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# AI Mood Tracking Application

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**Abstract**

Journaling is an activity that allows users to record events, feelings, and thoughts throughout the day. This aids meditation and self-discovery by allowing users to solidify their thoughts in the journaling media. However, journaling is not widespread as it is seen as unengaging, inconvenient to think and write, and ineffective at improving their day-to-day. The project aims to create a mobile AI Mood Tracking Application that uses sentiment analysis AI to determine the user's mood based on their journal entry. The application also provides reflection prompts and guided solutions to handle the mood detected. It also allows students to communicate with their corresponding counselors to create user interaction engagement. The application interface uses Flutter, while the back end uses Firebase. The AI model is trained using the GoEmotions dataset. The Agile Development Model divides the development into the planning, design, development, testing, deployment, review, and launch phases. The project is a step towards creating a practical journaling application for the mental-health-conscious modern generation. Future research can be done to perform testing and refinement of the application to increase the impact and acceptance among users. Further fine-tuning the AI Mood Tracking Application can adapt to be an effective tool that induces profound personal development in the user via deep and effective journaling, analysis, and reflection.

## 1. Introduction

A journal is a tool used to record daily events and experiences. One instrument for keeping track of everyday experiences and incidents is a journal [1]. Journaling enables people to precisely review written records in the past, as opposed to depending just on memory. Journals give a trustworthy narrative of the past by recording things in writing [2]. Going over these notes again improves introspection, self-awareness, and mental structuring. Maintaining a journal can help with self-awareness, organizing ideas, and recording notes and reminders, among other useful functions [3]. In general, diaries encourage introspection and personal development. Journals allow one to look back accurately on written records instead of relying on one's own memory. This aspect allows it to have many practical uses in deep reflection. For example, one may discover and understand oneself; write notes, reminders, and life lessons for oneself; put one's thoughts in order and many more.

Writing a journal has several advantages for college students. It elevates emotional health by lowering stress and elevating happiness. Students can evaluate their learning process and make necessary adjustments for improved performance through academic reflection [4]. Additionally, journaling fosters self-awareness, personal

development, and the improvement of analytical and problem-solving abilities. It enhances one's capacity for communication, writing, and self-expression. Journaling also promotes self-accountability and acts as a record of significant events encountered while in college [5]. All things considered, journal writing is an important habit that promotes kids' overall growth and academic achievement.

Most university students do not have the habit of using journals. Even if they do, they will only write about their day down in a physical notebook. These books are not effective for the reasons below. The first problem is the reluctance of using journals among students. This occurs because students find journal writing to be not engaging. The second problem is that the act of journaling takes time. This occurs because writing a journal entry and labelling one's own emotions manually takes more time on a physical medium such as a book. The third problem is that students are not able to benefit from journal writing. This is because they are unlikely to be guided to perform structured retrospection and reflection after writing.

To handle this issue the application aims to use predictive AI, graphics, and other assets to attract and engage users. This project develops an AI mood tracking and journaling system using a mobile-based approach. The application also aims to provide a digital medium for writing and an automated emotions labelling done by AI for increased convenience. Aside from that, the application also aims to have features to point users in the right direction of retrospection and reflection. The app is expected to provide an engaging platform for users to journal and write journal entries for the sake of retrospection. The act of journaling and retrospection offered by this platform is then expected to promote an improvement in terms of performance, mental health, and behavior.

This article consists of five parts. The first part explains the background of the project. The second section summarizes the literature review. The third part describes the project methodology and the findings from the system analysis and design is given in the fourth part. Section 5 demonstrates the implementation and testing of the system. The final section summarizes the project.

## 2. Literature Review

The domain of the case study will be journaling systems. Users using journaling systems will write events, thoughts, and emotions on a physical or digital medium. The act of journaling helps put one's thoughts in order [6] by aiding the user to explain events in a chronological order. People keep journals as a private writing tool to document their everyday experiences, ideas, feelings, and incidents. It acts as a written biography, offering a place to record and keep recollections, insights, and introspection. People who keep a journal regularly provide a written account of their lives that they may review and consider later.

The AI Mood Tracking Application is crucial for raising user engagement and journaling experiences. It makes use of Firebase for mobile back-end services [7], Flutter for cross-platform mobile development [8], and Projection Attention Networks for Document Classification [9], an on-device AI model. With a small model size, these technologies provide effective development, account management, data storage, authentication, and precise document classification.

The fourth technology that will be used is the GoEmotions Dataset. This is because this dataset has a large collection of 58 thousand user sentences from Reddit labelled with corresponding 28 emotions which are suitable for sentiment analysis as shown in **Figure 1** [10]. Flutter and Firebase will be used to develop the front-end and back-end of the AI Mood Tracking Application respectively. The PRADO AI Model will act as the Neural Network for Natural Language Processing of user journal entries. The GoEmotions dataset will be used to train the PRADO AI Model to classify entries into 28 emotions.

| Positive | | Negative | | Ambiguous |
|---|---|---|---|---|
| admiration 👏 | joy 😃 | anger 😡 | grief 😢 | confusion 😕 |
| amusement 😂 | love ❤️ | annoyance 😒 | nervousness 😬 | curiosity 🤔 |
| approval 👍 | optimism 🤞 | disappointment | remorse 😔 | realization 💡 |
| caring 🤗 | pride 😌 | disapproval 👎 | sadness 😞 | surprise 😲 |
| desire 😍 | relief 😅 | disgust 🤮 | | |
| excitement 🤩 | | embarrassment 😳 | | |
| gratitude 🙏 | | fear 😨 | | |

**Fig. 1** *Emotions Covered by GoEmotions*

Existing related systems have also been studied to identify their functions and features. These functions will then be related, adapted, and improved to the AI Mood Tracking Application. This allows the AI Mood Tracking Application to obtain the advantages of all the related systems for the niche of journaling and reflection. The analysis of other systems allows us to determine the competitive advantage of the AI Mood Tracking Application

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to be adapted to materials such as Battlecards and Company Profiles which are effective materials for sales personnel to address other competitive systems if the system were to be marketed to a wider audience [11]. One physical manual system and two digital mobile application-based systems have been examined to obtain more useful information for the proposed system development. The systems studied were Physical Manual Journaling, Samsung Calendar Application, and Moodtrack Social Diary.

A simple type of journaling is called physical manual journaling, in which events are written down on tangible materials. It enables users to journal expressively, producing meaning and knowledge in addition to writing information. Users can create and save digital entries using the AI Mood Tracking Application, which has characteristics akin to those of a real diary. For organising and viewing schedules and activities, the Samsung Calendar Application provides a practical calendar user interface (UI) [12]. This user interface offers a comprehensive view of previous emotions and diary entries, and it may be customized for the AI Mood Tracking Application. With Moodtrack Social Diary, users can anonymously communicate, track and analyse their moods, and receive reflection prompts [13]. By including reflection prompts from multiple sources and employing sentiment analysis AI for mood tracking, the AI Mood Tracking Application modifies these aspects. Counsellors and users can communicate while protecting the privacy and comfort of the users [14]. Features including account administration, calendar UI, expressive journaling, mood prediction AI model, reflection and solutions, lists and reminders, account analysis, and communication are all included in the suggested AI Mood Tracking Application. With the goal of assisting users in controlling their emotions, these elements encourage journaling, introspection, self-awareness, and conversation.

The features that are relevant in the comparison between the 3 competing systems with the AI Mood Tracking Application are Account management, calendar user interface, expressive journaling, mood prediction AI model, reflection and solutions, reminders and lists, account management and analysis and communication. **Table 1** shows the comparison of features between the 4 systems.

**Table 1** *System's Comparison*

| Features / System | Physical Manual Journaling | Samsung Calendar Application | Moodtrack Social Diary | AI Mood Tracking Application |
|---|---|---|---|---|
| Account management | X | √ | √ (Anonymous Accounts) | √ (Managed by admin / Counsellor) |
| Calendar UI | √ (Only the date is written) | √ | √ (Only the date is written) | √ |
| Expressive Journaling | √ | X | √ | √ |
| Mood prediction AI model | X | X | √ (Allows user to track own mood without AI prediction) | √ |
| Reflection and solutions | √ (only if user is aware to reflect) | X | X | √ |
| Reminders and List | √ (only if user wishes to create a list) | √ (As a to-do list, not reminder for good habits that aid mental health) | X | √ |
| Account Analysis | X | √ (For scheduling but not mood analysis) | √ | √ |
| Communication | X | X | √ (With other anonymous users) | √ (With counsellor in charge) |

## 3. Methodology

The AI Mood Tracking application will be developed according to the Agile Model. **Figure 2** shows this method. It is advised over immediate full-scale implementation. This is because this form of iterative and interactive method allows the developer to have an improved understanding of the final product before the actual implementation and launch [15].

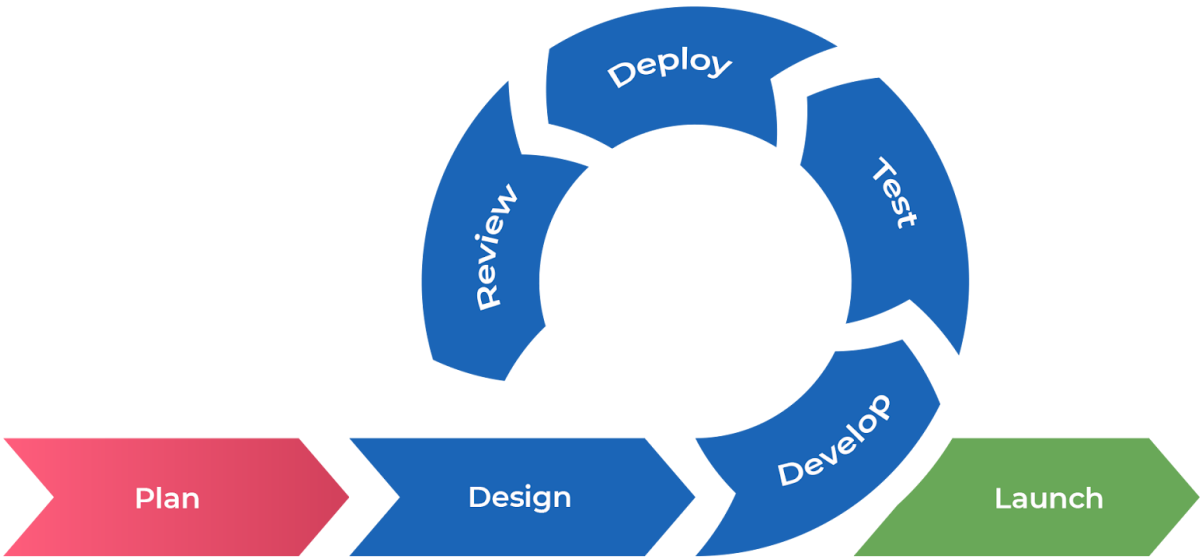


**Fig. 2** *Phases in Agile Model*

**Table 2** includes the system development workflow in the form of a table across the project's duration. **Appendix A** shows the Gantt Chart for the project plan. The project started on 8th October 2023 and is planned to end on 15th July 2024.

**Table 2** *System Development Workflow*

| No | Phases | Task | Duration (weeks) | Milestone |
|---|---|---|---|---|
| 1.0 | Planning | Write proposal<br>Create plan for activities<br>Determine requirements | 2 | UML Diagram<br>Activity Diagram |
| 2.0 | System Design | Design system modules<br>Design interaction between modules | 3 | System Architecture<br>Database Schema<br>UI Wireframe |
| 3.0 | Develop | Develop the initial functional prototype | 16 | Prototype of system |
| 4.0 | Testing | Unit, Integration and usability testing | 4 | Tested and functional prototype |
| 5.0 | Deploy | Test the system on portion of target audience<br>Send out feedback forms | 4 | Feedback report |
| 6.0 | Review | Identify improvements and solutions | 2 | List of improvements |
| 7.0 | Launch | Improve the prototype based on improvements<br>Complete report of project<br>Deploy the final system | 5 | Final deployable system<br>Complete final year project report |

## 4. Analysis and Design

This section describes the results of the analysis and design phase of the development of the AI Mood Tracking Application.

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## 4.1 System Requirement Analysis

The purpose of analysis is to determine the requirements for the application. There are five types of requirements, namely the functional, non-functional, hardware, software, and user requirements. Functional Requirements describe the system's behavior, services, and tasks that it performs [16].

**Table 3** *Functional Requirements of the AI Mood Tracking Application*

| Requirements | Function | User |
|---|---|---|
| 1. Calendar | • Allow users to view dates on the calendar.<br>• Allow users to write, view and edit journal entries for each date | User |
| 2. AI Model | • Allows user to see predicted mood based on journal entry. | User |
| 3. Reflection and Solutions | • Allows user to reflect on causes for emotion.<br>• Provides advice, aid and solutions to their specific situation. | User |
| 4. Reminders and List | • Allow user to add, remove and view list of methods entered via question prompts | User |
| 5. Account Management and Analysis | • Allows users and admin to create and modify account details.<br>• Allows users and admin to analyze user moods. | User and Admin |
| 6. Communication | • Allows users and admin to exchange messages for a specific day. | User and Admin |
| 7. User Management | • Admin will receive notification if a user under them has journaled.<br>• Allows admin to message and analyze multiple users. | Admin |

For the AI Mood Tracking Application, the admin will be an advisor in charge of the student such as a counsellor while the user will be the students themselves. The functional requirements is in **Table 3**. Non-functional requirements, as shown in **Table 4**, describe quality attributes of the system unlike functional requirements that describe what the system performs [17].

Table 4.2: Functional Requirements of the AI Mood Tracking Application

| Requirements | Descriptions |
|---|---|
| 1. Operational | • The system should work on mobile device of the Android platform |
| 2. Performance | • The system should be accessible at all times with internet access.<br>• The system should respond to any actions within 1 minute |
| 3. Security | • The system should allow users to access their own account.<br>• The system should keep journal entries of the users private |
| 4. Cultural and Political | • The system should facilitate student user and counsellor interaction |

User requirements are expectations of a user towards the introduction of a new system [18]. These expectations determine the features and capabilities of the system from the point of view of the user.

Table 4.3: User Requirements of the AI Mood Tracking Application

| No | User Requirements |
|---|---|
| 1 | The user should be able to enter their diary entries for each date |
| 2 | The user should be able to receive insights of their emotions based on their journal entry from the system |
| 3 | The user should be able to receive guidance for reflection and solution advice based on their emotions. |
| 4 | The user should be able to store important realizations acquired during reflection as a list of reminders. |
| 5 | The user should be able to view their past journal entries, insights, and reflections. |
| 6 | The user should be able to contact their assigned administrator and vice versa. |
| 7 | The user and administrator should be allowed to view analytical reports of their past emotions and moods. |
| 8 | The administrator should be able to manage user accounts under them. |

Software and hardware requirements determine the required components to support the execution of the AI Mood Tracking Application.

Table 4.4: Software Requirements of the AI Mood Tracking Application

| No | Software | Type | Functionality |
|---|---|---|---|
| 1 | Android SDK 24 | Operating System | Operating System to run the mobile application |
| 2 | Firebase | Backend Cloud Computing | Provide user authentication and data storage |

| | | | |
|---|---|---|---|
| | | Service | functionality |
| 3 | Visual Paradigm | Design tool | Aid in Activity Diagram |
| 4 | Drawio | Design tool | Aid in Unified Modeling Language Diagram |
| 5 | Coolours | Design tool | Aid in color selection |
| 6 | Visual Studio Code | Integrated Development Environment | Provide development environment |
| 7 | Android Studio | Integrated Development Environment | Provide Virtual Android Device to test application |

Table 4.5: Hardware Requirements of the AI Mood Tracking Application

| No | Hardware | Specification |
|---|---|---|
| 1 | Central Processing Unit | Octa-core (4x2.3 GHz Cortex-A73 & 4x1.7 GHz Cortex-A53) |
| 2 | Random Access Memory | 4 Gigabyte (GB) |
| 3 | Secondary Memory | 1 Gigabyte (GB) |

## 4.2 System Analysis

These requirements in the analysis phase will then be used to generate diagrams such as Unified Modeling Language Diagrams and activity diagrams which aid in the next phase, implementation. The UML Use Case Diagram in **Figure 3** showcases the interactions between the AI Mood Tracking Application and its users, namely the user and admin. The interaction between the user and the application are as follows; the user is able to login to the system, enter a journal, reflect on the journal, analyse their own account, manage their own account, and communicate with their admin. Meanwhile, the interaction between the admin and application are as follows; the admin can log into the system, analyse all user accounts assigned under them, manage their own account and communicate with all user accounts assigned under them.

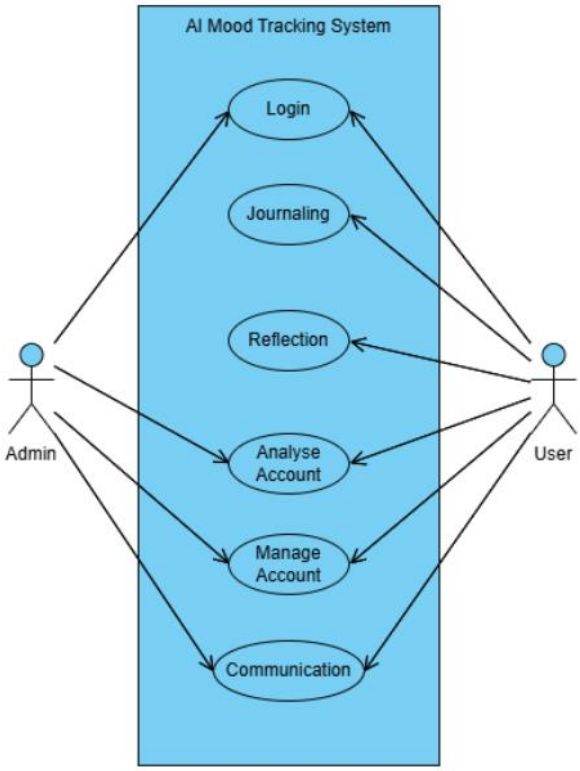


**Fig. 3** *UML Use Case Diagram*

Activity Diagram is a graphical representation a use case, which describes the actions required to be performed by the system. The Activity Diagram includes the steps of all use cases integrated together to map and show the user's experience while using the system. **Figure 4** shows the Activity Diagram of the use cases of the developed system.

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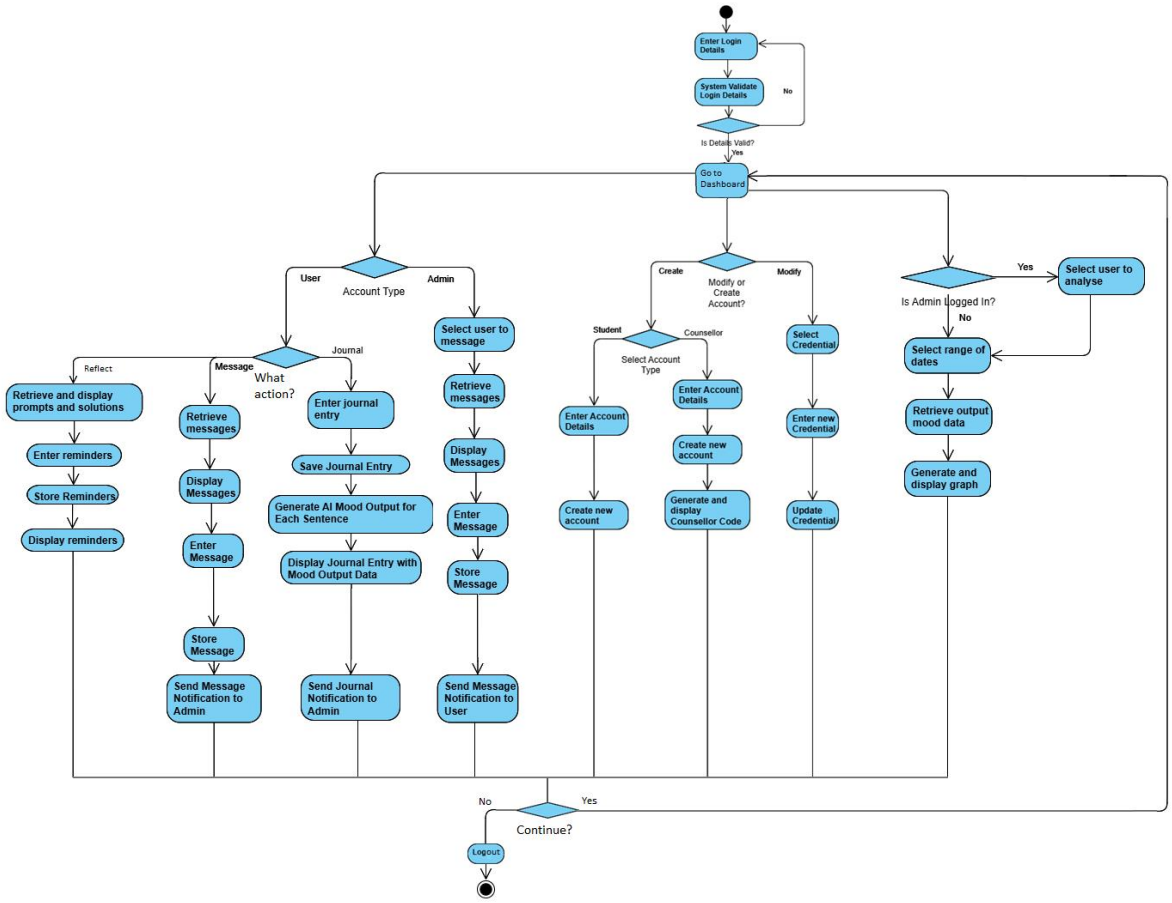


**Fig. 4** *Activity Diagram of the AI Mood Tracking Application*

- Login Procedure: After admins and users provide their login information, the system verifies it against the user database. The admin and user can access their login status using the system.
- Journaling Process: Journal entries are entered by users and kept in the user database. Using the AI Model, the system creates AI Mood Output, which is shown to the user and kept in the user database.
- The AI Model obtains the AI Mood Output from the user database during the reflection process. The users are presented with matching cues and solutions by the system. Self-reminders entered by users are kept in the user database.
- Examine the Account Process: Admins enter chosen user data and search queries, while users enter queries. The system generates reports for users and administrators by retrieving journal entry details and AI Mood Output from the user database.
- Manage Account Process: Inputting new or updated account information or confirming deletion into the system is done by users and administrators. In line with this, the user database is updated.
- Communication Process: The system allows for the exchange of messages between users and administrators, and it keeps track of those messages in the user database.

**Figure 5** shows the Unified Modeling Language Diagram of the AI Mood Tracking Application. The application consists of 6 classes, that are user, admin, journal entry, message, reflection, and mood. An admin may manage more than one user. A user may write more than one journal entry. An admin and user may send or receive more than one message. A journal entry may store many messages. A journal entry may store many reflections. A mood may be included or appear in many journal entries.

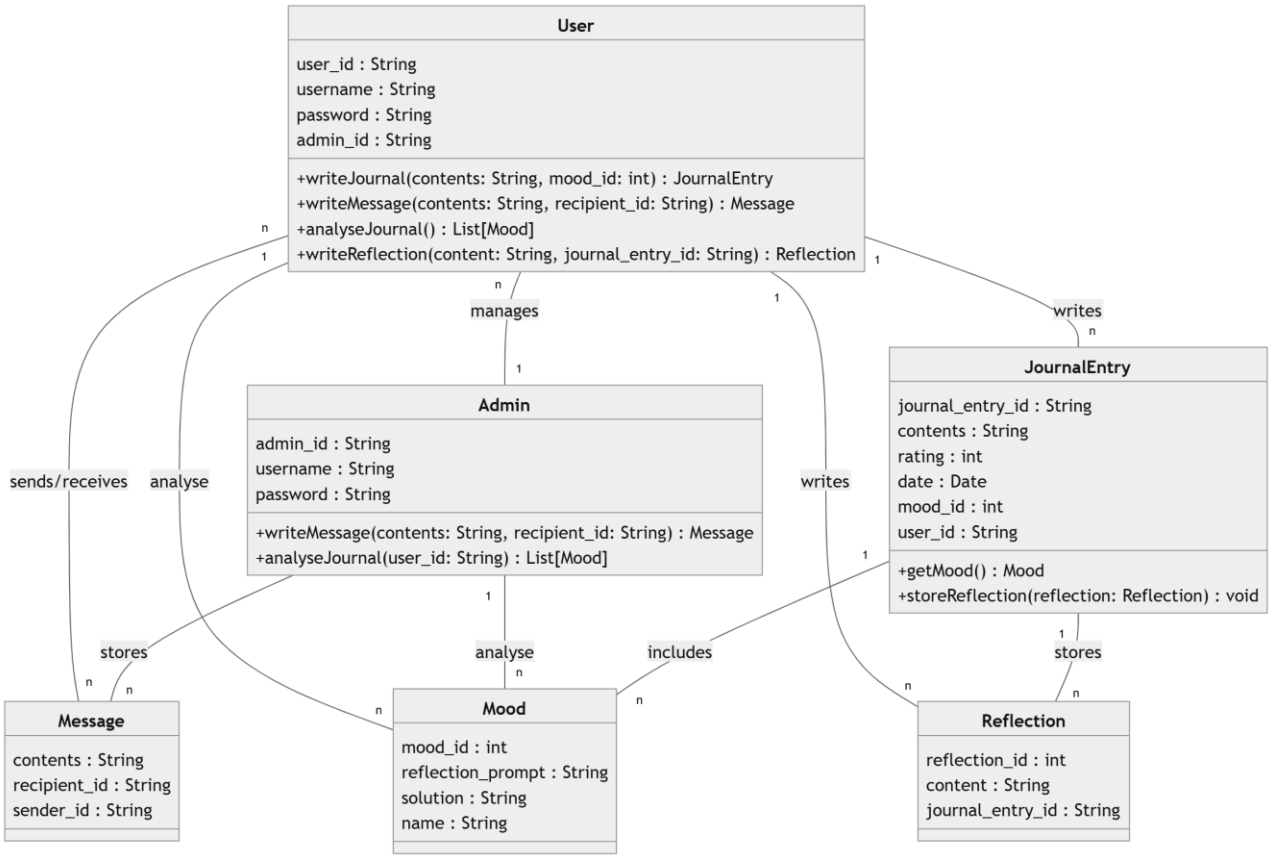


**Fig. 5** *UML Diagram of the AI Mood Tracking Application*

## 4.3 System Design

In the system design phase, the architecture, database, and interface will be designed based on the Unified Modeling Language Diagram and Activity Diagram from the system analysis phase. The designs in the system design phase will then be used as a basis to aid the development of the system.

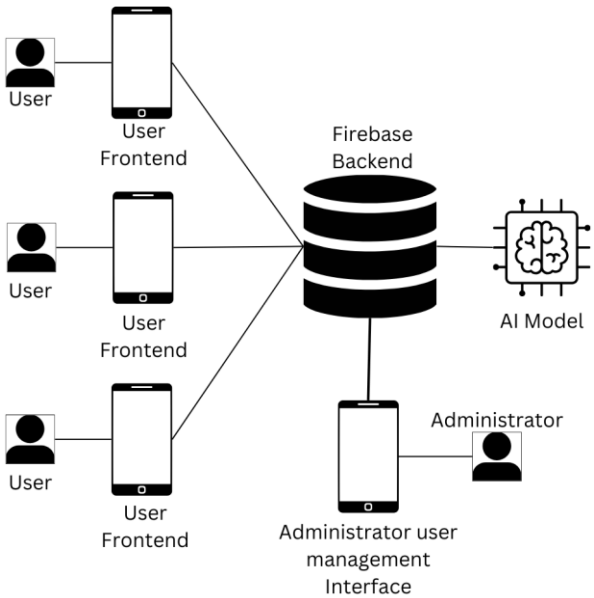


**Fig. 6** *System Architecture of the AI Mood Tracking Application*

**Figure 6** shows the system architecture of the AI Mood Tracking Application. The architecture shows multiple users, each using a mobile phone to show the user front-end application. The user frontend will communicate with Firebase backend to exchange login and authentication, journaling and AI mood outputs, reminders and solutions, messages and replies, query and report data. The Firebase backend will pass

journaling information to the AI model to generate and receive AI Mood Outputs. The administrator will use a mobile phone to show the user management interface. The user management interface will communicate with Firebase backend to exchange login and authentication, messages and replies, notifications, query and report data. Keep in mind that each administrator manages to have multiple users.

The tables below have been derived from the Unified Modeling Language Diagram. They were adapted to the NoSQL database of Cloud Firestore, although not a traditional structured SQL Relational Database, Cloud Firestore allows capabilities to manage relationships between data and storage of data entities via JSON-like documents.

i. `Tbl user (User_ID, User_Username, User_Password, Admin_ID)`
ii. `Tbl admin (Admin_ID, Admin_Username, Admin_Password)`
iii. `Tbl journal(Journal_ID, Journal_Contents, Journal_Rating, Journal_Date, Mood_ID, User_ID)`
iv. `Tbl reflection (Reflection_ID, Reflection_Content, Journal_ID)`
v. `Tbl message (Message_ID, Message_Contents, Recipient_ID, Sender_ID, Journal_ID)`
vi. `Tbl mood (Mood_ID, Mood_ReflectionPrompt, Mood_Solution, Mood_Name)`

The following interface has been designed on Figma based on the Unified Modeling Language Diagram and Activity Diagram. **Figure 7 – 17** illustrates the user interface design for this application.


**Fig. 7** *Login Interface*


**Fig. 8** *Student Dashboard Interfaces*

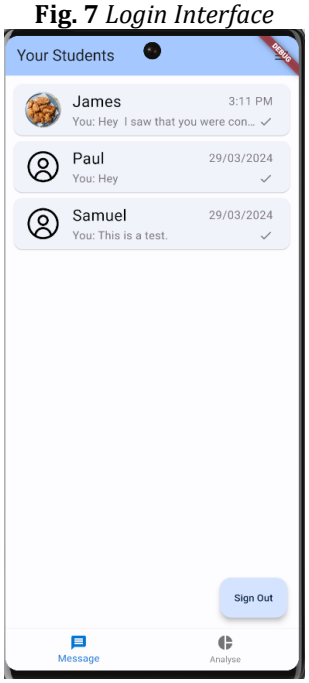


**Fig. 9** *Counselor Dashboard Interface*

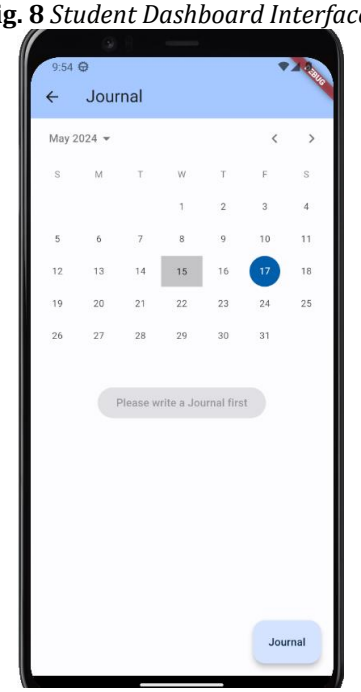


**Fig. 10** *Date Picking Interface*

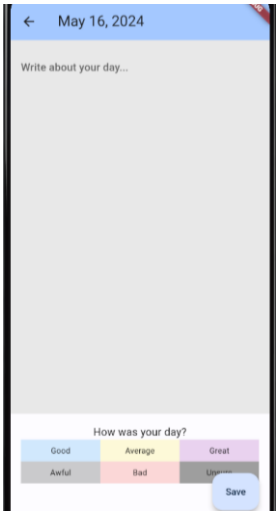


**Fig. 11** *Journal Writing*

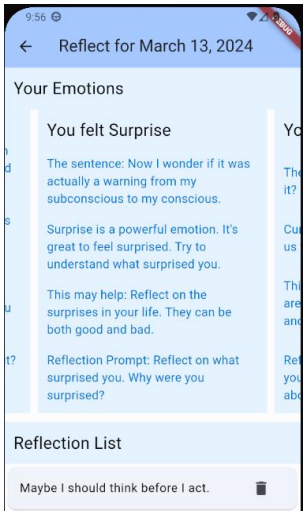


**Fig. 12** *Reflect Interface*

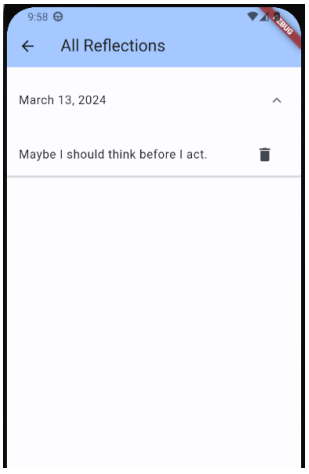


**Fig. 13** *Reminders Interface*

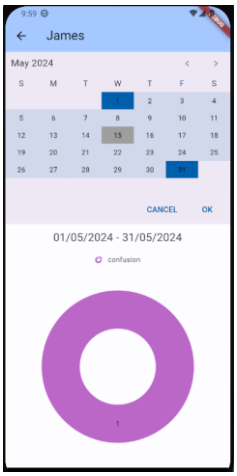


**Fig. 14** *Analysis Interface*

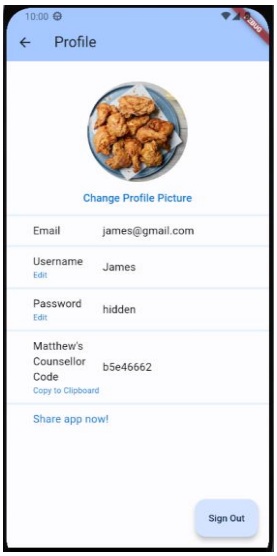


**Fig. 15** *Profile Interface*

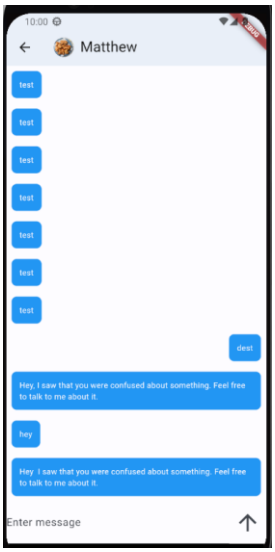


**Fig. 16** *Chat Interface*

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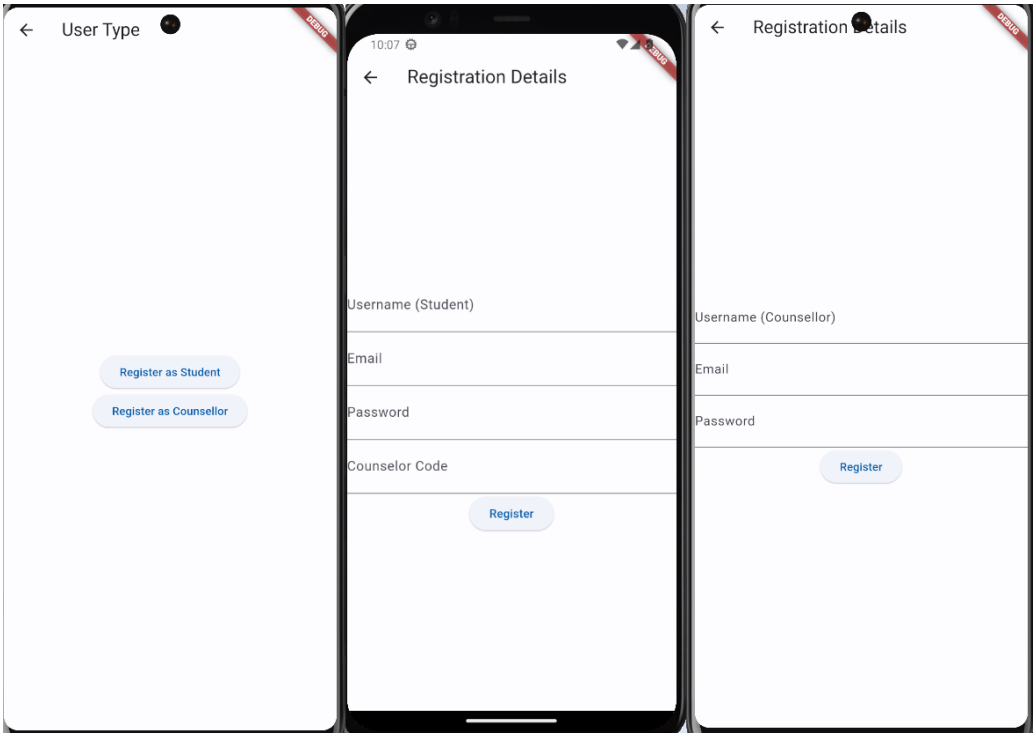


**Fig. 17** Register Interfaces

## 4.4 System Testing

In this section, a test has been carried out to assess the functionality of each module. This section ensures that the application functions as intended. The findings of this section are included in **Table 5**.

**Table 5**: *System Testing Results of each Module*

| **Module: Calendar** | | | | |
|---|---|---|---|---|
| Test Case ID | Description | Expected Result | Actual | Pass/Fail |
| M1-1 | To check whether the user can view dates on the calendar | The user should be able to view dates on the calendar | The user successfully viewed dates on the calendar | Pass |
| M1-2 | To check whether the user can write, view and edit journal entries for each date. | The user should be able to write, view and edit journal entries for each date. | The user successfully wrote, viewed and edited journal entries for each date. | Pass |
| **Module: AI Model** | | | | |
| M2-1 | To check whether the user can see predicted mood outputs based on journal entry. | The user should be able to see predicted mood outputs based on journal entry. | The user successfully saw predicted mood outputs based on journal entry. | Pass |
| **Module: Reflection and Solutions** | | | | |
| M3-1 | To check whether the user can reflect on causes for emotion. | The user should be able to reflect on causes for emotion. | The user successfully reflected on causes for emotion. | Pass |
| M3-2 | To check whether the user can receive advice, aid and solutions to their specific situation. | The user should be able to receive advice, aid and solutions to their specific situation. | The user successfully received advice, aid and solutions to their specific situation. | Pass |
| **Module: Reminders and List** | | | | |
| M4-1 | To check whether the user can add, remove and view list of methods entered via question prompts | The user should be able to add, remove and view list of methods entered via question prompts | The user successfully added, removed and viewed list of methods entered via question prompts | Pass |

| Module: Account Management and Analysis | | | | |
|---|---|---|---|---|
| M5-1 | To check whether the user and admin can create and modify account details. | The user and admin should be able to create and modify account details. | The user and admin successfully created and modified account details. | Pass |
| M5-2 | To check whether the user and admin can analyse user moods. | The user and admin should be able to analyse user moods. | The user and admin successfully analysed user moods. | Pass |

## 5. Conclusion

To conclude, the AI Mood Tracking Application is able to provide an platform for users to journal and write journal entries for the sake of retrospection. The act of journaling and retrospection offered by this platform aids the improvement of performance, mental health and behavior of user. Additionally, the application is able to attract and retains users to keep writing journal entries for self-improvement using engaging and interactive features such as AI Mood Outputs, reflection and communication with counsellor. Thus, this application is a novel exploration for the usage of sentiment analysis AI to identify emotions for reflection rather than for market research.

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## Conflict of Interest

The author declares that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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# Appendix A – Project Gantt Chart