deeper: The Mental Health Connector for Mental Health Consumers & Loved Ones

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Project Summary—The platform to be developed will allow mental health consumers and loved ones to better connect and empathize with one another. The aim of this application is not necessarily to build new connections or provide professional mental health services. There are already so many applications that provide these functionalities; rather, our value proposition comes from strengthening the connections that the user already has. The MVP to be delivered will involve three main functionalities detailed below: NLP journaling system, community forum, and a robust messaging system.

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1 Need for this Project

From the survey we conducted, the majority of loved ones participants state that the methods that they used to support the mental health consumer was less than 5 on an effectiveness scale from 1 to 10. Therefore, the app is for the mental health consumer and their loved ones. This application is needed because it is difficult for both parties to empathize with each other and understand each other's needs. The loved one wants to support the mental health consumer but does not know the best strategies usually to do so; at the same time, the mental health consumer wants the loved one to understand and not burden them. Especially on college campuses, mental health resources tend to be difficult to access or there are not enough resources to best support students. This application hopes to solve this issue and provide another supportive mechanism, especially since there are not currently any mental health solutions that target improving the connection between mental health consumers and their loved ones.

2 Problem Statement and Deliverables

2.1 Problem Statement

We connect mental health consumers and their loved ones to make meaningful mental health services accessible to all. This project involves the design of a mobile application that aims to bridge the gap between those suffering from mental health disorders (focusing on depression/anxiety with college students on college campuses first) and their friends and family. The aim is to improve the connection between mental health consumers and their loved ones. Specifically, this app will contain a monitoring and journaling system for an individual to gauge their own mental wellbeing while bringing awareness to this progress for third-party users associated with the individual. The latter will be done through machine learning in which the application will be able to gather information from an individual's interaction with the app. In addition, with the existing lack of understanding for how to help those with mental illnesses, this app acts as a platform to connect with and keep their family and friends updated with interactive functionalities such as empathizing tips. Our app provides another supportive mechanism; no current mental health solutions improve the connection between mental health consumers and their loved ones. Please see the competitive landscape section for other applications in the mental health space that do not have the value proposition we provide.

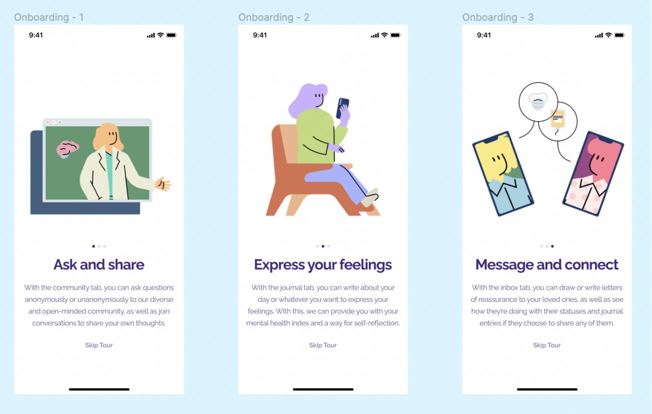
2.2 Deliverables

We will be testing this out on college students and deploying the app on Google Play and the Apple store. We aim to achieve a 75% accuracy on our ML algorithm for our journal and plan to continue training/iterating to approach the 100% mark. Please see the engineering requirement section for specific features.

3 Visualization

Bridging the gap between mental health consumers and their loved ones needs the facilitation of communication, convenience, and accessibility. The project functions involve both parties, in which the mental health consumer should have a way to healthily process and express their feelings for themselves and for others, while the loved one should have a way to properly relay their support and check in on their own mental health. Therefore, to fulfill and execute all of these functions, the project will be fully software-based, specifically in the form of a mobile application.

With the target of college students as mental health consumers in mind, there will be a singular user interface that will be simple and easy-to-use, emulating social media for building bonds and familiarity. The app requires sign-in authentication to differentiate, store, and connect people. It will also incorporate three main functionalities to address the pain points of mental health consumers, and they can be translated into interface requirements: a community page to ask questions or participate in conversations related to mental health, a journal page to safely express feelings and thoughts, and an inbox page to receive reassurance and check statuses of loved ones. The user will learn these functionalities with onboarding pages that are prompted after they sign in, as shown in Figure 1.1. After this introduction, the user will see their homepage, and there are tabs on the bottom of the app to navigate through the different pages, which each hold the functionalities, as shown in Figure 1.2. There will be back arrows to navigate back. All of these design choices will be to ensure that the app is intuitive, especially for college students. For a more in-depth app wireframe, please refer to the following link: https://www.figma.com/file/8lHPYkZNslN37Y4j8CfBP6/Healthcare-App-with-Blush-Illustrations-Community?node-id=6%3A0.



Ask and share

With the community tab, you can ask questions anonymously or unanonymously to our diverse and open-minded community, as well as join conversations to share your own thoughts.

Skip Tour

Express your feelings

With the journal tab, you can write about your day or whatever you want to express your feelings. With this, we can provide you with your mental health index and a way for self-reflection.

Skip Tour

Message and connect

With the inbox tab, you can draw or write letters of reassurance to your loved ones, as well as see how they're doing with their statuses and journal entries if they choose to share any of them.

Skip Tour

Figure 1.1 This is a wireframe of the onboarding screens when the user signs in. It details what they can do with the app (ask and share with the community tab, express feelings with the journal tab, and message and connect with the inbox tab).

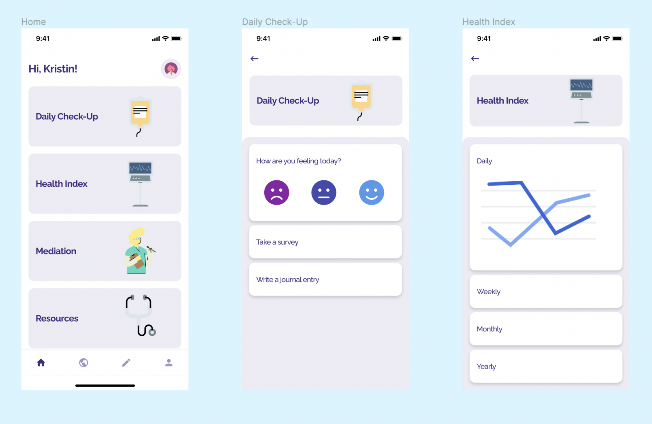


Figure 1.2 The left-most screen is a wireframe of the homepage, as well as some prompted functionalities (daily check-up, health index, mediation, and resources). Next to it are screens showing how the daily check-up and health index look and work.

4 Competing technologies

Based on research done on existing mental health applications available for both Android and iOS, the competition space can be categorized into two different sections.

The first section is composed of apps that allow users to anonymously search for professional help online. The following are some of the most widely used apps in this section and their key features.

- ❖ Talkspace
  - ➢ Offers a quick initial assessment to help the user get matched to the best counselor for their needs
  - ➢ Offers 24/7 counseling service
  - ➢ The level of support depends on the user's budget
- ❖ BetterHelp
  - ➢ Offers a quick initial assessment to help the user get matched to the best counselor for their needs
  - ➢ Supports different mediums to contact your counselor
  - ➢ Affordable

The second section is composed of apps that serve as a daily tracker for the user's feelings, emotions, and daily activities. The purpose of these apps is to help improve both monitoring and management of mental health conditions. They do so by applying different methods such as Cognitive Behavioral Therapy (CBT) and Acceptance Commitment Therapy (ACT) to help cope with feelings of depression, stress, and more. The following are some of the most widely used apps in this section and their key features.

- ❖ MoodKit
  - ➢ Offers a pool of suggested activities that enhance the user's sense of well-being and reduces negative feelings
  - ➢ A questionnaire to help users identify and modify negative thoughts

    - ➢ Monitoring screen that allows users to track their mood progress
    - ➢ Journal entry
- ❖ What's Up
    - ➢ A mood scale for users to record their daily feelings
    - ➢ Provides a set of breathing exercises, uplifting quotes, and additional information regarding mental health
    - ➢ Contains a forum where users can talk to others, creating a sense of a support group
    - ➢ Journal entry

From these descriptions and analyses, it is clear that our product is more similar to those in the second section. We plan to keep key features from these apps (e.g., journal entry, mood scale, exercises) but additionally implement more complex algorithms and features to better improve user experience and target the link between loved ones and users. No other app has this functionality.

5 ENGINEERING REQUIREMENTS

By gathering our team members' coding preferences and their past experiences, we've decided the frameworks and languages to use.

Frontend	React Native
Backend	Node.js, PyFlask
Cloud	Azure
Database	MongoDB

Since we've decided to deploy our app on both Apple's App Store and Google Play Store, we've decided to develop our frontend using a cross platform framework. Since most of us have some experience in React Native, we've decided to choose this framework.

For the backend, we've decided to use both Node.js and PyFlask to do backend processing. Both of them are powerful tools, and half of our team has some experience in at least one of those frameworks. Because Node.js is based on JavaScript, which is the same programming language used in React Native, the frontend and backend would be able to integrate fluently. Since we're using PyTorch library for the machine learning algorithm, using another Python-based framework, such as PyFlask, would be ideal to integrate the algorithm into the backend.

With the database, we choose to use MongoDB. The reason we choose this non-SQL database is because it enables us to save blobs of data. This system is extremely important because the way we've planned for our backend requires many self-defined data structures and classes. In this case, a database that doesn't require further formatting steps is the best choice. In addition, MongoDB has really comprehensive documentation on how to deploy it on Azure. This practicality would give us thorough guidance when we start to deal with clouds.

For the machine learning algorithm, PyTorch is the most popular library to use when it comes to Python machine learning development. Since some of the libraries and existing algorithms are based on PyTorch, we've decided to continue using PyTorch to develop the natural language processing functionality.

After extensive review and discussion, we've narrowed down the main functionalities of our mobile application. There are 3 main functions in our app: Journal Entry System, Message System, and Community. Here are the requirements for these three parts.

1. Journal Entry System
    a. Uses a natural language processing algorithm to give an accurate emotional index. The accuracy should be over 75%.
    b. The NLP algorithm reads only journals when the user gives permission to do so.
    c. Enables the user to share specific journals with others in our app or through other messaging apps.
    d. Only those who are the creator of the journal and those who are permitted to read the journal can read the shared journal.
    e. One can also share the mental health index that is tied to the journal.
2. Message System
    a. Uses instant messaging system.
    b. Includes a drop-down list to show friends' current status.
3. Community System
    a. Users are able to share their days and ask for others' opinions by posting "posts" in the community.
    b. Users can leave comments and like the post.
    c. Users have full control over the posts they've sent.

Here's our general fullstack flowchart of our application (Figure 2). As Figure 2 shows, the backend is mostly API endpoints. Frontend communicates with the backend through these endpoints. For maximum user data privacy, we've designed two databases that also talk to each other: one temporary database, and one more "permanent" database.As Figure 2 indicates, the message system stores messages in there temporarily. And as soon as the backend got confirmation of message delivery, the message in the database will be cleared.

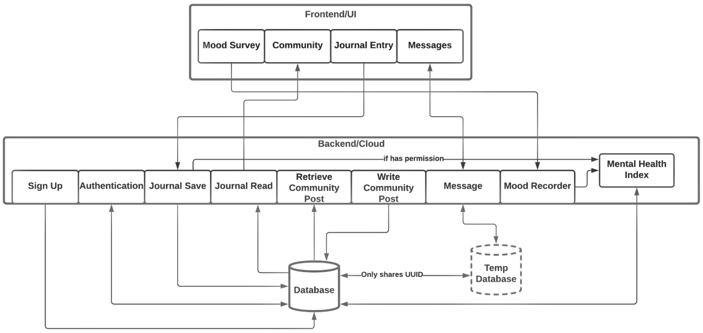


Figure 2 *Fullstack flowchart of the application.*