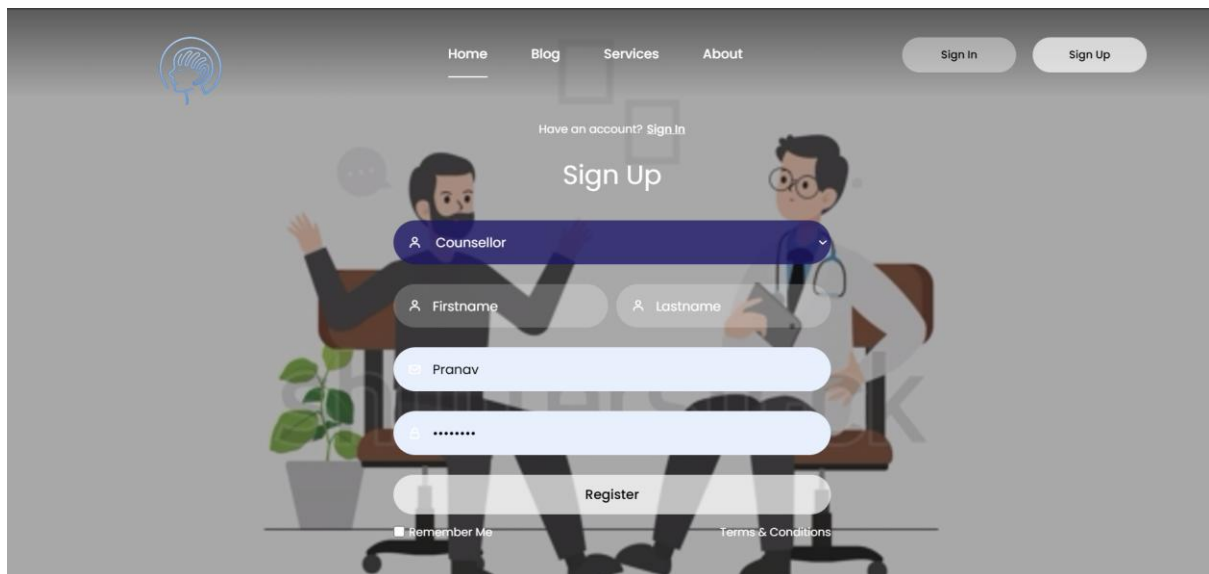
1. Landing Page- Displays the option to get started, along with links to different counselling guides.
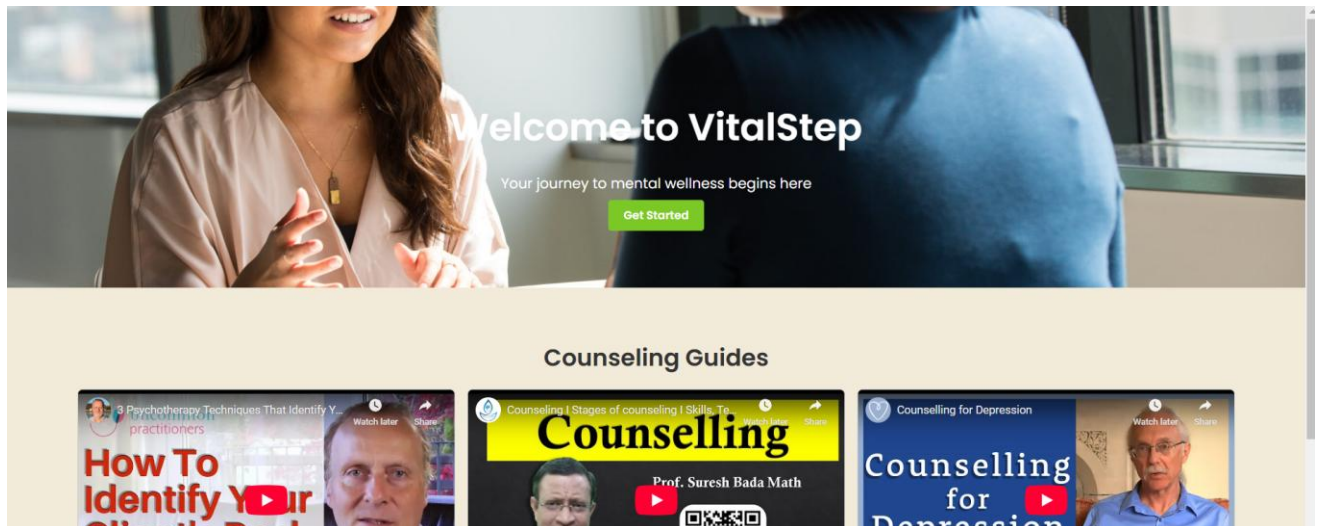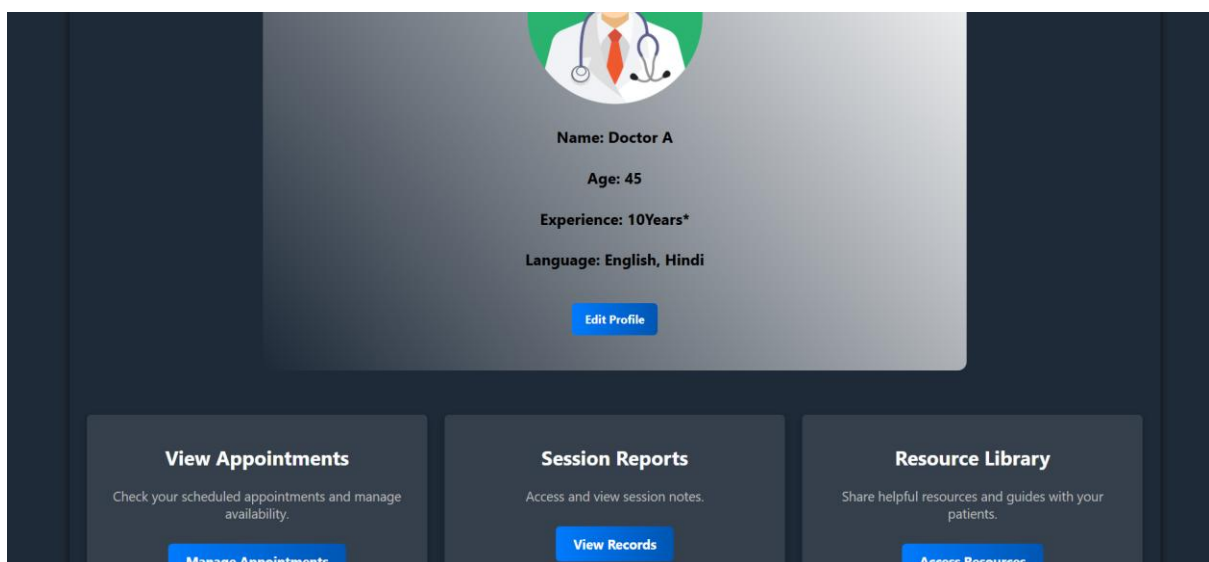
2. **Sign In –** Allows users to sign in.
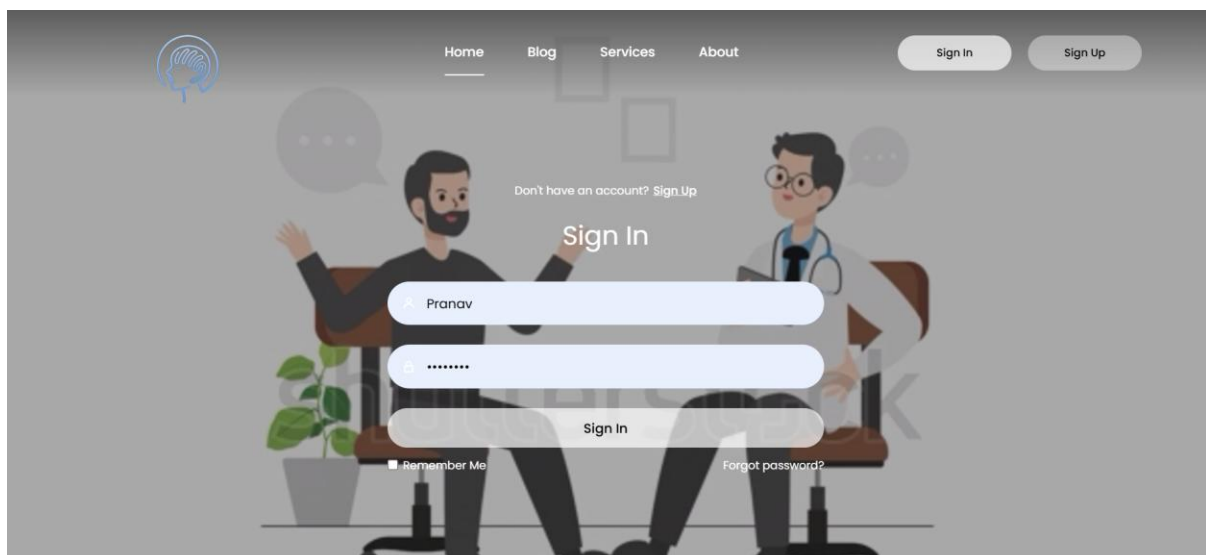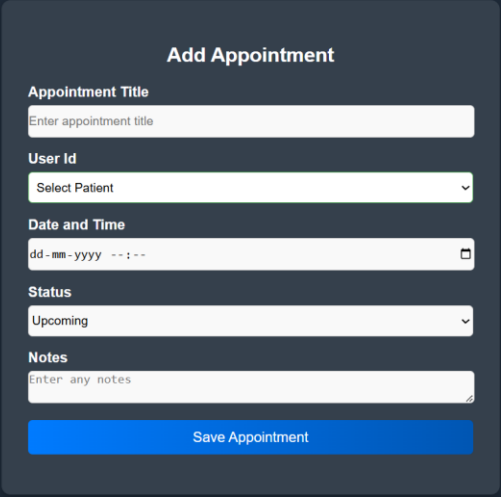
3. Sign Up Page: Allows to choose whether to sign up as a counsellor or patient.

3. **Dashboard:** The home page or dashboard displays basic details of user along with the links to features available on the website.

5. Appointments: The appointments page lets users create and edit appointments, by giving it a title, choosing its status and entering notes.
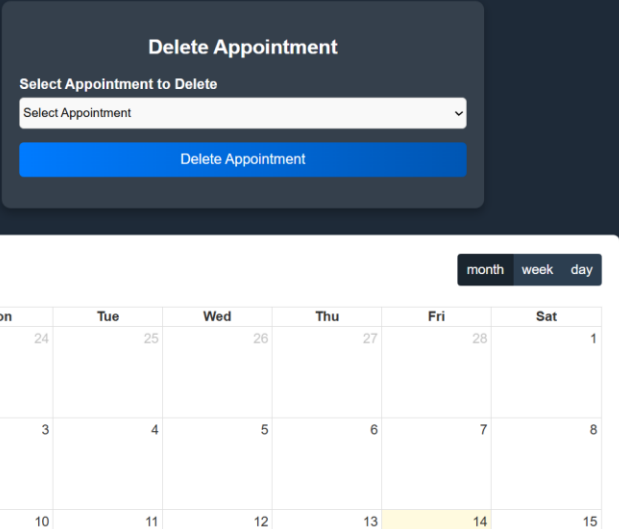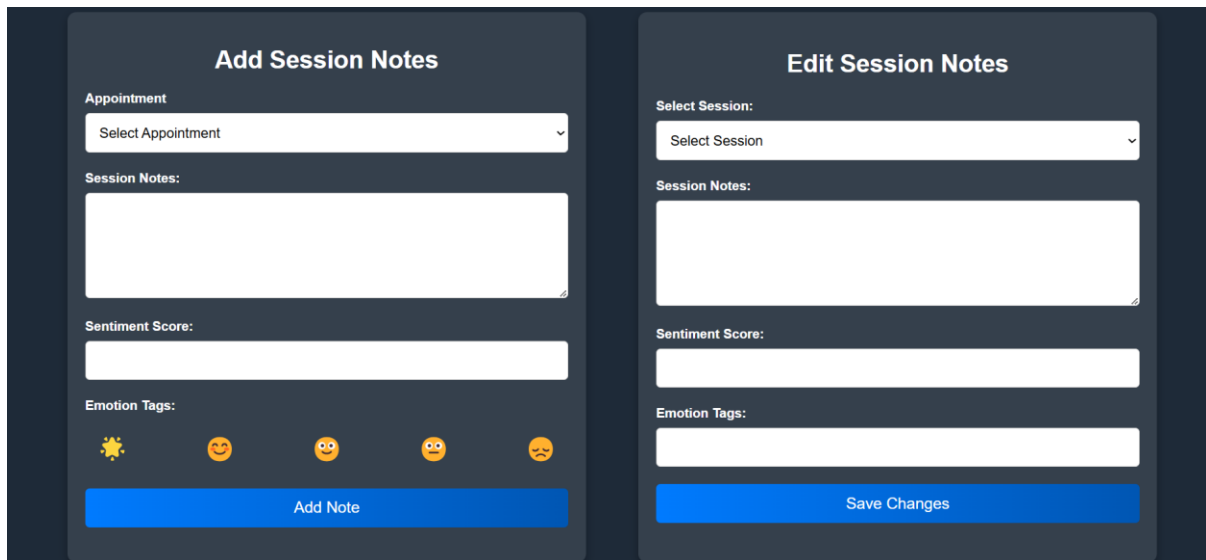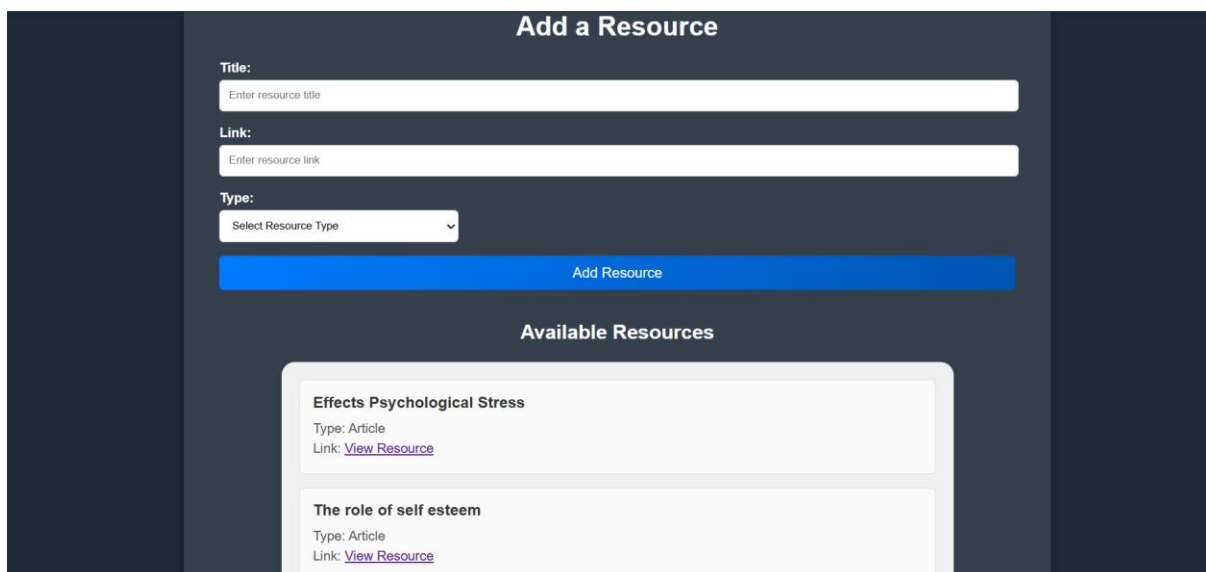
6. Session Notes: Allows to choose from the appointments created and store session notes along with it, including the emotion tags and sentiment score which can be used later for classifying sessions as good or scope for improvement.

7. Resources: Allows to add resources in the form of articles or videos so that other users can also refer to them for guidance.

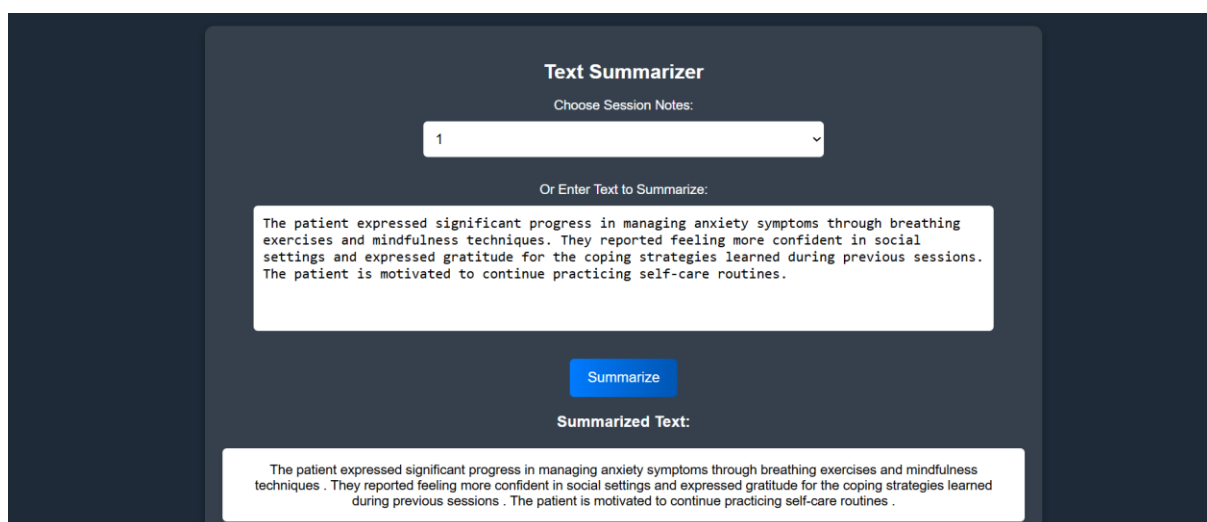**8. Chatbot:** Counsellors can interact with the chatbot to get guides, articles or quick reference.
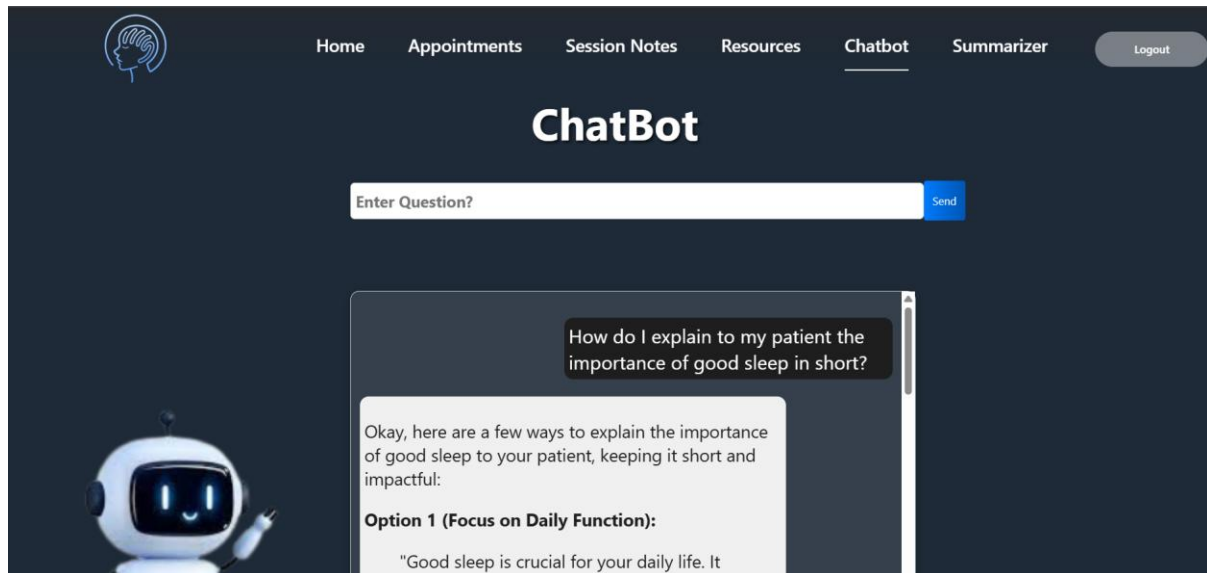

9. Summarizer: Counsellors can either choose from the already stored session notes or enter a new set of text that can be summarized, so in case they need to refer to past sessions without taking too much time they don't have to read through the entire thing.

10. Patient Home: Once patients login they are redirected here.
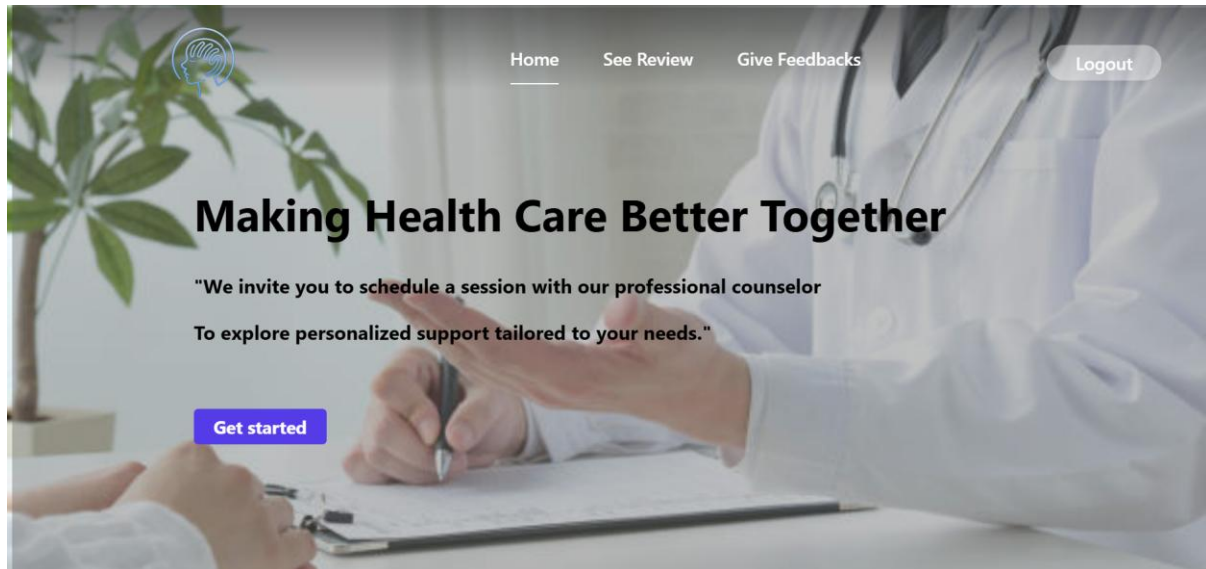
11. Feedback/ Reviews: Patients can leave reviews based on the sessions they attended with each counsellor.
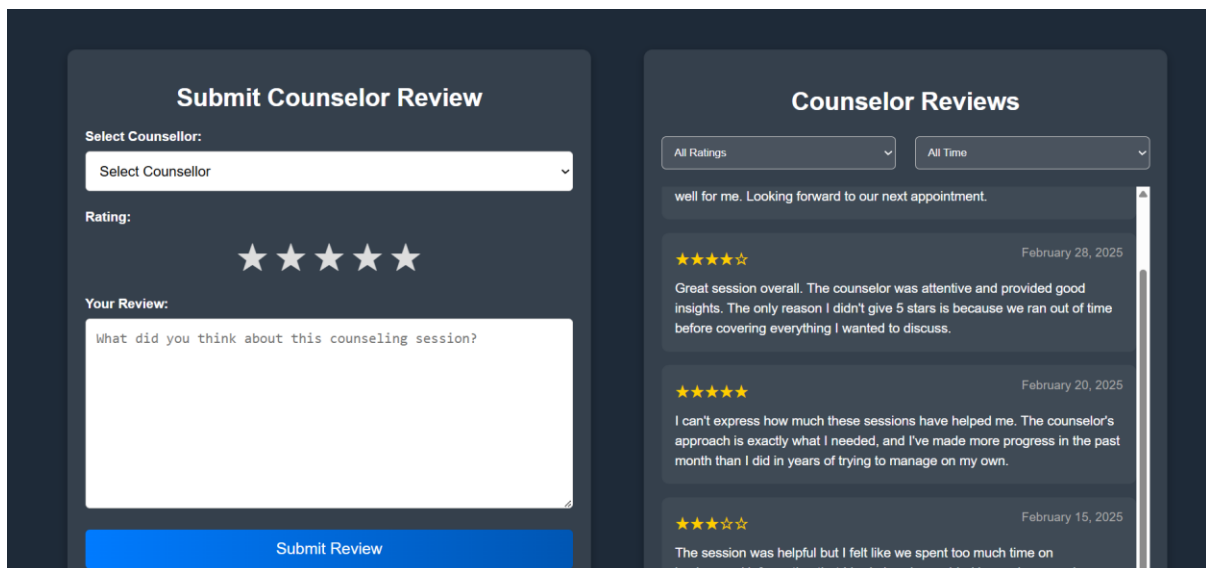
12. Counsellor Details: Reviews that patients leave on the feedback page is retrieved and Gemini summarises them to give the average rating, along with the summary of all the reviews they got and the strengths and areas of improvement are also assessed for counsellors.

See Counsellor Review

Soravich Pinrat
★ ★ ★ ★ ☆ (4.2)

Empathetic listening   insightful advice   building confidence and hope

providing helpful grounding techniques   creating a safe and understanding environment.

Soravich appears to be a highly effective counselor who is skilled at creating a supportive and understanding environment for their clients. They excel at providing insightful advice and helpful techniques. However, they could improve by being mindful of previously discussed information and tailoring their strategies to individual client needs.

Counselor Profile
Show Details

Counsellor 1
★ ★ ★ ★ ☆ (4.0)

Supportive and understanding

helpful in managing anxiety through techniques like breathing exercises

making clients feel heard and understood   providing helpful techniques.

Counsellor 1 generally receives positive feedback for their supportive and helpful techniques. The counselor is effective at helping clients manage anxiety. However, the negative review suggests a need to address potential shortcomings in

Booking Information

What to Expect

Each counseling session lasts 50 minutes. During your first session, your counselor will:

- Get to know you and your concerns
- Discuss your goals for therapy
- Begin developing a personalized treatment plan
- Answer any questions you may have

Prepare for Your Session

To make the most of your counseling session:

- Find a quiet, private space where you won't be interrupted
- Consider what you'd like to discuss or accomplish
- Be ready to share your thoughts and feelings openly
- Have a notebook handy to take notes on insights or techniques

Cancellation Policy

Counselor Profile
Hide Details

Strengths

Supportive and understanding, helpful in managing anxiety through techniques like breathing exercises, making clients feel heard and understood, providing helpful techniques.

Areas for Improvement

Addressing negative experiences (one review stated "Bad").

Overall Assessment

Counsellor 1 generally receives positive feedback for their supportive approach and helpful techniques. The counselor is effective at helping clients manage anxiety. However, the negative review suggests a need to address potential shortcomings in their approach to ensure a consistently positive experience for all clients.

TESTING

5.1 TEST PLAN

The goal of the system testing phase is to ensure that all modules and features of **VitalStep** work correctly after integration, identifying and resolving any defects before deployment.

Unit Testing	Verifies individual functions and modules work as expected.
Integration Testing	Ensures smooth interaction between different modules (e.g., login, appointments, chatbot).
Functional Testing	Checks if the system meets all functional requirements.
Usability Testing	Evaluates user experience, ensuring ease of use.
Performance Testing	Tests system response time and handling of high loads.
Security Testing	Checks vulnerabilities such as SQL injection and authentication security.

5.2 TEST CASES AND REPORTS

User Authentication:

Login (Valid): Redirects to Home Page

Login (Invalid Password): Shows "Invalid credentials"

Login (Unregistered Email): Shows "User does not exist"

Registration: Creates account & redirects to Login Page

Appointments:

Book Appointment: Saves appointment

View Appointments: Displays list correctly

Cancel Appointment: Removes appointment

Chatbot:

Valid Question: AI provides relevant answer

Feedback:

Enter Feedback: Lets user rate and enter feedback

Stores Feedback for further analysis: Analyses feedback for generating report of counsellor profile

Review System:

Submit Review: Saves review & rating

View Counsellor Score: Displays correct average rating

CONCLUSION

6.1 Design and Implementation Issues

6.1.1 Design Issues:

VitalStep was designed to be a comprehensive mental health management system, incorporating AI-driven features and multiple user roles. The primary challenge during the design phase was structuring a flexible and scalable database to handle diverse user interactions, including patients, counsellors, and administrators. Ensuring a seamless and intuitive UI/UX for both patients and professionals required iterative design refinements. Additionally, integrating AI-driven features like chatbot assistance and text summarization demanded significant computational resources, impacting early performance benchmarks.

6.1.2 Implementation Issues:

During the initial implementation, challenges included selecting the appropriate AI models for sentiment analysis and review evaluation while ensuring real-time responses. Compatibility across devices was another concern, as users access the platform via different browsers and operating systems. Managing secure authentication and access control was crucial to protect sensitive patient data, requiring robust encryption and session management mechanisms. Additionally, integrating the AI-powered chatbot (Gemini) and Counsellor profile generator required extensive testing to retrieve reviews and generate counsellor profiles and refine accuracy.

6.2 Advantages and Limitations

Advantages:

- AI-Driven Insights: Automated review analysis helps assess counsellor effectiveness and patient satisfaction.
- Session Reports & Summarization: Quick summarization of session notes saves time for professionals.
- Integrated Appointment System: Ensures structured counselling sessions with easy scheduling.

- User-Centric Design: Patients can provide feedback, and Gemini Integration helps analyse their strengths and areas of improvement so that counsellors can improve their approach accordingly.
- Security & Compliance: Patient data is securely stored, ensuring confidentiality and integrity.

Limitations:

- Limited Multi-Language Support: Currently optimized for English; expanding to other languages would enhance accessibility.
- Performance with Large Data Sets: AI-based analysis on large datasets might introduce minor latency.
- Real-Time Chatbot Accuracy: Contextual understanding in chatbot responses can be further refined.

6.3 Future Scope of the Project

VitalStep has immense potential in the mental healthcare domain. Future enhancements could include:

- Advanced AI Recommendations: AI-based counsellor-patient matching based on session history and sentiment analysis.
- Mobile App Integration: A dedicated mobile app for easier access to counselling sessions and appointment bookings.
- Predictive Analytics for Mental Health Trends: Identifying patterns in patient well-being over time for preventive measures.

6.4 References

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