

# Development of an AI-Powered Mood-Tracking Application for Personalized Mental Health Support

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**Abstract**—This proposal outlines the development of a comprehensive mood-tracking application that leverages AI to provide personalized mental health support. The app will enable users to log their moods, visualize mood trends, receive AI-driven chat support, and access local mental health resources. By offering in-depth mood analysis, personalized AI chat support, and integration with local resources, this app aims to enhance self-awareness, provide timely support, and improve access to mental health care.

**Index Terms**—Mental health, mood tracking, AI-driven support, personalized recommendations, mobile application, mental health resources, user engagement

## I. INTRODUCTION

### A. Problem Statement

In today's fast-paced and highly stressful world, maintaining mental well-being is becoming increasingly difficult. Many individuals struggle with monitoring their emotional health and often do not have immediate access to support when they need it most. Traditional mental health resources, such as therapy or counseling, are not always accessible or personalized enough to meet the unique needs of each individual. This gap in support can lead to prolonged periods of stress, anxiety, and other negative emotional states, ultimately affecting the overall quality of life.

### B. Importance

Addressing mental health is crucial because it impacts every aspect of a person's life, including their physical health, productivity, and interpersonal relationships. Mental health issues can lead to serious consequences if not managed properly, including chronic health conditions, reduced quality of life, and even suicidal tendencies[1]. Therefore, providing accessible and personalized mental health support is essential in promoting overall well-being and preventing more severe mental health issues.

### C. Challenges

Developing an effective mental health support application presents several challenges:

1) *Privacy and Security*: Ensuring user data is protected and handled with utmost confidentiality is critical.

2) *Accurate Emotional Analysis*: Accurately interpreting user inputs and analyzing emotional states require advanced natural language processing and machine learning techniques.

3) *User Engagement*: Creating an engaging and user-friendly interface that encourages regular use can be difficult.

4) *Personalization*: Providing truly personalized recommendations and support based on individual user data is complex.

5) *Accessibility*: Ensuring the application is accessible to a wide range of users with varying levels of technological proficiency.

### D. Solution

To address these challenges, we propose developing a comprehensive mood-tracking application that leverages AI to provide personalized mental health support. The application will allow users to log their moods, visualize mood trends, receive AI-driven chat support, and access local mental health resources. The AI component will use OpenAI's API for chat support, specifically leveraging Natural Language Processing (NLP) models like GPT (Generative Pre-trained Transformer). This technology will enable the chat assistant to mimic a supportive friend, providing empathetic and context-aware responses based on the user's input. The advanced NLP capabilities of GPT will allow for accurate emotional analysis and personalized suggestions, enhancing the overall user experience and effectiveness of the support provided.

### E. Users and Benefits

1) *Users*: The primary users of this application are individuals who seek to better understand and manage their emotional well-being. This includes:

- General Public (especially Vancouverites): Anyone interested in tracking and improving their mental health.
- Individuals with Mental Health Concerns: People experiencing stress, anxiety, depression, or other mental

health issues who need a convenient way to monitor their emotions and receive support.

- **Healthcare Providers:** Professionals who can use the app to better understand their patients' emotional states and provide more informed care.

2) *Benefits:* The benefits of this application include:

- **Enhanced Self-Awareness:** Users gain insights into their emotional patterns and triggers, helping them manage their mental health more effectively.
- **Timely Support:** The AI-driven chat function provides immediate, personalized support during times of emotional distress.
- **Personalized Recommendations:** Tailored advice and activities help users cope with negative emotions and promote positive mental health practices.
- **Improved Access to Mental Health Resources:** The app offers a convenient and accessible way for users to receive mental health support without the barriers associated with traditional therapy or counseling.

## II. RELATED WORK

### A. Existing Solutions

As mental health awareness increases, mood and mental health monitoring technology has developed significantly in recent years. Among them, Apple's "Apple Health(Mindfulness and Mood Tracking)" and Roble Ridge software's "Moodfit" are two eye-catching examples on the market.

1) *Apple Health (Mindfulness and Mood Tracking):* Apple Health provides a comprehensive platform for health tracking, including a feature for logging and tracking mood and mindfulness activities. Users can record their emotional state and engage in mindfulness practices through integrated apps like Breathe. It offers mood tracking, mindfulness exercises, integration with other health metrics, data visualization, and personalized insights. Although Apple Health's mood tracking features are relatively basic, focusing on self-reporting without advanced AI-driven insights or personalized mental health support. It lacks interactive chat support and detailed analysis of emotional patterns over time.

2) *Moodfit:* Moodfit is designed to help users improve their mood and overall mental health, offering tools and insights based on Cognitive Behavioral Therapy (CBT), gratitude journaling, and other therapeutic techniques. It includes mood tracking, gratitude journal, CBT-based exercises, mental health assessments, reminders, and progress reports. While Moodfit incorporates therapeutic techniques and provides detailed insights, it does not include AI-driven interactive support or personalized suggestions based on continuous mood analysis. The focus is more on self-help tools rather than interactive engagement.

### B. Comparison

By incorporating following features, our approach aims to offer a more comprehensive, personalized, and engaging solution to the challenge of managing mental well-being compared to existing options:

#### 1) *AI-Driven Mood Analysis:*

- **Existing Solutions:** Most existing apps rely on user inputs and basic data visualization without advanced analysis.
- **Our Approach:** Our application will leverage AI to provide in-depth analysis of mood patterns, offering personalized insights and identifying trends that may not be obvious from simple mood logs. This advanced analysis will help users understand the underlying factors influencing their emotions.

#### 2) *Personalized AI Chat Support:*

- **Existing Solutions:** Current mood tracking apps typically do not include interactive chat features, especially those driven by AI to provide empathetic and context-aware support.
- **Our Approach:** Our app will include an AI chat assistant that mimics a supportive friend, providing timely and personalized support when users are experiencing prolonged negative emotions. This feature enhances user engagement and offers a proactive approach to mental health support.

#### 3) *Integration of Local Mental Health Resources:*

- **Existing Solutions:** Most mood tracking apps do not integrate local mental health resources or provide easy access to additional support beyond the app itself.
- **Our Approach:** Our application will integrate a searchable database of local mental health resources (e.g., from HealthLink BC), ensuring that users can easily find and access external support when needed. This feature bridges the gap between self-help and professional help, making the app a more comprehensive mental health tool.

#### 4) *User Engagement and Motivation:*

- **Existing Solutions:** Many mood tracking apps struggle with maintaining user engagement over time, which can reduce their effectiveness.
- **Our Approach:** Our app will use a combination of reminders, notifications, and AI-driven interactions to keep users engaged. Regular prompts to log moods, along with positive affirmations and interactive chat support, will help users maintain a consistent habit of tracking their mental health.

## III. APPROACH

### A. Solution Strategy

Our solution strategy involves leveraging AI to provide personalized mental health support through a mobile application. By integrating AI-driven mood analysis, chat assistant therapy support, and local resources, we aim to create a comprehensive platform to help Vancouverites manage their mental well-being. We will use scrum to iterative development process and enhance the app's features.

### B. Product Description

We will build a native application that offers:

1) *Mood Logging:* Users can log their moods, emotions, scenarios, and notes.

2) *Mood History and Visualization*: Calendar and statistical views to track mood trends over time.

3) *AI Chat Assistant*: Provides personalized suggestions based on mood patterns.

4) *Reminders and Notifications*: Regular prompts to log mood and display affirmations.

5) *Local Mental Health Resources*: Searchable database of categorized resources from HealthLink BC.

### C. Software Architecture

1) *Frontend*: Built with React Native for a responsive, interactive and composable user interface. Besides that, it leverages web technology for faster native development.

2) *Backend*: Express.js for handling API requests, push notification and server-side logic.

3) *Database*: Postgres for storing user data, mood logs, and resource information.

4) *AI Component*: Fine-tune OpenAI model with data collected and call it to chat with users.

### D. Algorithms

- For the notification pushing, we need to use exponential backoff for retrying.
- For frontend fetching, we need to cache smartly to avoid wasting users' bandwidth and to deliver a better user experience

### E. Implementation

For the implementation of our solution, we will start by setting up and configuring the project environment. We will initialize the React Native project using Expo to facilitate a streamlined development process. Concurrently, the Express.js backend environment development environment will be set up locally with docker-compose. The Postgres database will be configured and connected to the backend for efficient data management.

On the frontend, we will design and implement UI components using Tamagui, ensuring a cohesive and responsive user experience. Key screens for mood logging, mood history, AI chat assistant, and resource search will be developed. To optimize data fetching and caching, we will integrate @tanstack/react-query, while user inputs will be validated using Zod. To let user chat with AI assistant, we will call OpenAI's chat endpoint <https://api.openai.com/v1/chat/completions> to interact with user.

The backend development will involve creating API endpoints with Express.js to handle user data, mood logs, and resource information. User authentication will be managed using Lucia, and database schemas and queries will be constructed with Kysely to leverage Postgres full-text search capabilities. Server activities will be logged with @soapbox/stickynotes, and API requests and responses will be validated using Zod.

Testing and deployment will involve unit and integration testing for both frontend and backend components. The backend will be deployed on a cloud VPS. Finally, the mobile application will be launched on Android and iOS platforms.

### F. Hardware

1) *Frontend*: Average spec mobile phones since most of the functionalities involves fetch data from server, or calls third party API.

2) *Backend*: Cloud VPS with sufficient cpu power and memory for hosting with S3-compatible storage for persistent storage

### G. Operating System

1) *Frontend*: Android and iOS

2) *Backend*: Ubuntu for its robustness, security, and widespread use in server deployments.

### H. Programming Language

Typescript for more robust typing system comparing to javascript

### I. Libraries

1) *Frontend*:

- tamagui for UI component
- expo for its ecosystem and native plugins
- zod for input validation
- @tanstack/react-query for caching fetch results

2) *Backend*:

- kysely for query builder. Because there is possibly a need to use Postgres' full text search extension, and orms cannot provide similar extend of flexibility
- lucia for authentication
- @soapbox/stickynotes for logging
- zod for schema validation

## IV. DELIVERABLES

### A. Week1

- Task 1.1: Set up version control system
- Task 1.2: Install necessary development tools (e.g. expo, npm, Node.js, docker files)
- Task 1.3: Create initial UI wireframes for main screens (login, mood logging, calendar)
- Task 1.4: Define database schema for user data, mood logs, and resources

### B. Week2

- Task 2.1: Develop frontend for basic mood logging
- Task 2.2: Set up backend API endpoint for saving mood logs
- Task 2.3: Connect frontend mood logging form to backend API
- Task 2.4: Implement basic validation for mood logging input

### C. Week3

- Task 3.1: Implement scenario selection related to emotions
- Task 3.2: Implement notes addition feature
- Task 3.3: Implement basic authentication system (user registration and login)
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#### D. Week4

- Task 4.1: Implement calendar view for mood entries
- Task 4.2: Create backend API to fetch mood logs for a specific user
- Task 4.3: Connect calendar view to backend API to display mood entries

#### E. Week5

- Task 5.1: Set up integration with OpenAI API (configure API keys, test connection)
- Task 5.2: Develop backend logic to send mood data to OpenAI API
- Task 5.3: Make AI output better through prompt engineering before trying fine tuning

#### F. Week6

- Task 6.1: Create frontend component for AI chat assistant
- Task 6.2: Display AI-generated affirmation on the frontend
- Task 6.3: Implement reminders system (backend logic)
- Task 6.4: Develop frontend for displaying notifications to users

#### G. Week7

- Task 7.1: Integrate HealthLink BC resources into database
- Task 7.2: Develop backend API to query local mental health resources
- Task 7.3: Create frontend search component for resources
- Task 7.4: Implement resource categorization and display on frontend

#### H. Week8

- Task 8.1: Conduct unit testing for all implemented features (mood logging, history, AI assistant, notifications, resources)
- Task 8.2: Perform integration testing to ensure components work together smoothly
- Task 8.3: Fix identified bugs from testing

#### I. Week9

- Task 9.1: Make final refinements based on testing
- Task 9.2: Prepare comprehensive documentation
- Task 9.3: Build and test the production build of the app
- Task 9.4: Deploy the backend to production
- Task 9.5: Prepare and deliver final project presentation and report submission

### V. EVALUATION

#### A. Success Definition

Success for our project will be defined by our team's ability to build the mood-tracking application within the given time frame, incorporating the planned features such as AI-driven mood analysis and chat support. As a learning project, success will also be measured by the skills and knowledge we gain in mobile app development and AI integration.

#### B. Success Measurement

To measure the success of our project, we will consider:

- Completion of Key Features: Whether we have successfully implemented the core functionalities as planned.
- Learning Outcomes: Each team member's understanding and application of React Native and AI technologies, assessed through self-assessments.

### VI. RISKS

#### A. Potential Issues

- Inexperience: Our lack of experience in mobile app development and AI integration could lead to delays and challenges in implementing the planned features.
- Project Management and Coordination: Balancing project work with other academic responsibilities may affect our project timeline and quality.
- Technical Overreach: Attempting to implement advanced features without foundational skills might lead to incomplete or buggy features.

#### B. Mitigation Strategies

- Learning Encouragement and Resources Sharing: Team members will independently study React Native and AI principles. Insights, useful findings, and learning resources can be shared in our WeChat group chat or Discord server, allowing everyone to benefit from individual discoveries and fostering a collaborative learning environment.
- Collaborative Problem Solving: When facing significant challenges or decisions, we will use our group chat or Discord server for helping each other, brainstorming, and problem-solving. Each team member can ask for help, as well as contribute ideas and solutions.
- Simplified Initial Version: Start with a basic version of the application that includes core features, then gradually add more complex functionalities.

#### C. Contingency Plans

- Scope Reduction: If certain features are too complex to implement within the timeline, prioritize core functionalities over advanced features.
- Flexibility in Planning: Be prepared to adjust the project timeline and goals based on our learning pace and available resources.

### VII. CONCLUSION

In this project proposal, we outlined our plan to develop a mood-tracking application primarily as a vehicle for learning mobile app development and exploring AI integration. Although we are beginners in these technologies, our project is structured to support our learning journey through practical application. The experience gained will be invaluable, not only in understanding app development but also in managing a real-world project within an academic setting. We look forward to overcoming the challenges and delivering a functional prototype that meets our educational objectives.

## REFERENCES

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