ÇANKAYA UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Project Report

CENG 407

Innovative System Design and Development I

15

Daily: an AI Powered Journaling Application with Image Generation

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Introduction

In an era where Artificial Intelligence (AI) seamlessly integrates into our daily lives, our project incorporates this technology to enhance user experiences. This report delves into the transformative potential of AI in enhancing diary applications, focusing on emotion recognition through Natural Language Processing (NLP). The aim is to optimize functionality and provide users with a deeper understanding of their emotions, revolutionizing the diary-writing experience.

This project report includes a work plan, a literature review, a software requirement specification, and a software design description.

Workplan

Daily Work Plan

PROJECT TITLE	daily: an AI powered journaling application
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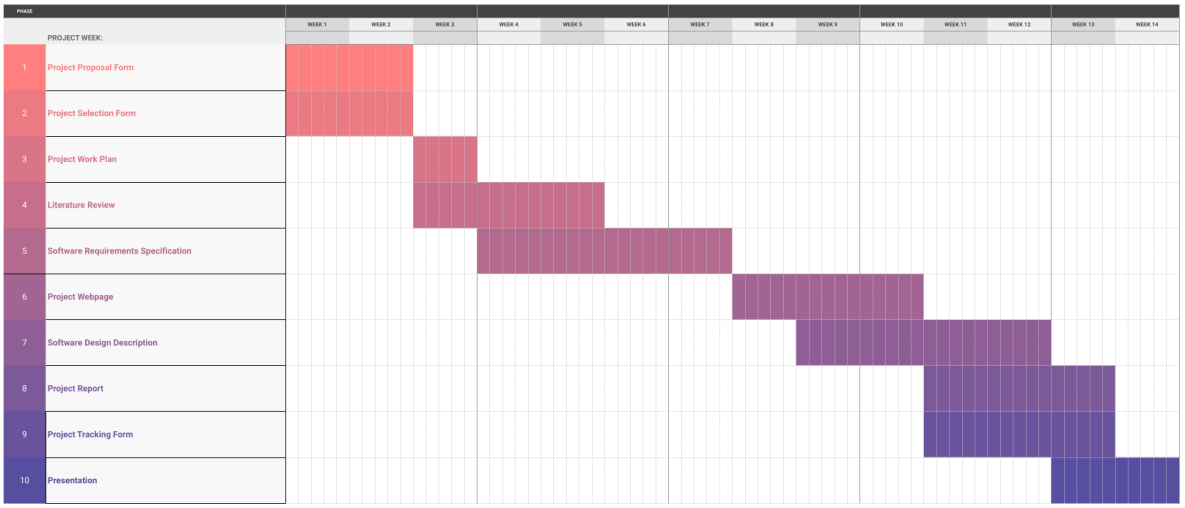


Literature Review

Abstract

In the rapidly evolving area of Artificial Intelligence, its integration into our daily lives has become an important aspect. This paper focuses on enhancing our diary application by the usage of artificial intelligence, diving into topics such as emotion recognition. Through algorithm evaluation, we aim to optimize functionality. The focus lies on using Natural Language Processor (NLP) for emotion detection, to ensure accurate predictions. In this paper, we evaluate different approaches for this process. The objective is to select the most suitable AI model(s) for our application. This work aims to provide users with a deeper understanding of their emotions, revolutionizing the diary-writing experience.

Öz

Yapay zekânın hızla gelişen alanında, günlük hayatımıza entegrasyonu önemli bir husus haline gelmiştir. Bu makale, yapay zekânın kullanımıyla günlük uygulamamızı iyileştirmeye odaklanarak duygu tanıma gibi konuları derinlemesine incelemektedir. Algoritma değerlendirme yoluyla işlevselliği optimize etmeyi hedefliyoruz. Doğal Dil İşlemcisi'ni (NLP) duygu algılama için kullanarak doğru tahminler sağlamaya odaklanıyoruz. Bu makalede bu süreç için farklı yaklaşımları değerlendiriyoruz. Amacımız, uygulamamız için en uygun AI model(ler)ini seçmektir. Bu çalışma, kullanıcılara duygularını daha derinlemesine anlamalarını sağlamayı ve günlük tutma deneyimini devrimselleştirmeyi amaçlamaktadır.

Introduction

As the field of Artificial Intelligence continues to advance, its integration into our daily lives and digital interactions assumes an increasingly pivotal role. The primary objective of this paper is to enhance the interactivity of our diary application through the incorporation of Artificial Intelligence. In the course of this research, we explore prospective applications of Artificial Intelligence technologies, including text-based emotion recognition, text summarization, and generative image processing. Moreover, we delve into the evaluation of various algorithms, assessing their efficacy, and identify how we can employ these algorithms to serve our specific objectives.

One of the main features of our application is that the entries written by the user are going to be processed by our NLP model for emotion detection. To achieve correct and computationally efficient predictions we must analyze certain detection approaches, such as the rule-based approaches, machine learning approaches and the hybrid approach, which employs both of the machine learning and rule-based approaches. We also research generative image processing, and generate images based on the entries processed by our NLP engine. The application will exclusively accommodate the English language.

In this paper we survey through various AI models that are used for emotion detection in search of the most appropriate model or models for our application.

Natural Language Processor

Emotion Detection

Emotion detection starts with emotions. There are various forms of representing emotions [1]. Two main categories of emotion models are discrete and dimensional models. Some most widely used discrete emotional models are Ekman's six basic emotions [2] and Plutchik model which names eight fundamental emotions in opposite pairs [3]. Such as joy vs. sadness. Discrete models place emotions into distinct classes.

Dimensional emotion model is a theory that proposes that emotions can be represented by their position in a space defined by two or more dimensions. There are some models that represent emotions in 3 dimensions and 2 dimensions. Such as Russell and Mehrabian's 3 dimensional model [4] and Plutchik's 2 dimensional wheel of emotions [3]. While discrete models are more widely used, dimensional models better represent emotions that are similar to each other [1].

Choosing an emotional model also has to do with the detection algorithm that is going to be used and the dataset trained on. We have found several ready to use datasets, some of them represent emotions dimensionally while some represent them in a discrete way.

Detection Approaches

Engineering a natural language processor starts with selecting the tasks of the NLP model. We expect these tasks to change in time as our application grows in size, supports new features and pivots and evolves from the starting point, but we are going to start our research with an initial thought on these objectives and design choices we can take to overcome them.

We expect our NLP model to detect emotions, summarize content and rate the quality of posts, or filter out spam content. Detecting emotions requires rather less work compared to summarizing content.

Naive Bayes Algorithm

A supervised machine learning approach utilizing the Naive Bayes algorithm. Naive Bayes is a text classification algorithm that utilizes the Bayes' Theorem, which is a theorem regarding statistics and probability. The algorithm calculates the probability of an input belonging to a certain emotional category by calculating the probability based on a training dataset containing the probabilities[5].

Word Embeddings Method

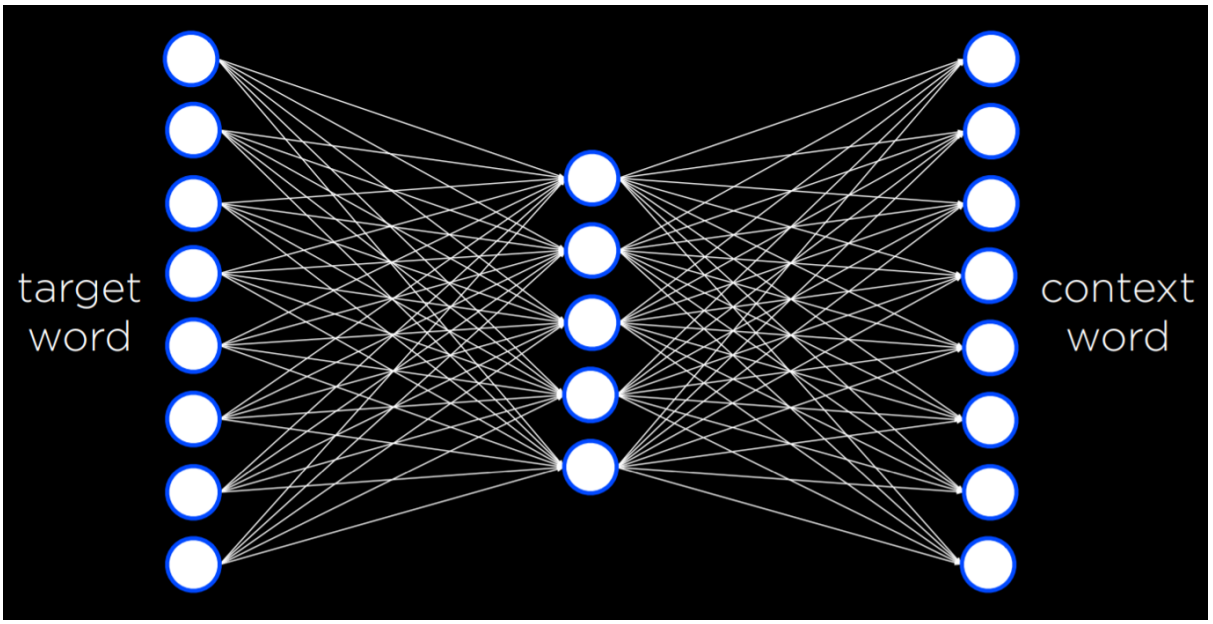


Figure 1 - Word2Vec Model [6]

Word2Vec is a neural network model that uses the Word Embeddings method to represent each word with a vector. One important aspect of this method is, now that we have vectors representing our words, we can train neural networks, which work well with vectors and numbers.

Word2Vec model learns by parameter optimization, using a backpropagation algorithm. The model adjusts the vector representations in each iteration of the training process to find a more accurate vector representation of words. There is no need to code a Word2Vec from the start-up in our case. The Word2Vec model exists within the **Gensim** library in Python and can be given tokenized texts to train and can be used together with the **Scikit-learn** library with ease.

Some use cases of this method could be to generate words that associate most with a certain word. We can check this association just by a distance function. Running this distance function for each word in pairs with our certain word then selecting the closest distance pairs we can arrive at the associations and extract semantic meanings.

Lilleberg, Zhu and Zhang achieved a successful prediction rate of +70% in their work utilizing a Word2Vec model [7].

Transformer Based Models for Emotion Detection

For us to understand the Transformer models, we need to understand what is an **attention mechanism** and what is a **self-attention mechanism**. An **attention mechanism** is a mechanism that enables neural networks to focus on the features of the input data dynamically [8]. A **self-attention mechanism** involves an attention mechanism that considers various positions within a single sequence in order to generate a representation for that sequence [9]. Transformer models are using self-attention mechanisms to compute representations of its input [9]. This enables them to effectively process and understand context-rich information.

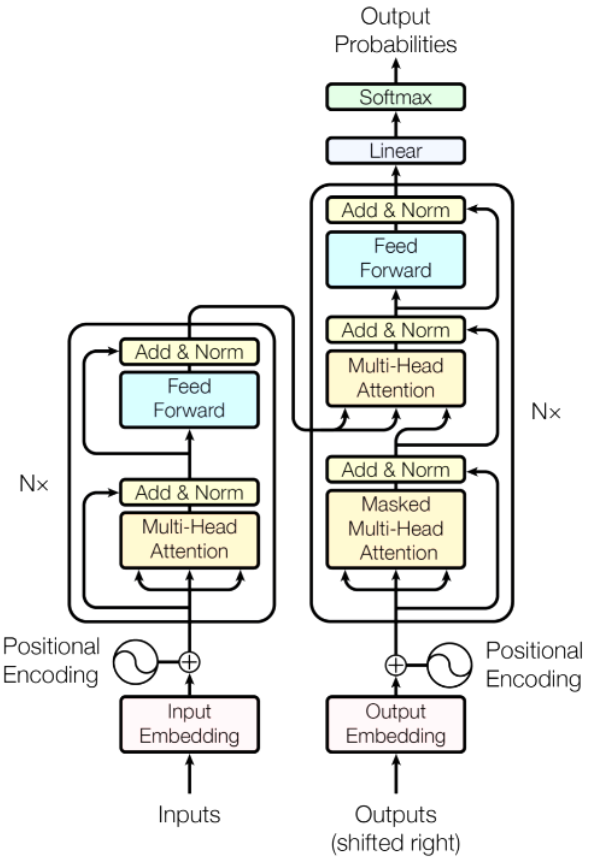


Figure 2 - Transformer Model Architecture [9]

In the context of emotion detection, transformer-based models such as **BERT**, **GPT**, and **RoBERTa** have demonstrated remarkable performance [10]–[12]. These models can be fine-tuned specifically for emotion detection tasks, leveraging their pre-trained knowledge to effectively identify and classify emotions in text [13].

Pros and Cons

1. Naive Bayes Algorithm:
    - Pros:
        - Simple and easy to implement.
        - Works well in small training datasets.
        - Efficient for text classification cases.
    - Cons:
        - Assumes that features are independent.
        - Cannot capture the complex relationships between the words.
2. Word Embeddings Method (Word2Vec):
    - Pros:
        - Represents words in a vector, encapsulating semantic relationships.
        - Can be pre-trained on large datasets.
    - Cons:
        - For best results, a great amount of data is needed.
        - Cannot capture context-specific details of words.
3. Transformer Based Models:
    - Pros:
        - Can capture context-specific details.
        - Cutting edge results.
    - Cons:
        - Requires powerful hardware for training.
        - Large memory requirements.

Conclusion

This report highlights the significance of AI, particularly in emotion detection to enhance user experience in our diary application. We've examined the standard approaches, from Naive Bayes to more advanced models like Transformer models. Each offering some pros and some cons. As the field of AI continues to evolve, maintaining a keen awareness of growing technologies and upholding the ethical considerations is vital for our applications success and impact.

Software Requirement Specification

1. Introduction

1.1 Purpose

The purpose of this document is to describe the application, Daily (stylized as daily) an AI powered journaling application. This app aims to create a fun and new way of journaling and writing diaries by introducing artificial intelligence, data analysis and anonymous journal sharing features. This document includes detailed information about requirements of the project. It reflects the identified constraints and proposed software functionalities. Moreover, this document explains how users interact with the application.

1.2 Scope of Project

In the realm of personal development, our journaling application emerges as a powerful tool, guiding users on a transformative journey of self-discovery and growth. At its core, the platform is designed to cultivate clarity and self-reflection, offering users a space to navigate the labyrinth of their thoughts and emotions. Through carefully crafted features, individuals can embark on a journey of introspection, gaining valuable insights into their inner world.

One of the pivotal aspects of our project lies in encouraging users to set and achieve personal goals. This feature adds a dynamic dimension to the journaling experience, fostering a sense of accomplishment and progress. Goal-setting functionalities, coupled with intuitive progress trackers and reminders, become integral components, steering users towards realizing their aspirations.

Communication skills, often underestimated in the context of personal development, take center stage in our application. Here, the platform serves as more than just a repository of thoughts; it becomes a training ground for expressing oneself articulately. Writing prompts are strategically incorporated to prompt users to delve deeper into their thoughts, fostering a communication style that is both expressive and refined.

Integrating technology, our application incorporates Natural Language Processing (NLP) to analyze and derive insights from users' journal entries. This not only adds a layer of sophistication to the user experience but also provides personalized feedback and recommendations for further growth.

1.3 Glossary

API (Application Programming Interface) - A set of protocols, tools, and definitions for building application software, enabling communication between different software components.

AI (Artificial Intelligence) - Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.

CI/CD Pipeline (Continuous Integration/Continuous Deployment) - An automated process for software development, integrating code changes and facilitating continuous delivery and deployment.

Data Analysis - Data analysis is the action of collecting, preprocessing data and later analyzing relations and making assumptions based on the data.

Deep Learning - A machine learning subfield that uses models that incorporate multiple layers of neurons.

GDPR (General Data Protection Regulation) - A regulation in EU law on data protection and privacy in the European Union and the European Economic Area.

Generative Image AI - An artificial intelligence system that utilizes neural networks to craft images based on some text input.

Golang - An open-source programming language used for backend server development.

Machine Learning - A subfield of artificial intelligence that uses statistics and mathematics to make predictions, based on input data.

Natural Language Processing - An artificial intelligence concept that utilizes special neural network models to extract information from text.

Neural Network - A machine learning method that uses an interconnected set of nodes that process an input and create outputs based on mathematical formulas.

React Native - A framework for building native apps using React, a JavaScript library for building user interfaces.

Reinforcement Learning - Reinforcement learning is another approach to machine learning, where after each action, the agent gets feedback in the form of reward or punishment (a positive or a negative numerical value).

Smart Mobile Device - A portable computing device such as a smartphone or tablet.

Text summarisation - Text summarisation is an action performed by NLP models that takes an input text, captures the essence of the text and generates a summarized version of it.

1.4 Overview of the Document

The second part of the document describes functionalities of the daily: an AI powered journaling application. Informal requirements are described and it is a context for technical requirement specification in the Requirements Specification chapter. Requirement specification chapter is written for software developers and details of the functionality of the simulation are described in technical terms. Both of the sections describe the functionalities of the same product. However, it is described differently because they are intended for different audiences.

2. Overall Description

2.1 Product Perspective

Daily, an AI powered journaling application with image generation is a mobile journaling project that incorporates several artificial intelligence methods to provide an interactive mobile journaling platform. The project has several aspects. It provides a journaling system, analyzes dailies, provides statistics about writing habits and emotions, collects dailies in albums, generates images based on extracted emotions and keywords for these dailies. This platform also improves user interactivity by providing a daily sharing and reading mechanism for users who are interested in sharing their stories and reading about others'.

2.1.1 User Characteristics

2.1.1.1 User Demographics

- Participants must be at least 13 years of age.

2.1.1.2 User Technical Proficiency

- Participants must own a smart mobile device.
- Participants must have the ability to read and write.
- Participants must have familiarity using mobile operating systems iOS or Android.

2.1.1.3 Admin

- Admin must have a knowledge of website moderation.
- Admins must be familiar with database management systems.

2.1.2 Overview of Functional Requirements

Functional Req. ID #	Functional Requirement Name	Functional Requirement Description
FR 1	User registration	The system must allow users to register and create profiles.
FR 2	User authentication	The system must allow users to login using an authentication system.
FR 3	Explore other dailies	The system must display a stream of content to users.
FR 4	User profile	The system must keep the user profile in a database and the profile data should be reachable by the user
FR 5	Daily album	A page where users can see the previously generated photos by the AI.
FR 6	Linking social media accounts	Users can link their social media accounts to their profiles
FR 7	Diary taking	Users can write diary entries called “daily”.
FR 8	Daily sharing	Users can choose to share their dailies anonymously to the platform for other users to read.
FR 9	Emotion analysis	The system should use an AI model to analyze the daily entries of users and send it to the related user to see.
FR 10	Image generation	The system should use the keywords extracted by AI to generate an image for all daily entries.

2.2 Constraints, Assumptions and Dependencies

Constraints:

- **Device Compatibility:** Must be compatible with a range of mobile devices.
- **Storage Limits:** Limited by the device's and server's storage capacities.
- **Processing Power:** Dependent on the processing capabilities of the user's device for the frontend.
- **Mobile Operating Systems:** Dependent on iOS and Android operating systems for updates and compatibility.

Assumptions:

- **User Tech Savviness:** Assumes a basic level of user familiarity with mobile apps.
- **Stable Internet Connection:** Assumes users have regular access to a stable internet connection.
- **Regular Usage:** Assumes users will regularly input journal entries for effective analysis.
- **Data Accuracy:** Assumes the data input by users is accurate and truthful.

Dependencies:

- **Third-Party APIs:** Dependence on external APIs for features like sentiment analysis or data storage.
- **Cloud Services:** Relies on cloud services for backend data storage and AI processing.
- **Open-Source Libraries:** Utilizes open-source libraries in React Native, Golang, and Python, subject to their availability and updates.
- **Network Dependency:** Relies on internet connectivity for synchronization and AI analysis.

3. Specific Requirements

This section will describe the requirements for the software. The requirements will be classified into 3 main sections; these sections are interface requirements, functional and non-functional requirements.

3.1 Interface Requirements

3.1.1 User Interface

- **Main page**: A page where users can navigate between statistics, albums, write a daily, explore, profile tabs.
- **Register and login page**: A page where users can register if there is no account and also log in if there is an account.
- **Statistics tab**: A page where the user can see the detailed overview of their previously written dailies. Contains emotional data, streaks, frequency etc.
- Profile tab: Shows the username, user profile picture, summary of statistics, and settings.
- **Write a daily tab**: A blank notebook-like page where users can write dailies. When it's done, users can select whether they want to share it or not.
- **Explore tab**: A tab where the user can read dailies of other people and rate them. The tab shows the image of the daily and if the user finds it good they can display and read it.
- **Album tab (your daily)**: A tab where the user can see the previous daily entries they have written as an image album format.

3.1.2 Hardware Interface

The "daily" platform is designed to be used on smartphones and other mobile tablets. The platform will be compatible with both iOS and Android devices. The devices should have sufficient storage space for the installation of the application.

3.1.3 Software Interface:

- **Operating Systems**: The platform will be compatible with major mobile operating systems such as Android and iOS.
- **Database Management Systems**: The platform will interact with a database management system (DBMS) to store, retrieve, and manage data. The DBMS will handle user information, user-generated content, etc.
- **Social Media APIs**: The platform will interact with the APIs of various social media platforms for linking social media accounts. This will allow users to connect their daily profiles with their social media accounts, facilitating easy sharing and engagement.
- **AI Software**: The platform features an AI system to be used in dailies. The AI system extracts keywords, analyzes entries and generates images.

3.1.4 Communication Interfaces

The daily platform will leverage multiple communication protocols to facilitate data exchange across different components of the system. Here are the primary communication interfaces used:

- **HTTP/HTTPS**: The platform will extensively use the HTTP/HTTPS protocols for communication between the client (user's device) and the server. This includes requests and responses for web pages, API calls, media files, and more. HTTPS, the secure version of HTTP, will be used to encrypt data for security purposes.
- **REST APIs**: The platform will interact with various external services (like social media platforms, AI services) through their RESTful APIs, which use standard HTTP methods for data exchange.
- **TCP/IP**: At a lower level, the platform will rely on the standard Internet protocol suite, TCP/IP, for network communications.
- **SSL/TLS**: To ensure secure data transmission, particularly for sensitive data like login credentials and payment information, the platform will use SSL/TLS protocols to encrypt the data.

3.2 Detailed Functional Requirements

3.2.1 FR1

Name	FR1 User Registration
Purpose/Description	The User Registration function allows new users to create an account on the platform. The account creation process should be user-friendly and secure.
Inputs	User's personal information, including email, username, and password.
Processing	The system will validate the input information, check for existing accounts with the same information, and register the new user in the database.
Outputs	The output is a new user account. The user will receive a confirmation message after successful registration. In case of error, an appropriate error message will be displayed.

3.2.2 FR2

Name	FR2 User Authentication
Purpose/Description	The User Authentication function verifies the identity of users when they log into the platform. It ensures that access to user accounts is restricted to authorized individuals.
Inputs	User's username or email and password.
Processing	The system will validate the entered credentials against the stored user data in the database.
Outputs	The output is the successful login of the user into the system or an error message if the login fails.

3.2.3 FR3

Name	FR3 Explore other dailies
Purpose/Description	The exploring function will display a stream of contents of anonymously shared dailies as pictures generated by the AI system to users. If a user likes the picture they can read its contents. The user can choose to explore and read these anonymously shared dailies.
Inputs	Users’ interactions with the platform
Processing	The system will process user input data and it will handle any unexpected or abnormal situations by defaulting to a general feed.
Outputs	The output will be the feed itself containing daily pictures and content.

3.2.4 FR4

Name	FR4 User profile
Purpose/Description	The User Profile allows users to see their personal profile. The profile will include information such as summary of statistics, username, user profile picture.
Inputs	User profile information and user activity data.
Processing	The system will update profiles based on user inputs and track their activity on the platform. System will handle unexpected or abnormal situations by providing error messages and options to correct information.
Outputs	The output is an updated user profile, summary of statistics. The updates will be shown in real-time on the user's profile page.

3.2.5 FR5

Name	FR5 Daily album
Purpose/Description	The daily album allows users to display their daily collection. Dailies are represented with generated images by AI. If the user wants to read their content they can do so by selecting them.
Inputs	User ID
Processing	The system will display the list of dailies based on the user id. System will handle unexpected or abnormal situations by providing error messages and options to correct information.
Outputs	The output will be the list of dailies containing daily pictures and content.

3.2.6 FR6

Name	FR6 Linking social media accounts
Purpose/Description	This function allows users to connect their social media accounts to their profile on the platform. This facilitates sharing of content and integration of social media activities like sharing the AI generated picture of the daily.
Inputs	User's social media account details and permission to link accounts
Processing	The system will validate the social media account details and link the account to the user's profile.
Outputs	The output is the linked social media account, visible on the user's profile, and the ability to share content directly from the platform to the linked social media accounts.

3.2.7 FR7

Name	FR7 Diary taking
Purpose/Description	This function allows users to add diaries which are called “daily” to their album by writing in the application’s notebook. A daily includes text content and image.
Inputs	User's text input
Processing	The system will take the text input. After extracting the keywords and emotions, a picture will be generated by AI.
Outputs	The output is the daily entry which contains text and picture.

3.2.8 FR8

Name	FR8 Daily sharing
Purpose/Description	This function allows users to share their dailies anonymously.
Inputs	User's daily
Processing	The system will take the daily and send it to global feed.
Outputs	The output is the daily entry which is represented at users' feed.

3.2.9 FR9

Name	FR9 Emotion analysis
Purpose/Description	This function takes user's finished daily to analyze and extract emotions.
Inputs	User's daily
Processing	The AI system will take the daily and extract emotions and keywords based on that.
Outputs	The output is the daily analysis displayed as statistics.

3.2.10 FR10

Name	FR10 Image generation
Purpose/Description	This function takes keywords and emotions to generate an image based on that.
Inputs	Extracted keywords and emotions.
Processing	The system will take the input and will send it to an image generation model.
Outputs	The output is the picture generated by AI.

3.3 Non Functional Requirements

3.3.1 Platform Compatibility and Performance

React Native Limitations: Ensure compatibility with both iOS and Android platforms, keeping in mind the different performance characteristics and design guidelines of each.

Performance Overheads: React Native can have performance limitations for computation-intensive tasks compared to native development.

3.3.2 Backend Server Constraints (Golang)

Scalability and Load Management: The server must efficiently handle varying loads, potentially requiring load balancing and efficient resource management.

Database Interactions: Optimize database queries and ensure efficient data handling, especially with large journal entries or high user volumes.

3.3.3 Python AI System Constraints

Computational Resources: AI and machine learning models can be resource-intensive. Assess the need for specialized hardware or cloud resources for processing.

Data Privacy and Security: Handling personal journal entries requires stringent data privacy measures and compliance with regulations like GDPR or HIPAA.

3.3.4 Integration and Communication Between Components

API Design and Management: Robust and secure APIs for communication between the frontend, backend, and AI system.

Data Serialization and Transfer: Efficient data serialization formats to minimize latency and bandwidth usage.

3.3.5 User Interface and User Experience

Cross-Platform UI Consistency: Ensuring a consistent UI/UX on different device types and operating systems.

Accessibility and Localization: Designing for accessibility and potential localization needs.

3.3.6 Development and Deployment Infrastructure

Version Compatibility: Ensuring compatibility between different versions of React Native, Golang, and Python libraries.

CI/CD Pipeline: Streamlining the development process with a continuous integration and deployment pipeline.

3.3.7 Testing and Quality Assurance

Cross-Platform Testing: Comprehensive testing strategies for both Android and iOS platforms.

AI Model Accuracy and Bias Testing: Ensuring the AI provides accurate and unbiased analysis of journal entries.

3.3.8 Regulatory and Compliance Constraints

Data Protection Laws: Compliance with data protection laws in different regions (e.g., GDPR in Europe).

Intellectual Property: Use of open-source libraries and dependencies within legal constraints.

3.3.9 Market and User Constraints

User Demographics and Behavior: Tailoring features and performance according to the target user base.

Competitive Features: Keeping up with features offered by competitors in the journaling app market.

3.3.10 Dependency Management

External Libraries and Frameworks: Managing dependencies and ensuring compatibility across different libraries used in React Native, Golang, and Python.

3.3.11 Network and Connectivity

Offline Functionality: Designing for scenarios where users might have limited or no internet connectivity.

Data Synchronization: Efficient synchronization of journal entries between the device and server.

4. Use Cases

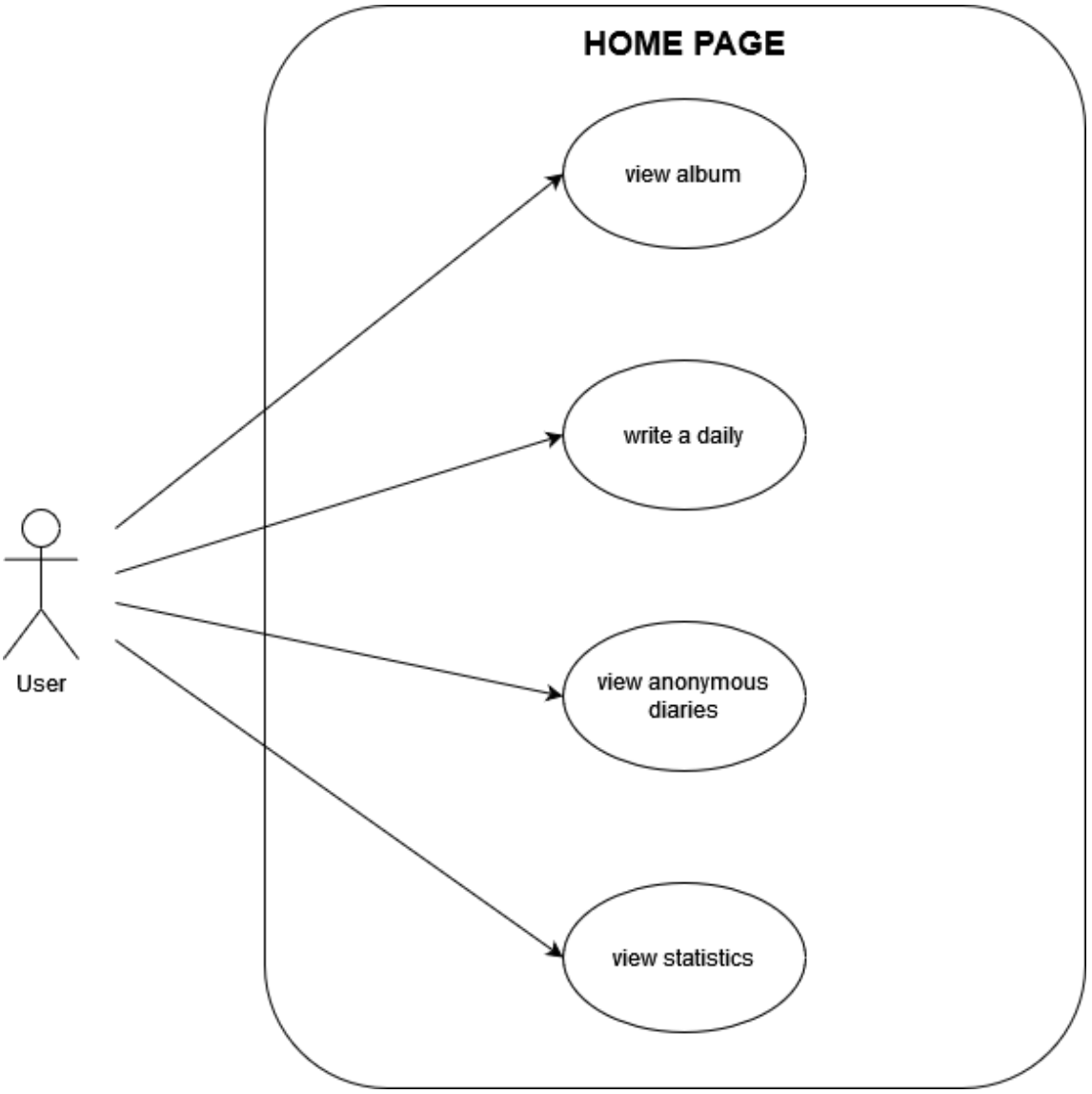
4.1 Viewing Homepage

Use Case:

User:

- ☐ View album
- ☐ Write a daily
- ☐ View shared anonymous images
- ☐ View statistics

Diagram:



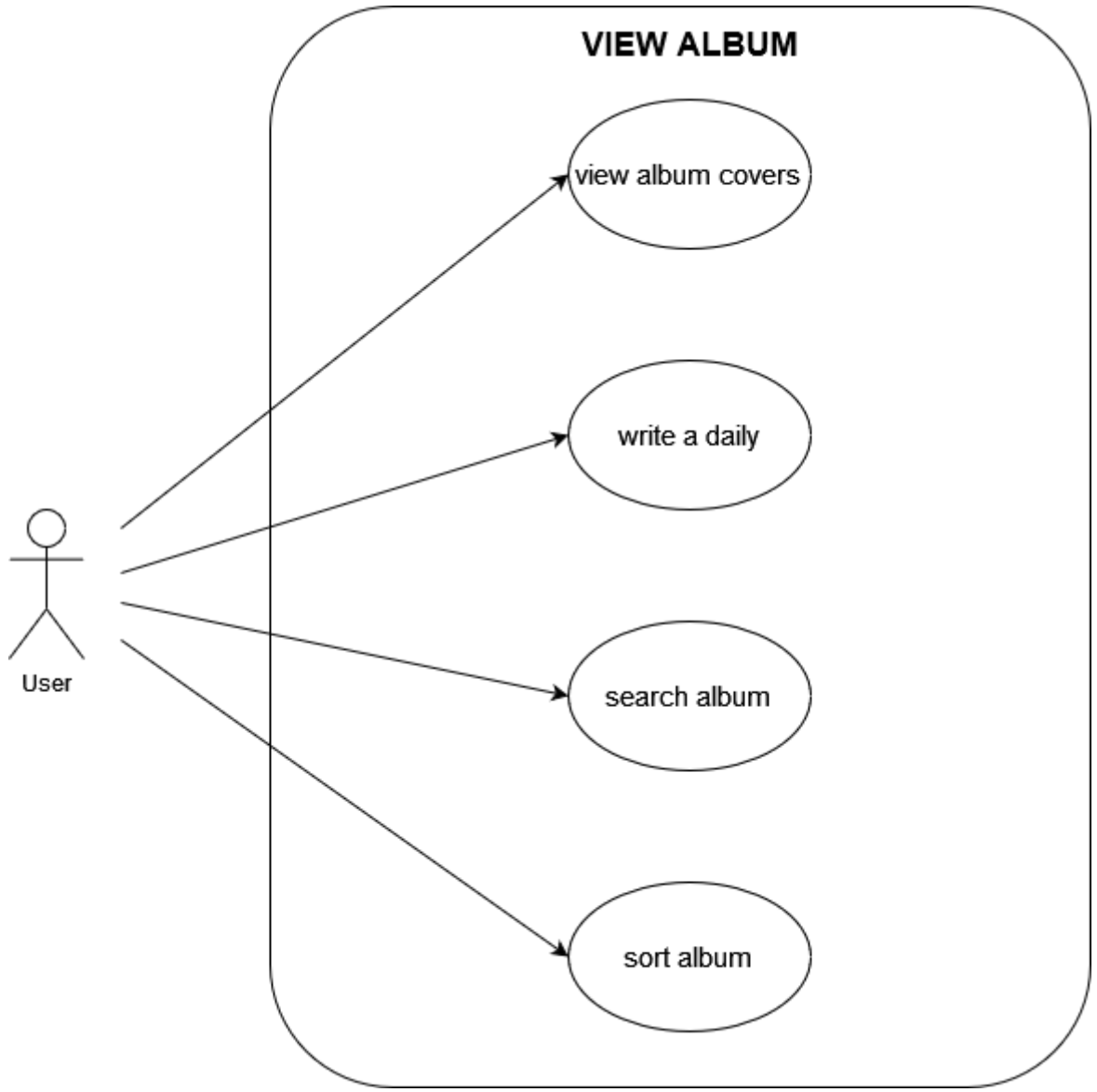
4.2 Viewing Album

Use Case:

User:

- ☐ View album covers
- ☐ Write a daily
- ☐ Search album
- ☐ Sort album

Diagram:



4.3 Viewing Statistics

Use Case:

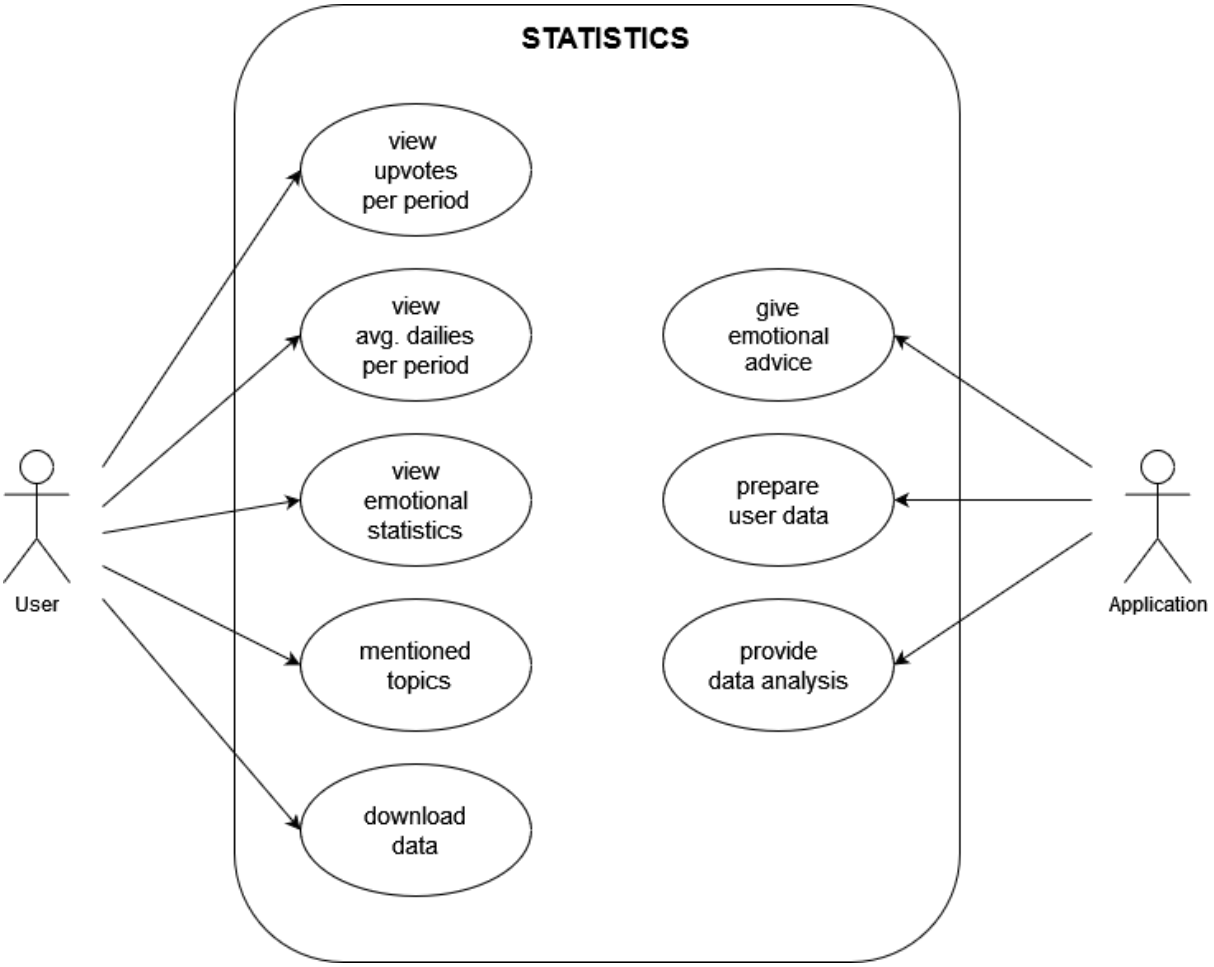
User:

- ☐ View upvotes per period
- ☐ View average pages written per period
- ☐ View emotional statistics
- ☐ View mentioned topics
- ☐ Download user data

Application:

- ☐ Provide emotional advice
- ☐ Prepare user data
- ☐ Prepare data analysis

Diagram:



4.4 Writing a Daily

Use Case:

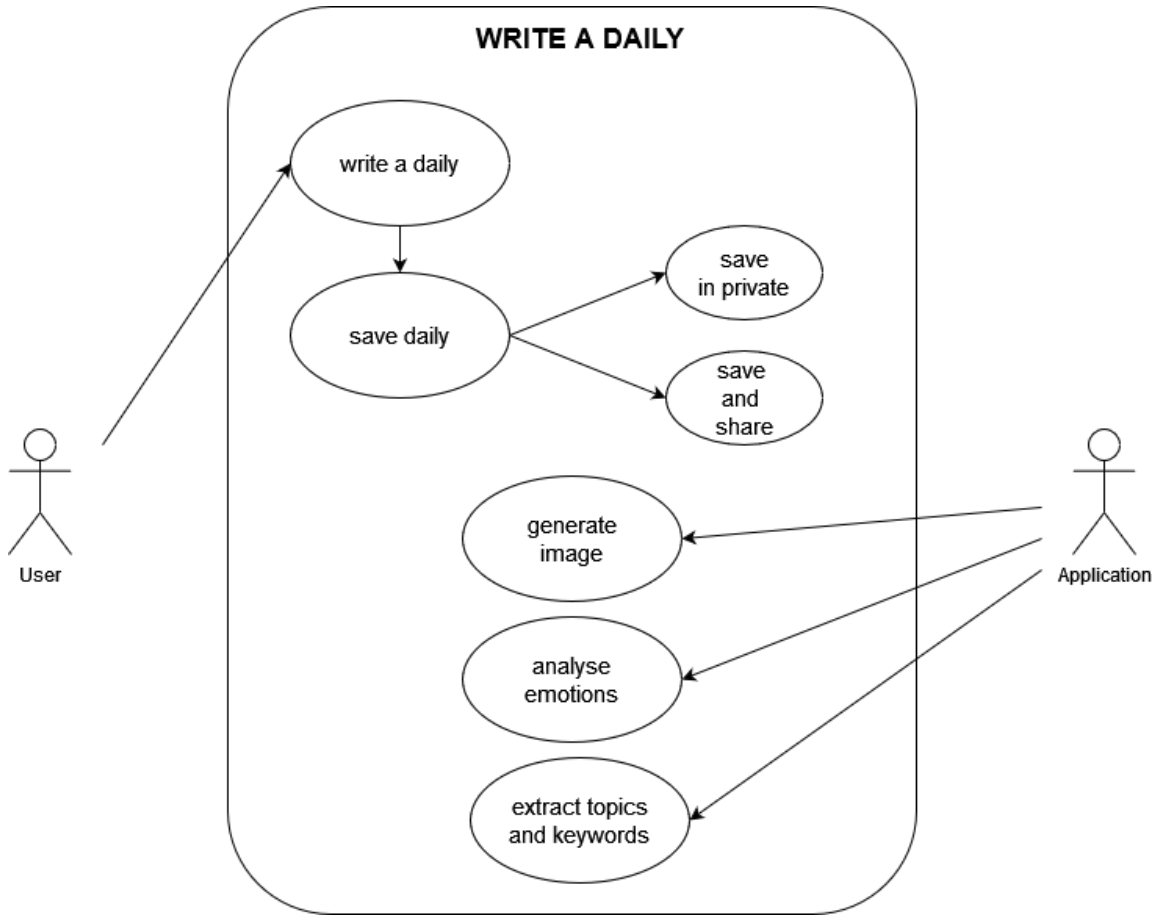
User:

- ☐ Write a daily
- ☐ Save a daily
  - ☐ Save in private
  - ☐ Save and share

Application:

- ☐ Generate image
- ☐ Analyse emotions
- ☐ Extract topic and keyword

Diagram:



4.5 Viewing Anonymous Dailies

Use Case:

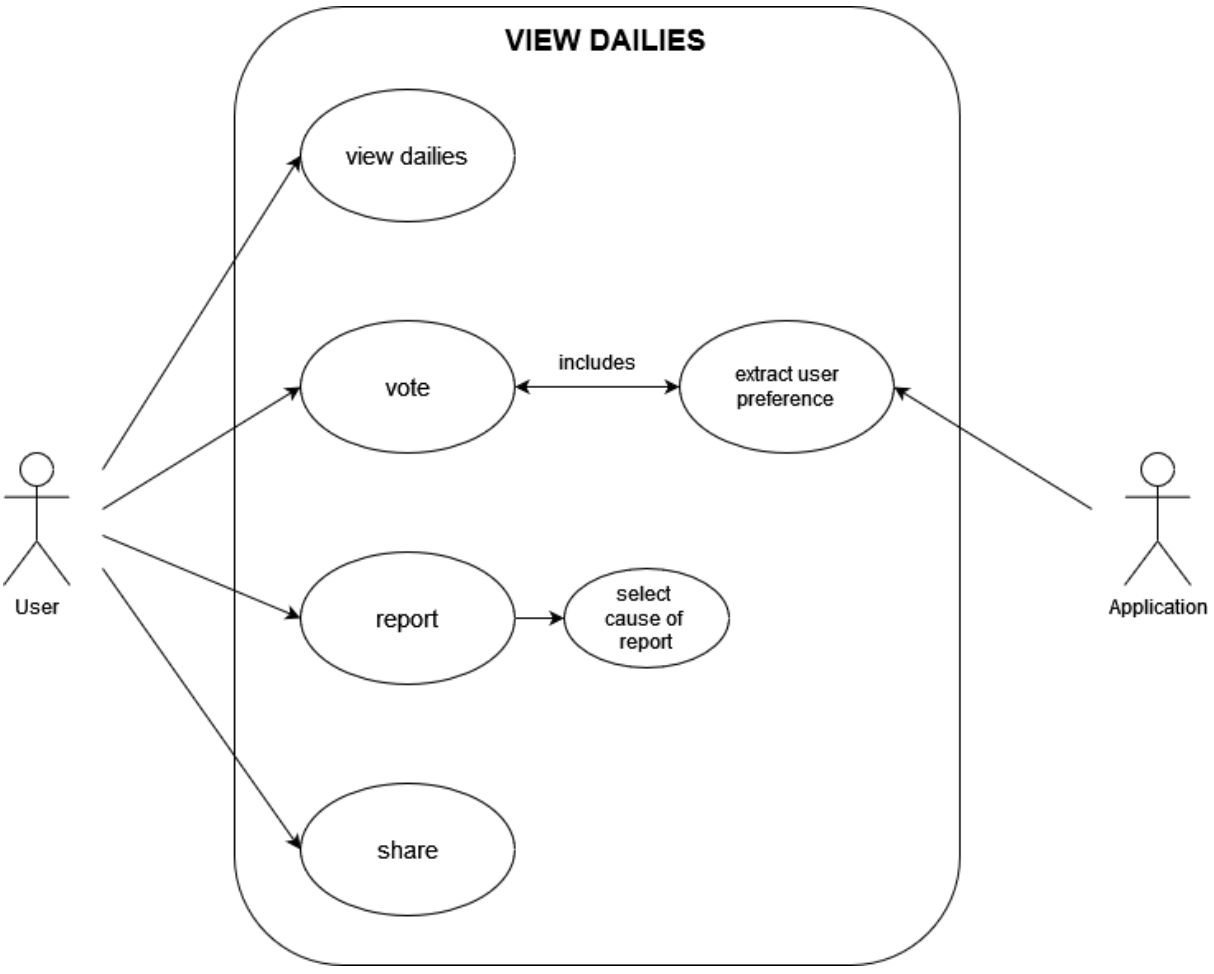
User:

- ☐ View dailies
- ☐ Vote
- ☐ Report
  - ☐ Select cause of report
- ☐ Share

Application:

- ☐ Extract user preferences based on user votes

Diagram:



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4.6 Detailed Descriptions

4.6.1 Viewing Homepage User Case

Actors	User
Use Case Number	UC1
Overview	This use case captures the process of a user viewing their homepage for the application.
References	FR3, FR5, FR7, FR9
Related Use Cases	UC2, UC3, UC4, UC5
Typical Flow Description	Precondition: Users are logged into their accounts and want to navigate around the application. 1. User selects the desired tab.

4.6.2 Viewing Album User Case

Actors	User
Use Case Number	UC2
Overview	This use case captures the process of a user viewing their previously generated pictures and if the user selects one of them, displaying the contents of the daily.
References	FR5, FR7, FR9, FR10
Related Use Cases	UC1, UC4
Typical Flow Description	Precondition: User has written at least one daily before and wants to display generated images. 1. User navigates to the album tab. 2. User can select or search from the displayed pictures or create a daily entry. Post-condition: If user selected a picture the application will show the daily's text contents.

4.6.3 Viewing Statistics User Case

Actors	User, Application
Use Case Number	UC3
Overview	This use case captures the process of a user viewing their homepage for the application.
References	FR3, FR5, FR7, FR9
Related Use Cases	UC1, UC4
Typical Flow Description	Precondition: User has written at least one daily before and wants to display their statistics. 1. User navigates to the statistics tab. 2. Application gives the user their statistics based on the previous daily entries.

4.6.4 Writing a Daily User Case

Actors	User, Application
Use Case Number	UC4
Overview	This use case captures the process of a user writing a daily.
References	FR7, FR8, FR10
Related Use Cases	UC1
Typical Flow Description	Precondition: User wants to write a new daily or continue writing a daily. 1. User navigates to write a daily tab. 2. User writes a diary. 3. User saves the daily. 4. User decides whether to share the daily anonymously or not 5. Application extracts topics and keywords. 6. Application generates an image 7. The image is send to the user. Post-condition: The daily is added to the album and displayed to the user.

4.6.5 Viewing Anonymous Dailies User Case

Actors	User, Application
Use Case Number	UC5
Overview	This use case captures the process of a user viewing anonymously shared dailies.
References	FR3, FR8, FR9, FR10
Related Use Cases	UC1, UC4
Typical Flow Description	Precondition: User wants to view global feed of dailies. 1. User navigates to the explore tab. 2. User views other people's daily pictures. 3. If user wants to read a daily, they tap on the picture. 4. If user wants to react, they vote or report. 5. If user reports the daily, they select a report reason. Post-condition: If user reports or votes on a daily, the voted or reported daily's reaction score changes.

5. Conclusion

Software Requirements Specification (SRS) for the "daily" application outlines its functionality, technical details, and user interaction mechanisms. The document reflects the app's innovative integration of AI for emotion analysis, and social sharing features, while ensuring user privacy and data security. This SRS provides a solid foundation for developing an intuitive and user-friendly journaling tool that aligns with technological advancements and user expectations.

Software Design Description

1. Introduction

1.1 Purpose

The purpose of this Software Design Document (SDD) is to detail the architecture and system design of the Daily platform. Daily is a journaling platform that provides a fun and new way of journaling and writing diaries by introducing artificial intelligence, data analysis and anonymous journal sharing features. By this journal sharing feature we aim to foster a sense of community. This document provides a comprehensive architectural blueprint of the system to effectively guide development, maintenance, testing, and evaluation of the platform.

1.2 Glossary

The Daily Platform: An innovative online system designed to enhance the journaling and diary-writing experience by leveraging artificial intelligence and data analysis. It offers features such as personalized daily albums, dynamic daily sharing, statistical emotional analysis

Daily: Refers to the name given to each diary entry in "The Daily Platform" application, serving as the backbone of the platform. Once a daily is created, it cannot be edited after 12 PM.

AI (Artificial Intelligence): The incorporation of intelligent algorithms and data analysis techniques to enable "The Daily Platform" to emotionally analyze diary entries, generate unique images, and enhance the overall journaling experience.

React Native and Expo: Frameworks used for developing "The Daily Platform" application for both iOS and Android platforms, providing a user-friendly interface.

Gin Framework: The backend framework powering "The Daily Platform," ensuring robust, scalable, and efficient performance.

Roberta (RoBERTa): A natural language processing (NLP) model that builds upon BERT architecture, developed by Facebook AI Research (FAIR). Known for its innovative pre-training approach, including the removal of the next sentence prediction (NSP) objective and dynamic masking during training.

Key Extraction: The process of identifying and extracting crucial information or keywords from a given text. In the context of RoBERTa, it excels in key extraction, aiding applications like document summarization, information retrieval, and content analysis.

Emotion Recognition: The ability of RoBERTa to discern emotional tones within text, enabling accurate identification and categorization of emotions expressed in written content. This has applications in sentiment analysis and emotional support systems.

Sentiment Analysis: The process of determining the sentiment expressed in a piece of text, often used for understanding user emotions and attitudes. RoBERTa's capabilities make it suitable for sentiment analysis applications.

Dynamic Masking: A training strategy used in RoBERTa where each instance is randomly sampled with different masks during each epoch. Enhances the model's ability to generalize across various contexts, contributing to better overall performance on NLP benchmarks.

User Privacy: Ethical consideration emphasized when working with data from online communities like Reddit. Involves ensuring data anonymization and training the model with respect for the privacy and sensitivity of the shared content.

2. System Overview

The daily platform is a revolutionary online system tailored to enhance the journaling and diary-writing experience. It leverages the power of artificial intelligence and data analysis to introduce a new way of personal expression and community building. Sharing personal stories, daily offers an innovative anonymous journal sharing feature, facilitating a deeper sense of connection among its users.

A “daily” - the name of every diary entry in our application - is the backbone of our application. These dailies cannot be edited after once the clock hits 12 PM. The platform's features are designed with users' needs at the center of the design. These features include personalized daily albums, a dynamic daily sharing system, statistical emotional analysis, personal growth tracking features, among others.

Designed for both iOS and Android platforms using React Native and Expo, it offers a user-friendly interface that encourages users to connect with their inner child and writer. What sets it apart is its AI functionality, built using Python, which emotionally analyzes these entries to gain insights into the user's mood and thoughts. The AI then generates a unique image that encapsulates the essence of the daily, adding a visual dimension to the journaling experience. On the backend, the application is powered by the Gin framework, ensuring a robust, scalable, and efficient performance. "d**ai**ly" is more than just a diary app; it's a platform for self-expression, emotional exploration, and communal support, driven by AI.

Artificial Intelligence

RoBERTa

Roberta, short for "Robustly optimized BERT approach," is a natural language processing (NLP) model that builds upon the success of the BERT (Bidirectional Encoder Representations from Transformers) architecture. Developed by Facebook AI Research (FAIR) in 2019, Roberta enhances the pre-training process of language models by addressing certain limitations of BERT. The training approach has been modified, which is the main innovation, specifically in the removal of the next sentence prediction (NSP) objective and the implementation of dynamic masking during training which involves predicting whether two sentences follow each other in the training data. This change allows Roberta to effectively leverage bidirectional context without relying on the artificial task of predicting the sequential relationship between sentences.

Additionally the dynamic masking approach enhances the model's ability to generalize across various contexts, leading to better overall performance on a wide range of NLP benchmarks. The modification of the masking strategy contributes to the performance of the model by exposing it to diverse patterns in the training data, thereby improving its adaptability to different linguistic structures.

Why did we choose RoBERTa?

Choosing Roberta as the foundation for our AI model is a strategic decision, due to its success in key extraction and emotion recognition applications. RoBERTa's advanced architecture, which optimizes the pre-training process, has been important in achieving superior results in these specific domains.

RoBERTa excels in identifying and extracting crucial information or keywords from a given text. Whether applied to document summarization, information retrieval, or content analysis, RoBERTa's proficiency in key extraction provides a foundation for developing AI models that excel in understanding and summarizing textual information.

Emotion recognition, another critical application, benefits significantly from Roberta's capabilities. By leveraging RoBERTa's advanced features, AI models can be trained to accurately identify and categorize emotions expressed in written content.

In summary, the choice of RoBERTa for our AI model is well-founded, particularly in the context of key extraction and emotion recognition. The model's solid architecture and training methodologies position it as a reliable and effective tool for developing applications that demand nuanced language understanding, making it a valuable asset in the realm of natural language processing.

Training Data

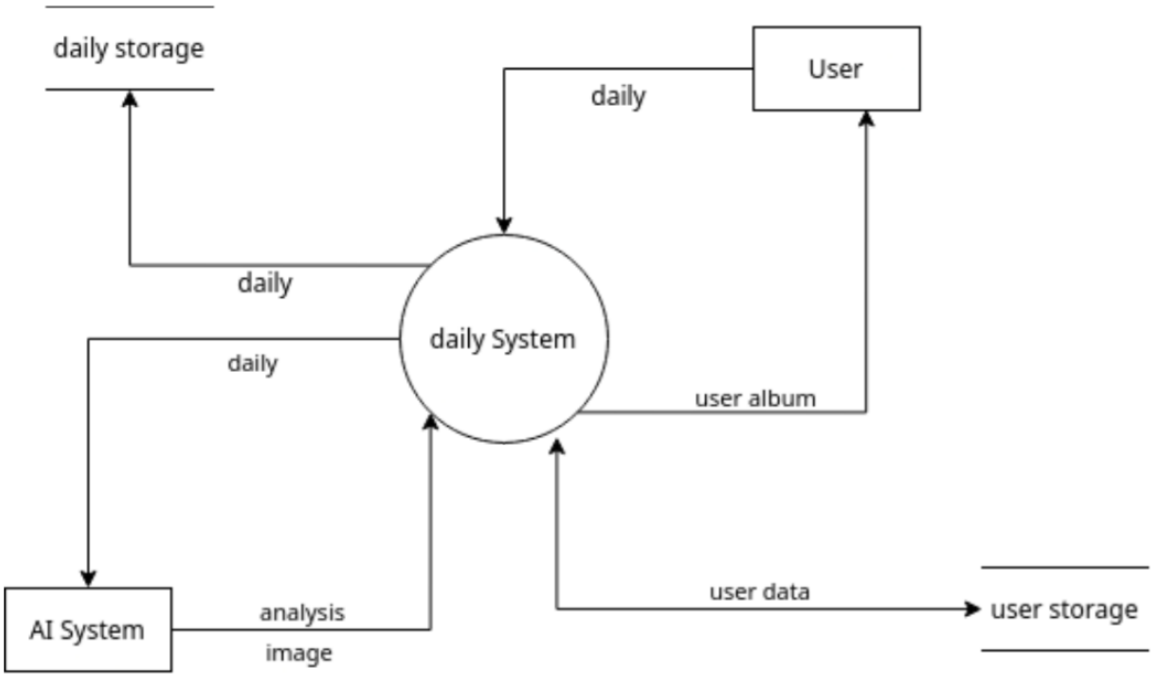
We chose Reddit’s "r/offmychest" subreddit to train our model because of conceptual similarity with diary taking. "r/offmychest" is a subreddit where individuals share personal stories, struggles, and emotions in a supportive community environment. Utilizing this data source for training can offer our model exposure to a diverse range of real-world experiences and language use..

However, it's important to be mindful of potential challenges associated with using user-generated content from online forums. The language on Reddit, including "offmychest," can vary widely in terms of formality, grammar, and cultural references. This diversity can be both an asset and a challenge, as the model needs to be adept at handling informal language and understanding context within various conversational styles.

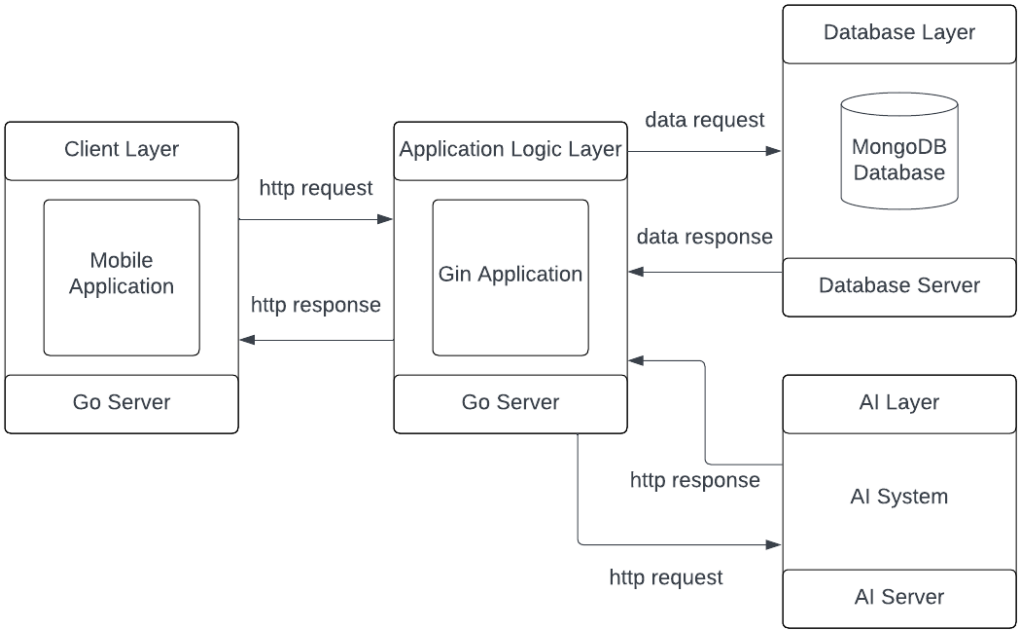
Additionally, it's crucial to consider ethical considerations and user privacy when working with data from online communities. Ensure that the data is anonymized and that our model is trained with respect for the privacy and sensitivity of the content shared on the subreddit.

3. System Design

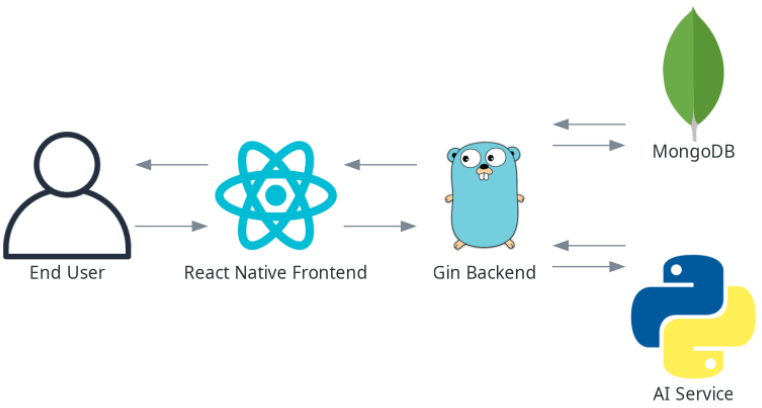
3.1 Context Diagram



3.2 High Level System Architecture Diagram

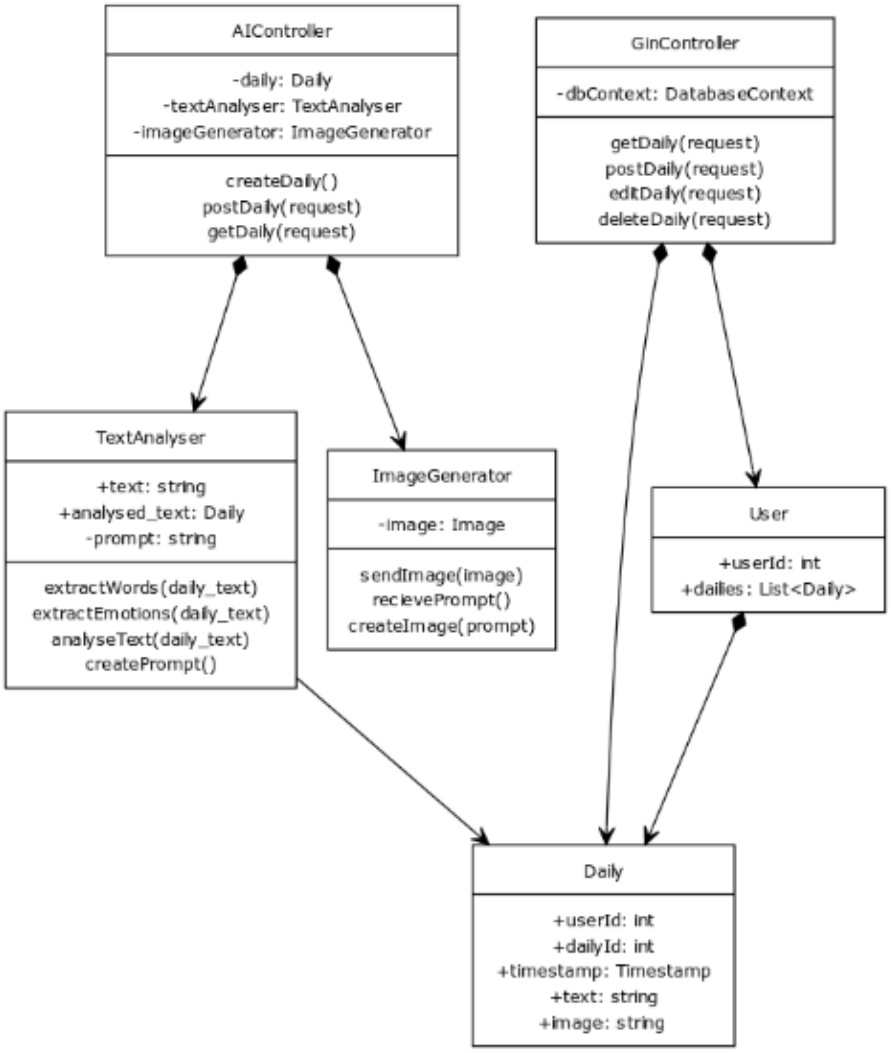


3.3 Service Flow



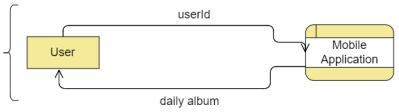
Service Flow

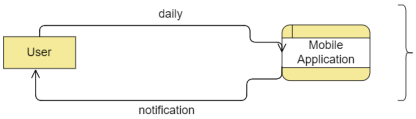
3.4 UML Class Diagram



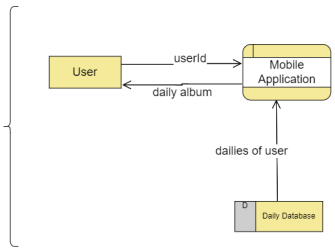
3.5 Data Flow Diagram

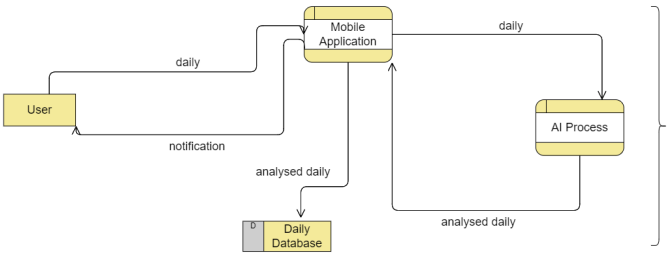
Level 0 Data Flows



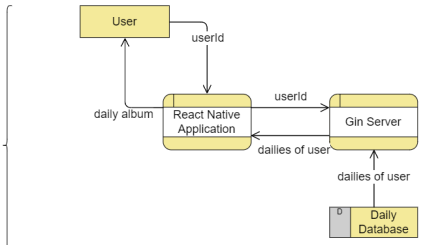


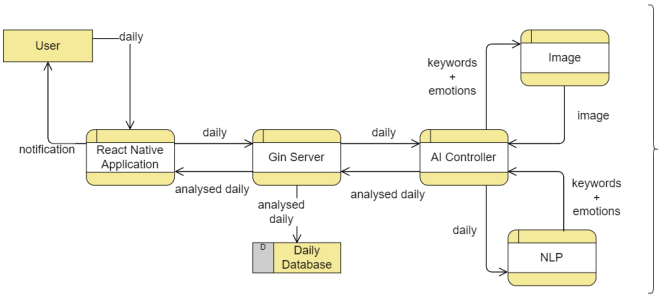
Level 1 Data Flows





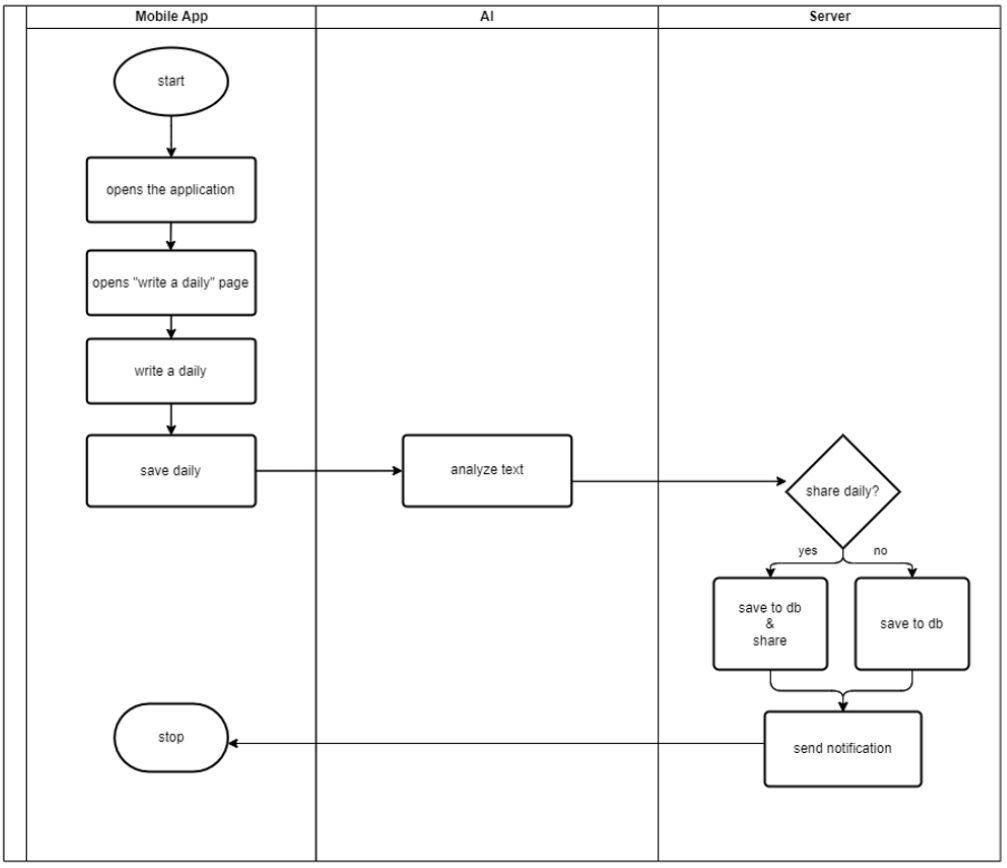
Level 2 Data Flows



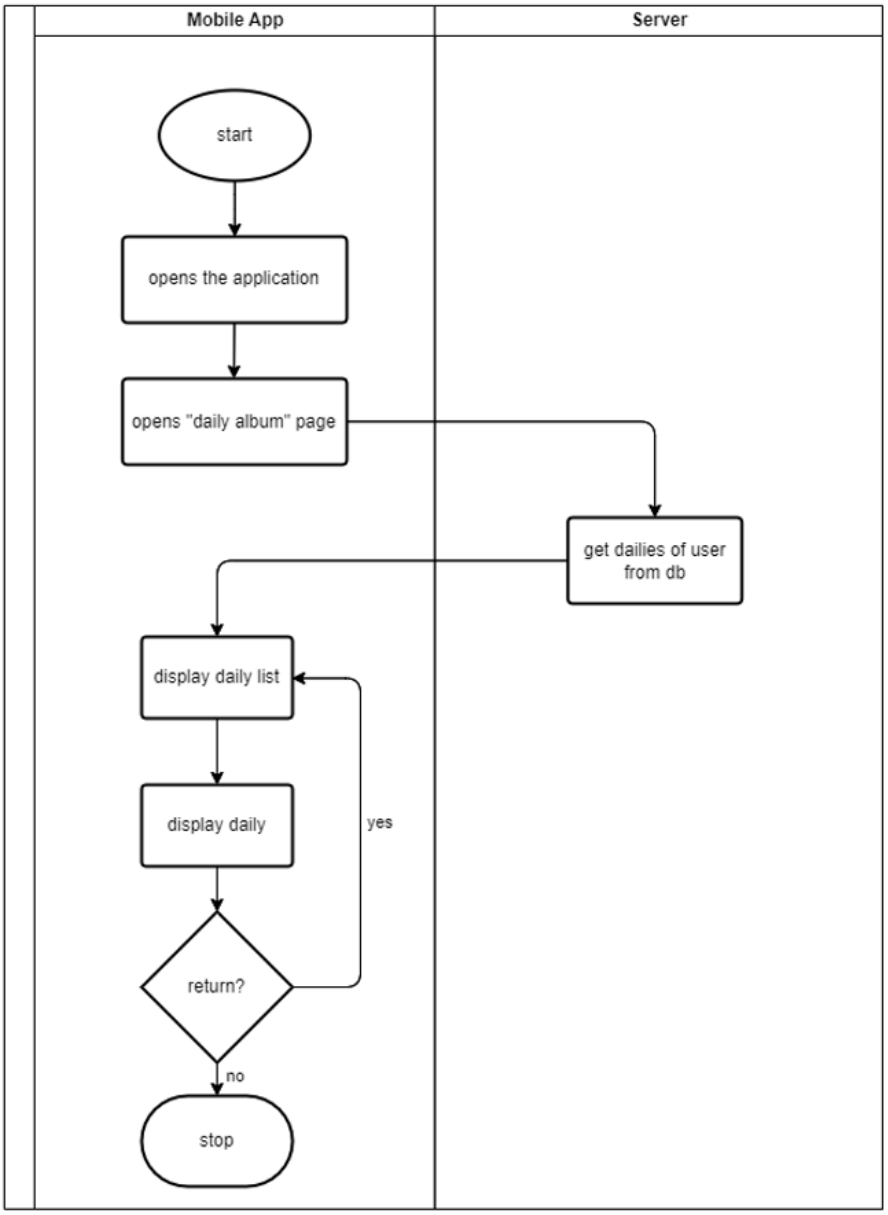


3.6 Activity Diagrams

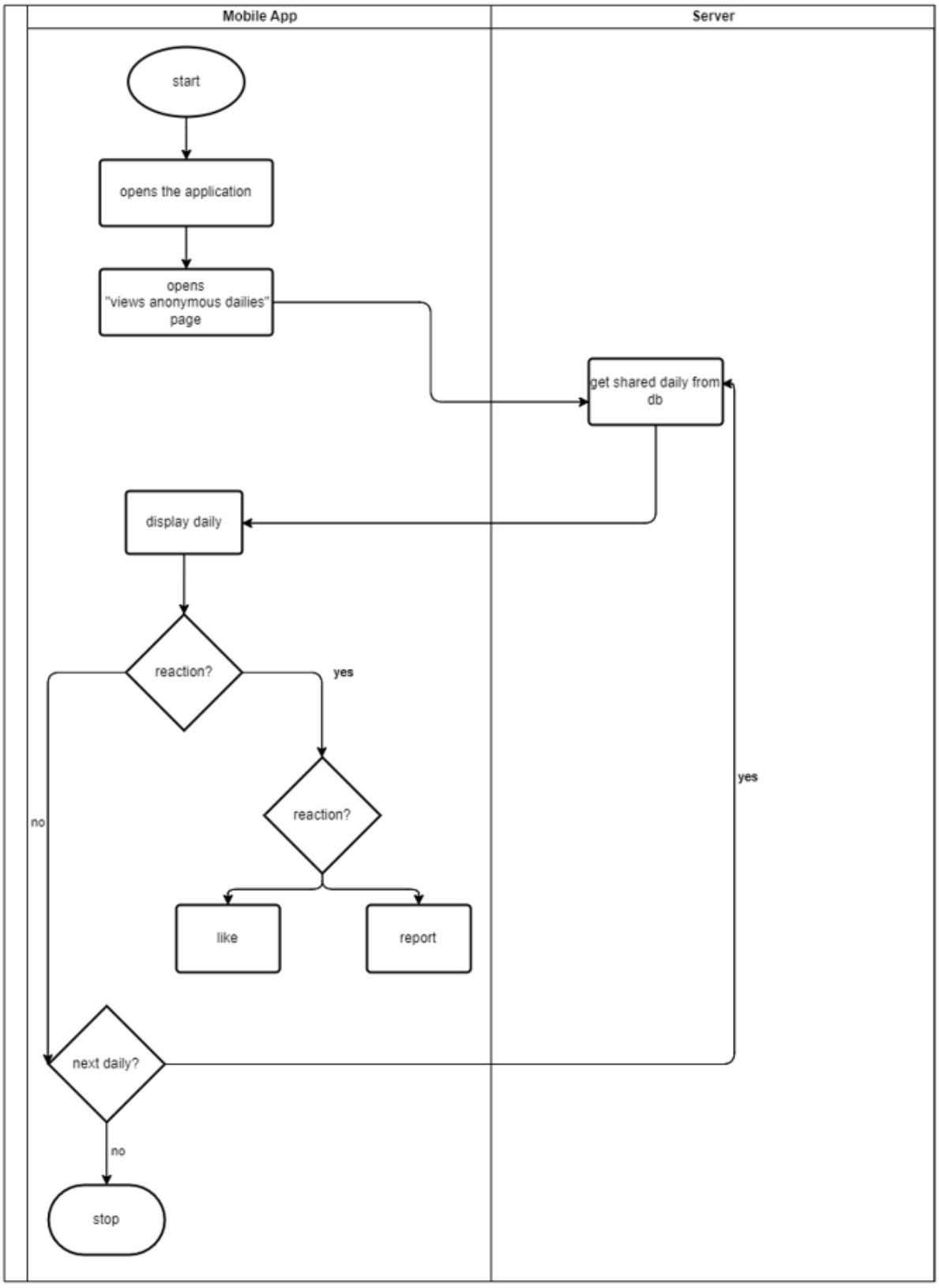
3.6.1 Writing a daily



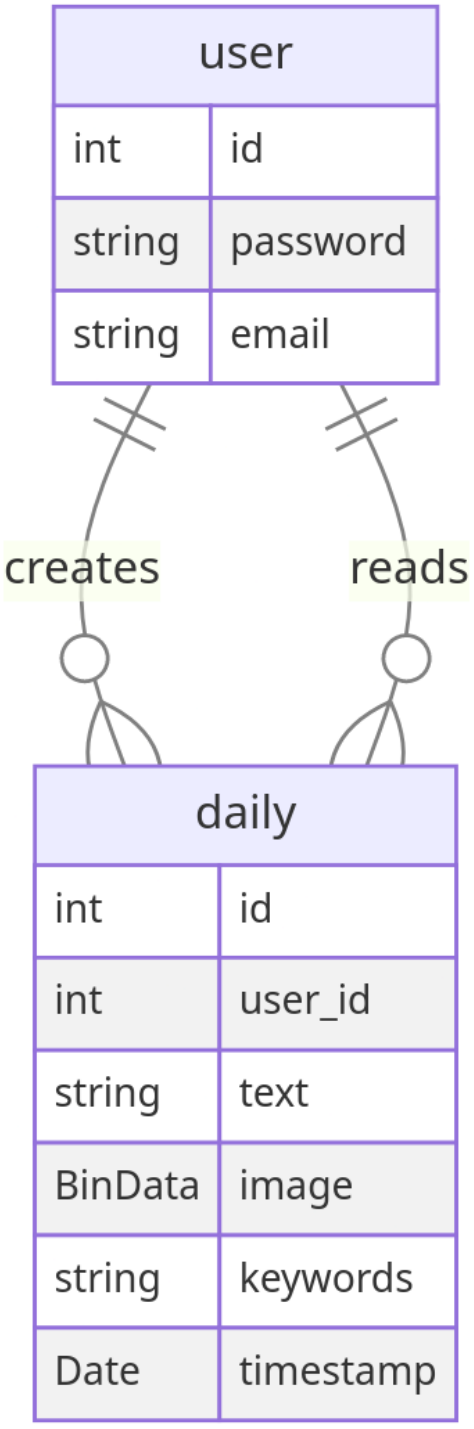
3.6.2 Display Album



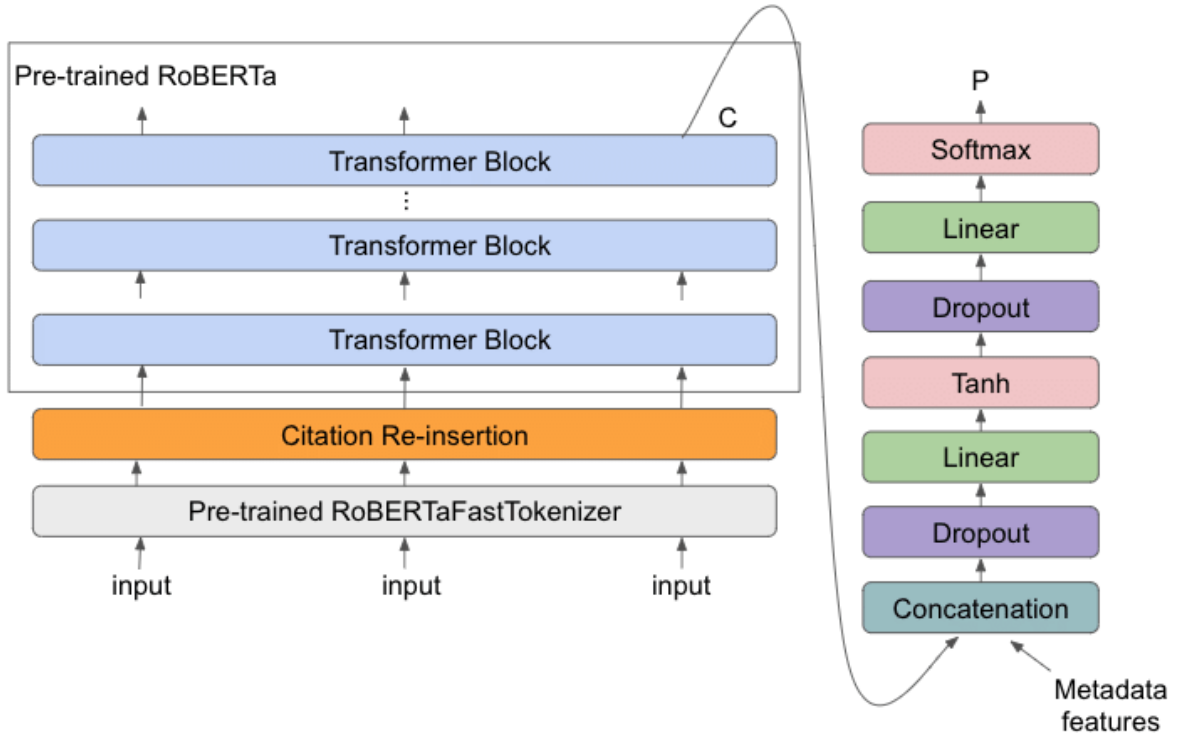
3.6.3 View Shared Dailies



3.7 Entity-Relationship Diagram

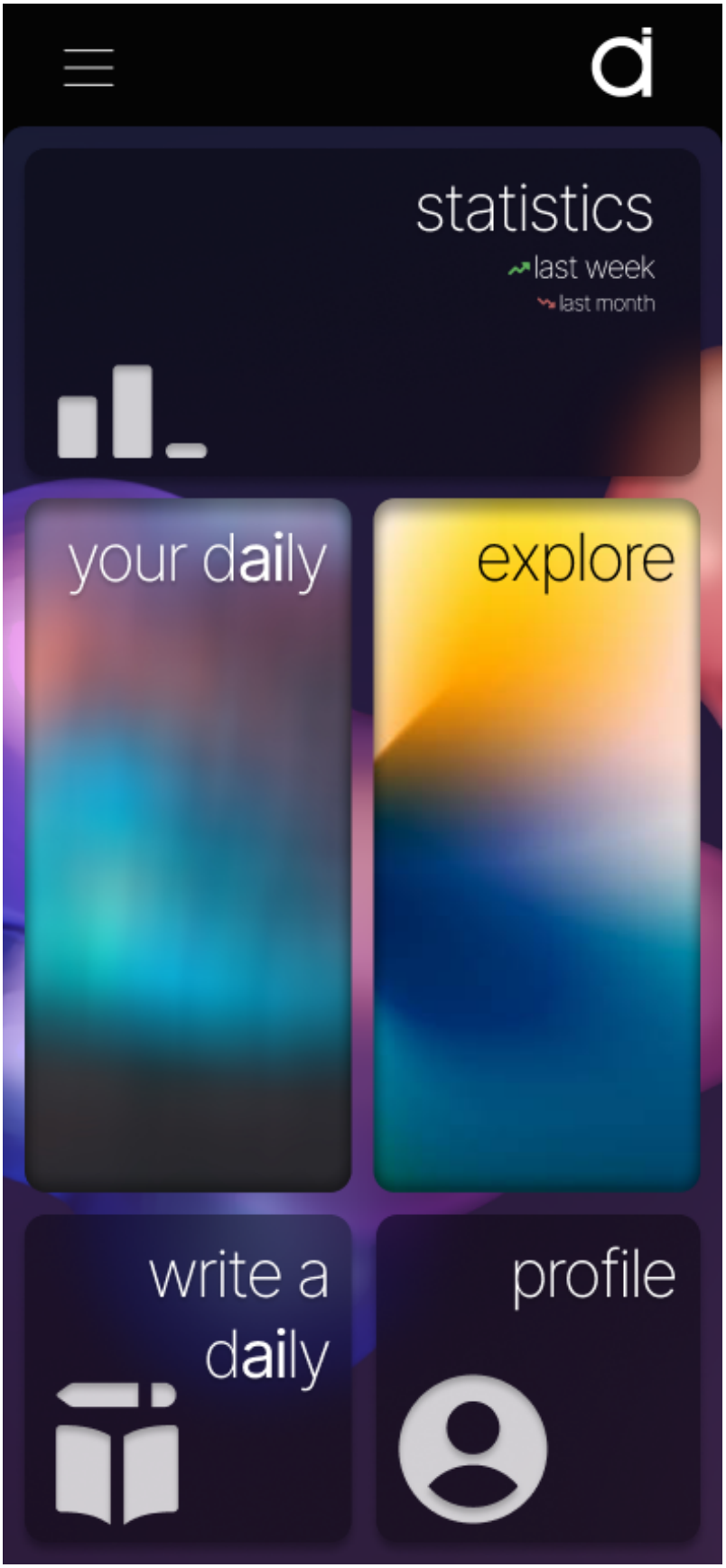


3.8 RoBERTa Model Architecture Diagram

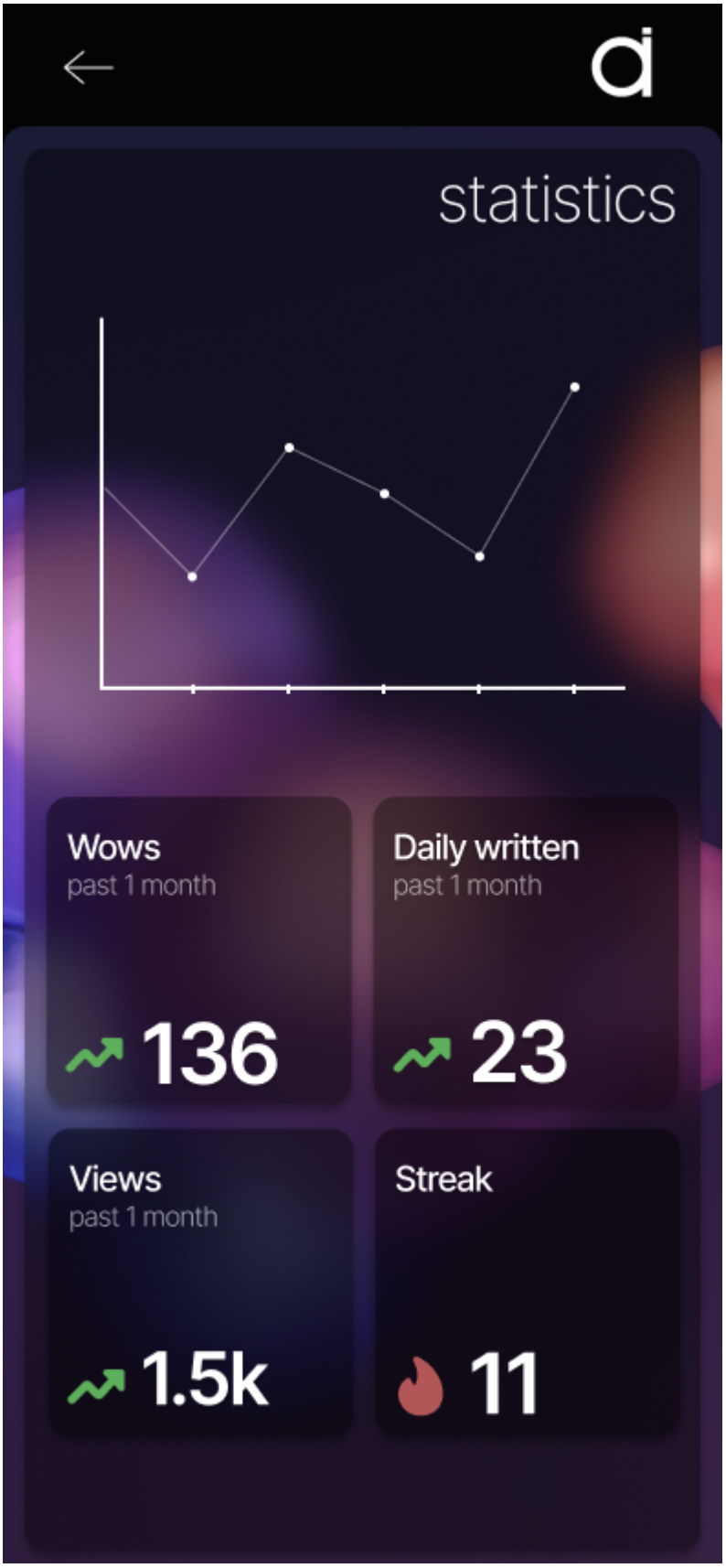


4. User Interfaces

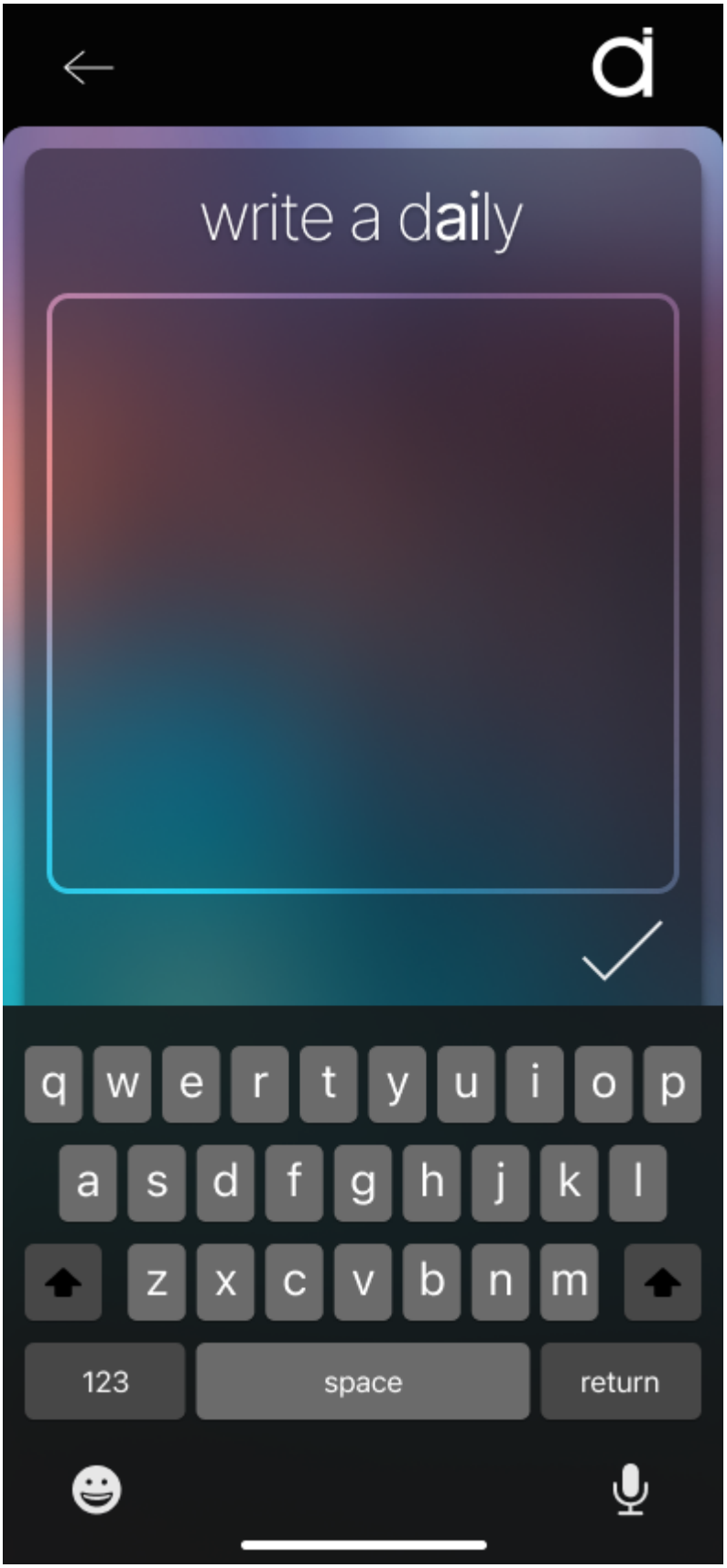
4.1 Homepage



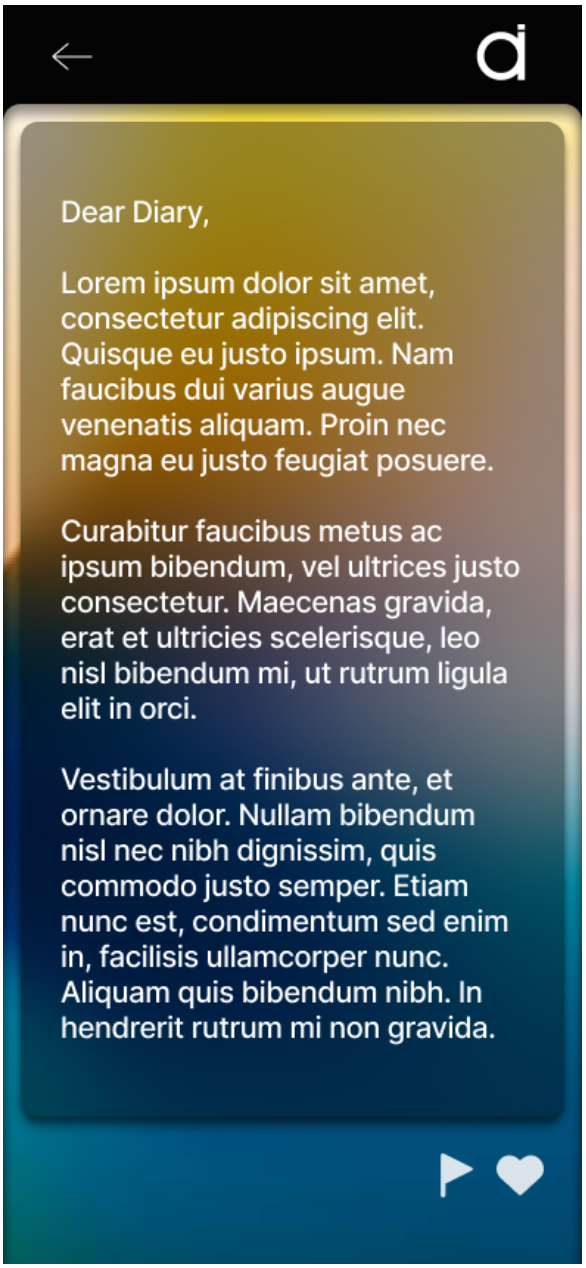
4.2 Statistics



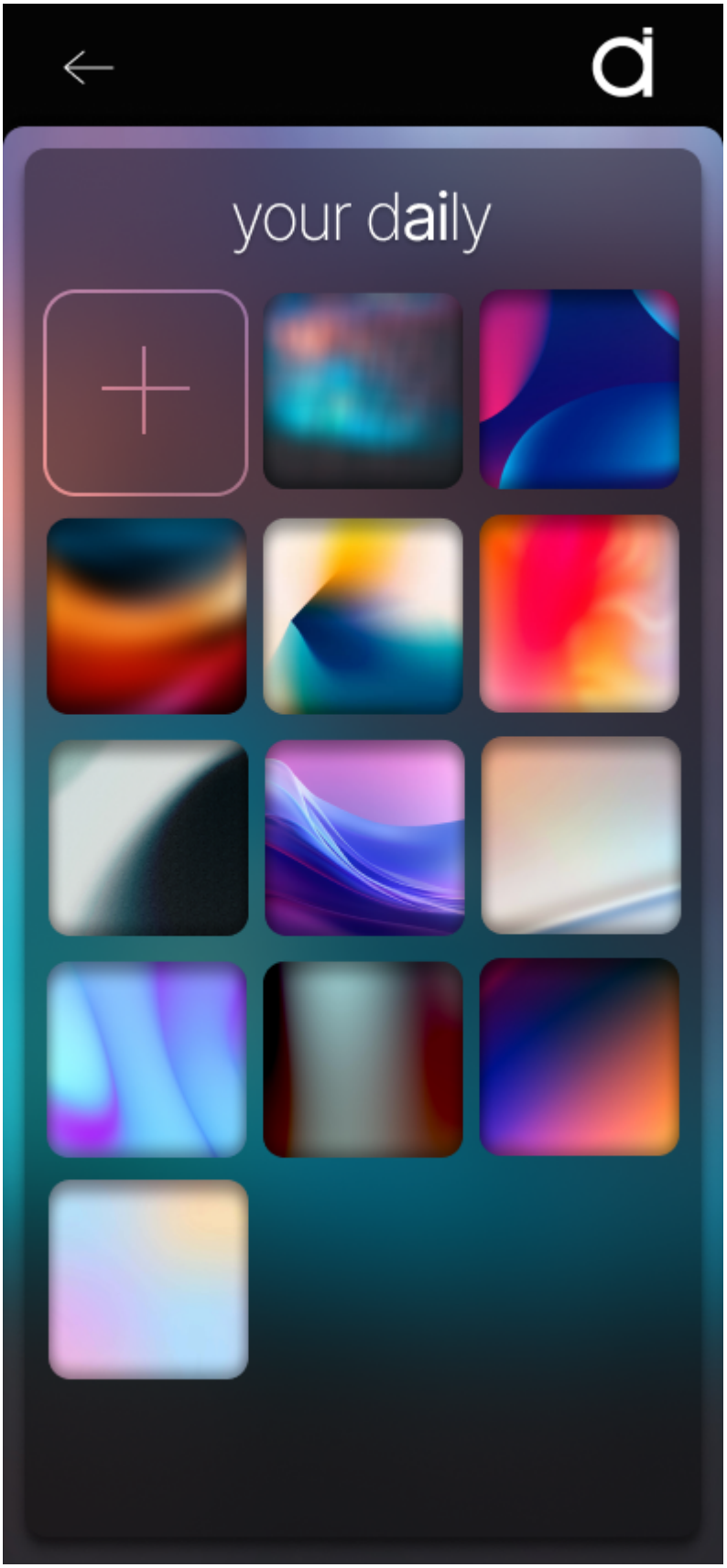
4.3 Write a Daily



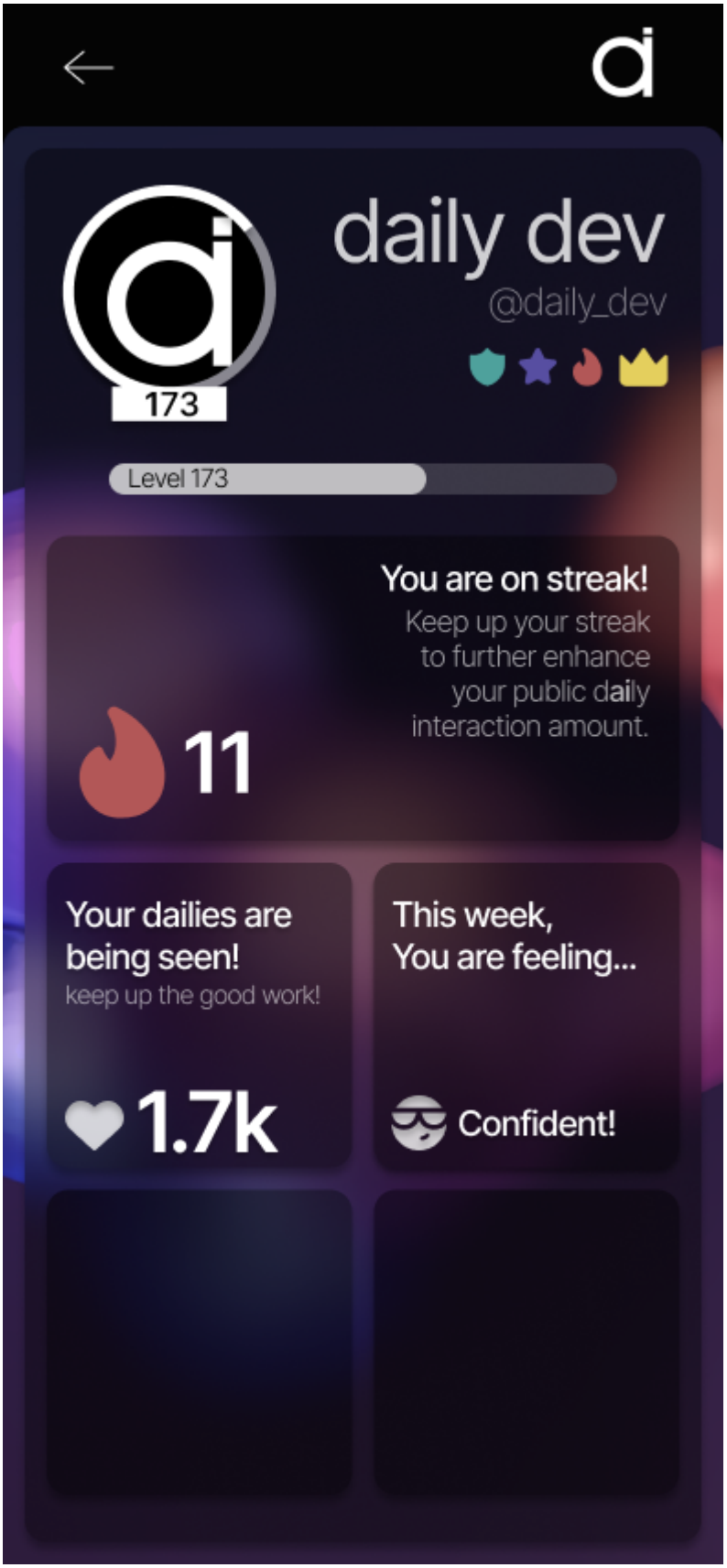
4.4 Explore


Dear Diary,
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Quisque eu justo ipsum. Nam faucibus dui varius augue venenatis aliquam. Proin nec magna eu justo feugiat posuere.
Curabitur faucibus metus ac ipsum bibendum, vel ultrices justo consectetur. Maecenas gravida, erat et ultricies scelerisque, leo nisl bibendum mi, ut rutrum ligula elit in orci.
Vestibulum at finibus ante, et ornare dolor. Nullam bibendum nisl nec nibh dignissim, quis commodo justo semper. Etiam nunc est, condimentum sed enim in, facilisis ullamcorper nunc. Aliquam quis bibendum nibh. In hendrerit rutrum mi non gravida.

4.5 Your Daily



4.6 Profile


daily dev
@daily_dev
173
Level 173
You are on streak!
Keep up your streak to further enhance your public daily interaction amount.
11
Your dailies are being seen!
keep up the good work!
1.7k
This week, You are feeling...
Confident!

Conclusion

This report integrates a detailed work plan, a literature review, a Software Requirements Specification (SRS), and a Software Design Description (SDD). It explores the integration of AI in journaling, with an emphasis on emotion detection and image generation as well as introducing social media like features to the application to create a community. The report demonstrates a framework for the development process, considering both technical and ethical aspects. It serves as a foundational document, guiding us through the creation of our mobile application.

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