

CLOUD NINE: MENTAL DISORDER IDENTIFICATION AND HELP GUIDE

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ULAB

UNIVERSITY OF LIBERAL ARTS
BANGLADESH

CLOUD NINE: MENTAL DISORDER IDENTIFICATION AND HELP GUIDE

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A report submitted
in partial fulfilment of the requirements
for the degree of Bachelor of
Science in Computer Science and Engineering

UNIVERSITY OF LIBERAL ARTS BANGLADESH
Dhaka, Bangladesh
October, 2021

DECLARATION

I declare that this report entitled "Cloud Nine: Mental Disorder Identification and Help Guide" is the result of my own research except as cited in the references. The report has not been accepted for any degree yet and is not concurrently submitted in candidature of any other degree either.

Signature:

A rectangular box containing a handwritten signature in cursive script that reads "Mithila".

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Date: 12 October, 2021

CERTIFICATE OF APPROVAL

The project report entitled "*Cloud Nine: Mental Disorder Identification and Help Guide*" is submitted to the Department of Computer Science and Engineering at University of Liberal Arts Bangladesh (ULAB) in partial fulfillment of the requirements for the degree of Bachelor of Science.

Dated: October 12, 2021.

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DEDICATION

To the most special person of my life, my husband and family members, who gave me constant love, trust, consistent support throughout the journey of developing the project. Also, their unconditional believe in me that made me strong enough to stand back through the up and downs I faced.

To my mentors and companions for their understanding, support, love, and for spending their precious time to listen and discuss about my problems through the long journey, and until the ending of this proposition.

This report is dedicated to all of them. Small or big, they all have contributed to my work bit by bit.

ACKNOWLEDGEMENT

Each and every one who have helped me to finish this project, I appreciate all of their part of contribution even if it was really small, it matters a lot to me. Apart from that, thanks to Almighty who gave me the strength to work and held me back whenever I needed any kind of support or faced trouble throughout the task.

Special thanks to my project supervisor Bijan Paul sir for all his patience. Also, for his precious time to listen to my problems, guidance and support during the development of this project. Without his outstanding guidance it would be impossible for me to conquer each of the obstacles that I experienced in these hard three months of my development of this project. His huge expectation from me inspired me a lot to work really hard and meet his expectations.

My husband, family and friends gave me feedback by installing the app in their phones and gave me suggestions that helped me so much to improve my project. I am really thankful to all of them.

ABSTRACT

Mental Disorder is a worldwide problem. There are enormous number of patients with mental disorders worldwide. Unfortunately, it is a taboo not only in our society but also in the rest of the world too. People get hard time understanding that mental disorder is as normal as any other physical disorder or diseases. Also, it is equally normal to have any kind of mental disorder just like any other physical disorder. All we have to learn about is how we can treat mental disorder in a way so that the patients who have any mental disorder is not afraid to talk about his/her condition without any fear. Apart from that, my project "*Cloud Nine: Mental Disorder Identification and Help Guide*" is about identifying mental disorders, basic information to maintain a better mental health, and providing feedback based on the user's mental condition.

Keywords: Mental Health, Mental Disorder, Generalized Anxiety Disorders, Schizophrenia, Obsessive Compulsive Disorder, Postpartum Depression, Narcissistic, Anorexia Nervosa, Post Traumatic Stress Disorder, Kleptomania

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Chapter 1: Introduction

1.1 Introduction

A development project paves the way to integrate the idea and imagination of the developer. It creates scopes for a new project with new features that can be helpful for the targeted users in many ways. I had decided to work on the project "Cloud Nine: Mental Disorder Identification and Help Guide" being inspired by some existing projects that help people with a mental disorder. The idea of identifying mental disorders came from my own experience since I got to know about my mental disorder. It made me realize how ignorant we are in general about our mental health and hesitate to take help until we cannot survive anymore. The project I have worked on is an android app that helps users to assess their mental health conditions by answering questions as per their symptoms and suggests guidance thereby.

1.2 Motivation

According to the National Mental Health Survey of 2018-2019 made on Bangladeshi citizens found 18.7% of adults and 12.6% of children have criteria for a mental disorder.[1] Even more surprising, they were not aware of the fact that they have a mental disorder!

The available human resources for mental health are way too poor. There are only 225 neurologists, 270 psychiatrists, and 565 psychologists available. That is, 0.1, 0.16, and 0.34 per 100,000 people.[2]

As everything is being digitalized, and the way we are solely connected to mobile phones, it motivated me to create an app to provide the basic solution at least and assess our mental health by taking tests.

1.3 Objectives

The main objective of this project was to create awareness in Bangladesh about mental disorders and identifying if any. Then help the users to assess their mental health and provide necessary guidelines for the users. Apart from these, some other objectives of this project are written below:

- Develop and deploy a mobile application that can

- Identify mental disorder
- Track mood and help accordingly
- Provide guidelines for a healthy lifestyle
- Remind users to feel grateful and blessed through a gratitude list
- Provide feedback based on their inputs through the database
- Set daily goals and self-care for the user to achieve every day
- Help users get a power pack of information about sleep, lifestyle, exercise, meditation, medication, and therapy.
- Create a space called Diary Tales for the user where he/she can share
 - Thoughts
 - Feelings
 - Any random thing that might be bothering
- Using the provided data, the user will get guidelines of meditation, medication, exercise, or therapy accordingly.

1.4 Expected Outcomes

The expected outcome of my project is a full-fledged mobile application

- Developed using Java language on Android Studio
- Used firebase for storing the data and analysis in the backend
- Identify mental disorder (if any) and help accordingly
- Ensure a user-friendly and efficient interface so that non-geek users also can use it

1.5 Project Management and Finance

To manage the project well, I have used the Agile methodology. This methodology has five steps. They are:

- Step 1: Planning, research, and requirement analysis
- Step 2: Developing algorithm and system design
- Step 3: Implementation
- Step 4: Testing
- Step 5: Deployment

As my project is based on the research of ten different types of mental disorders and needed constant changes throughout the project's lifetime, it required me to repeat the steps. So, it was

easy and convenient for my project to follow this methodology to achieve all the project goals within the given limitations.

About the finance of the project, as I used a free version of the Android platform and Firebase database, I had zero cost to develop my project so far.

1.6 Report Layout

Chapter 1: Introduction

This chapter contains the sections with its keywords that follow:

1.1 Introduction: This part represents the introduction of the development project I have created.

1.2 Motivation: It covers the alarming statistics of what I was motivated to do the project.

1.3 Objectives: This part of the report contains the goals of my project that I had set to achieve

1.4 Expected Outcomes: In this section, the outcome of the project is discussed

1.5 Project Management and Finance: This part talks about the project management methodology and the costing of the project.

1.6 Report Layout: A brief about each section of the chapters of the report is written in this section

Chapter 2: Background

This chapter contains the background information about the project.

2.1 Preliminaries/Terminologies: This section contains the specific body terms used in medical science which are used in the project

2.2 Related Works: The related works of the project and short detail about them is discussed in this section

2.3 Comparative Analysis: This portion covers the comparison of the related works and analysis between the related works and my developed project

2.4 Scope of the Problem: This section talks about identifying the problem, documenting the project goals, outcomes, tasks, and timeline of the project

2.5 Challenges: This part represents the challenges I have faced throughout the project

Chapter 3: Requirement Specification

In this chapter I have talked about the project requirements and specifications of the requirements.

3.1 Requirement Collection and Analysis: In this section, the requirement of the project, its collection, and analysis is written

3.2 Use Case Modeling and Description: This part contains the use case diagram and its description

3.3 Logical Data Model: The logical schema of the project in terms of the data structure is shown in this section

3.4 Design Requirement: It talks about the requirements for the design of the project

Chapter 4: Design Specification

This chapter covers the different stages of designs and their specification.

4.1 Front-end Design: This part covers the design of the front-end and its description

4.2 Back-end Design: This part covers the design of the back-end and its description

4.3 Interaction Design and User Experience (UX): The interactive design of the project and UX are shown in this section

4.4 Implementation Requirements: The requirements of the implementation for the project are discussed here

Chapter 5: Implementation and Testing

Here I have covered the mechanism of the testing phase and their implementation followed by the keywords of the chapter.

5.1 Implementation of Database: This part talks about the implementation of the database and its mechanism

5.2 Implementation of Front-end Design: The implementation of the front-end design and its mechanism is discussed here

5.3 Testing Implementation: This part contains the testing implementation of the project and its description

5.4 Test Results and Reports: In this section, there are the test results achieved through user input and their reports

Chapter 6: Impact on Society, Environment and Sustainability

This chapter contains the impact of my project on society, environment, and sustainability.

6.1 Impact on Society: This portion talks about the impact that the project creates on society

6.2 Impact on Environment: It covers the impact that the project creates on the environment

6.3 Ethical Aspects: This part represents the ethical aspect of my project

6.4 Sustainability Plan: This section talks about the project's sustainability plan

Chapter 7: Conclusion and Future Scope

In this chapter I have talked about the discussion, conclusion, and scope for further development.

7.1 Discussion and Conclusion: It covers the overall discussion and conclusion of the project

7.2 Scope for Further Developments: I have discussed the scope for further developments in this section

References: All the references from where I have collected data and used in the project and report is mentioned here

Appendices:

Appendix A: Mental Disorders Along with their general symptoms

Chapter 2: Background

2.1 Preliminaries/Terminologies:

- MH: Mental Health
- BD: Bipolar Disorder
- GAD: Generalized Anxiety Disorder
- OCD: Obsessive-Compulsive Disorder
- PTSD: Post Traumatic Stress Disorder
- PHQ-9: Patient Health Questionnaire-9
- ULAB: University of Liberal Arts Bangladesh

2.2 Related Works:

There are around 3000 apps available that have worked on different types of mental health issues. Some of them are specified to specific mental disorders, some are for users in general, and some have certified doctors to have the help from directly. Worldwide there is a good number of apps available for MH. But, in our country, there are only a few apps that focus specifically on mental health. For example, "Monosheba", "Dhiman", "Youper Aura", and "Clear Fear" are some of the famous apps of this field. These apps take user input to track mood and provide some basic guidelines to maintain a better MH. There is also information about different aspects of life that

affects our mental health. Some of the apps have paid versions for some special features, such as talking to a certified psychiatrist or psychologist.

2.3 Comparative Analysis:

A drawback of the related apps is they do not work on identifying any mental disorder. In my app, this feature has been the main focus and goal. The user can identify their mental disorders (if any) and see the severity or intensity level as well.

As I have researched other apps which are available worldwide, I took some ideas from there and implemented some of the features in my app to make a better version of this kind of apps. Among them, the PHQ-9 test set and GAD-7 test set are the most common feature in those apps. Being inspired by these two features mainly, I have researched eight other mental disorders and have prepared a question set for each of them.

In total, I have worked on ten mental disorders from different criteria of mental disorders. The table below shows the mental disorders along with their typical symptoms:

No.1	Disorder Name	General Symptoms
1.	Depression	Feeling low, upset, less energetic [3], [4], [5], [6], [7]
2.	Bipolar Disorder	Feeling euphoric, upbeat, expansive [8], [9], [10], [11], [12]
3.	Generalized Anxiety Disorder	Worrying too much, feeling restless, irritated [13], [14], [15], [16], [17]
4.	Schizophrenia	Having hallucinations, delusion, movement disorders [18], [19], [20], [21], [22]
5.	Obsessive-Compulsive Disorder	Fear of contamination, unwanted aggressive, sexual, or religious thoughts [23], [24], [25], [26], [27]
6.	Postpartum Depression	Feeling thyself a bad mother, withdrawing from family, difficulty bonding with the new baby [28], [29], [30], [31], [32]

7.	Narcissistic	Being self-centered, thinking of having extraordinary power or talent [33], [34], [35], [36], [37]
8.	Anorexia Nervosa	Preoccupied with the thoughts of diet, weight loss, unrealistic body image [38], [39], [40], [41], [42]
9.	Post-Traumatic Stress Disorder	Having intrusive memories, nightmares, or feeling emotionally numb [43], [44], [45], [46], [47]
10.	Kleptomania	Stealing things that one does not need, and feeling relieved afterwards [48], [49], [50], [51], [52]

Table 2.3: Mental Disorders Along with their general symptoms

2.4 Scope of the Problem:

The number of Mental Disorder patients are dramatically increasing among people in recent years. To work on this project, I needed a wide range of statistics to show that it is increasing among the people of Bangladesh too, and this problem must be taken care of.

The goals of this project include identifying the mental disorders, tracking mood, set daily goals, and self-care for the user. It also lets the user write the blessings in the gratitude list, write a diary, and set reminders. Lastly, it provides a power pack of information in the help guide about sleep, lifestyle, exercise, meditation, medication, and therapy.

The Gantt chart below shows the tasks and timeline for them:

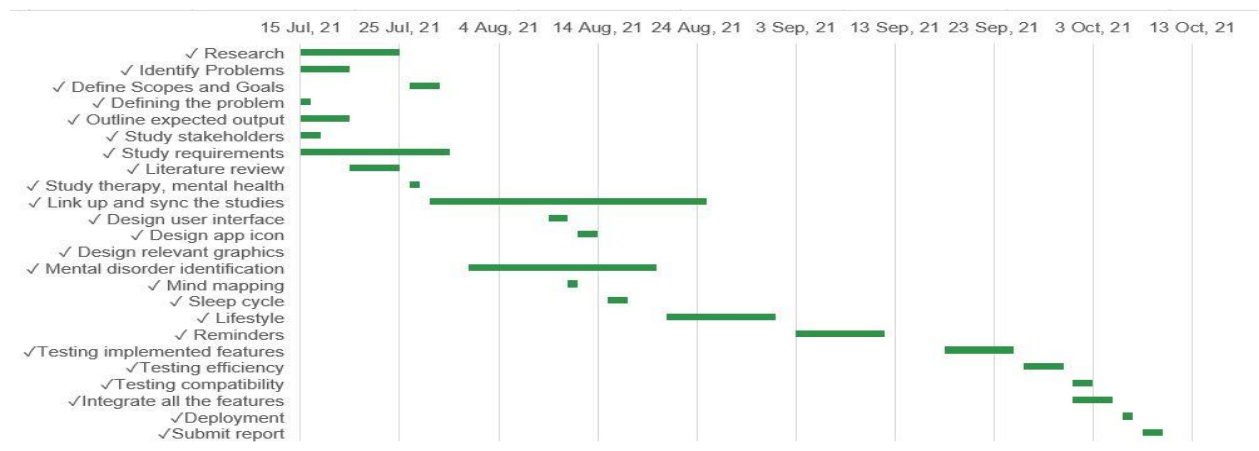


Fig 2.4: Gantt Chart

2.5 Challenges:

There were many challenges I faced throughout the time to do the project. The main challenges are highlighted below:

- Researching about different types of symptoms and syncing them with different types of diseases
- Providing Solutions based on the user inputs
- Lack of data access to provide solutions
- Creating the Help Guide, because it required a huge number of authentications of the information
- Database Syncing
- Showing the Personal Insights to the user as per the user's feedback

Chapter 3: Requirement Specification

3.1 Requirement Collection and Analysis:

The completion of the project required loads of information such as:

1. Collection of data about the ten mental disorders I have worked on
2. Research papers to get the information about the symptoms of the mental disorders
3. Surveys that are done on patients with mental disorders to provide the basic solution
4. Studying about sleep, lifestyle, exercise, meditation, medication, and therapy and syncing them with mental health
5. Analysis of the related apps to prepare a better version of the existing ones

3.2 Use Case Modeling and Description:

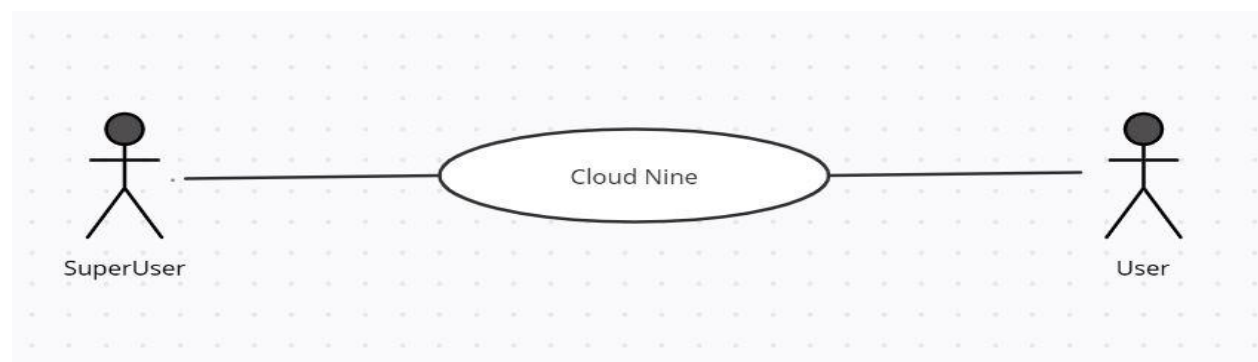


Figure no 3.2.1: Use case a) Cloud Nine (Level 0 diagram)

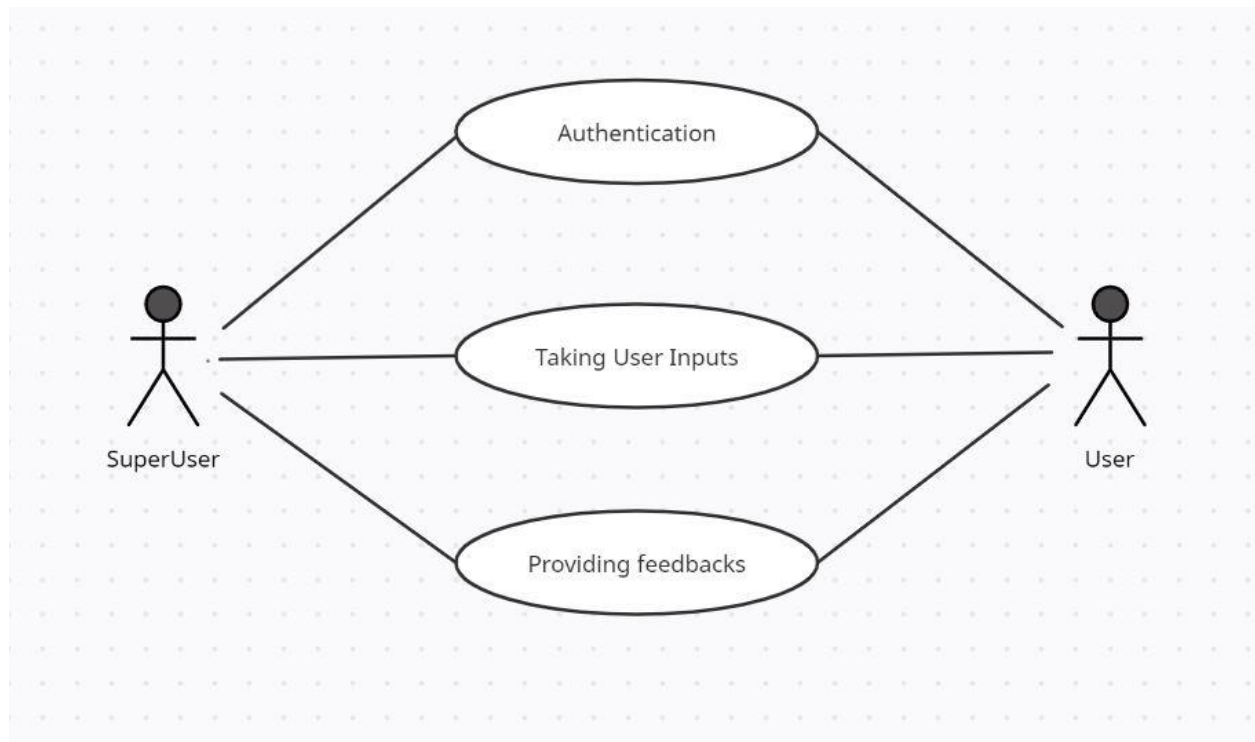


Figure no 3.2.2: Use case b) Cloud Nine (Level 1 diagram)

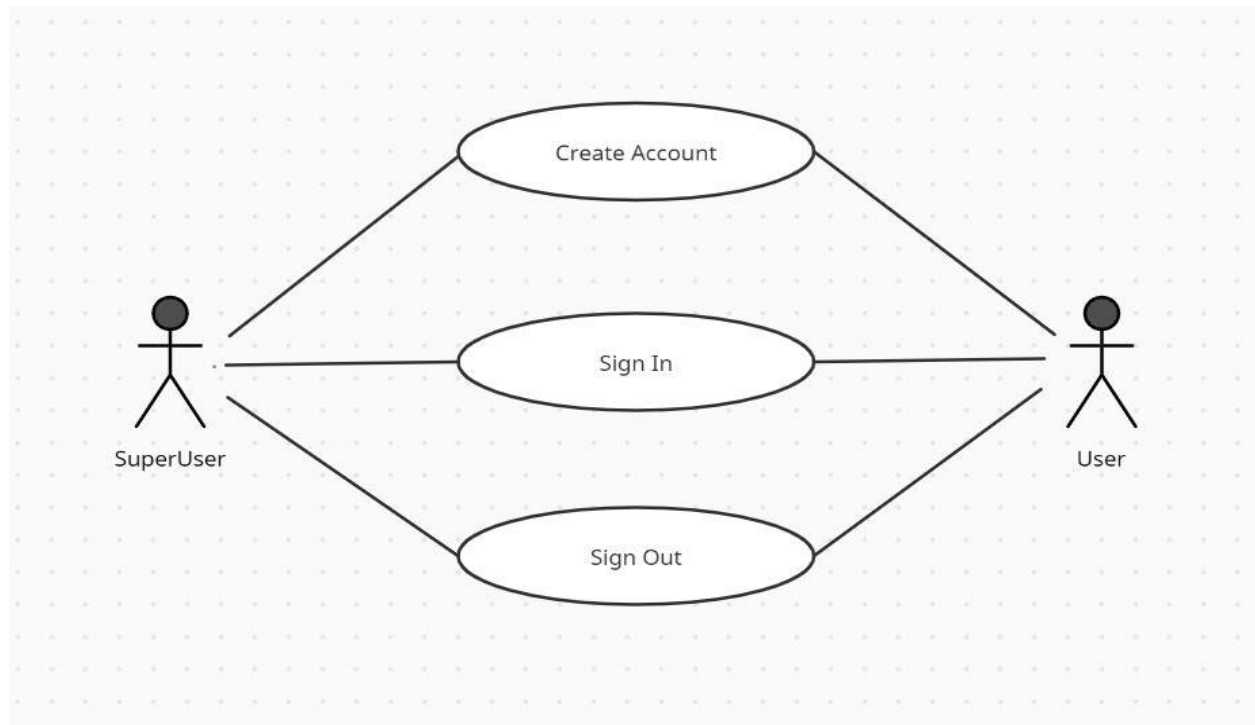


Figure no 3.2.3: Use case c) Authentication (Level 1.1 diagram)

3.3 Logical Data Model:

The logical data model below shows the relationship between the data structure and user, and the super user and data structure:

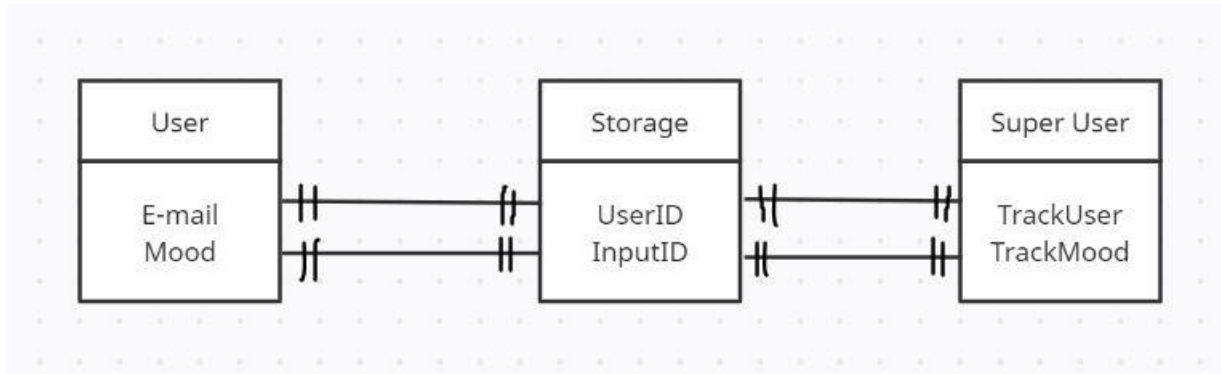


Figure no 3.3: Logical Data Model

3.4 Design Requirement:

To design the project, I have used XML for the front-end and Firebase database for the back-end.

XML: XML stands for eXtensible Markup Language. It is a standard way to encode data in Applications that are internet-based. XML is used to create the user interface or layout files in Android. It is a case-sensitive language. XML has in-built keywords that make the coding a lot more efficient.

Firebase: Firebase database is a platform that provides different types of services. Such as cloud storage, cloud messaging, user authentication, hosting, real-time database, machine learning, etc.

Chapter 4: Design Specification

4.1 Front-end Design:

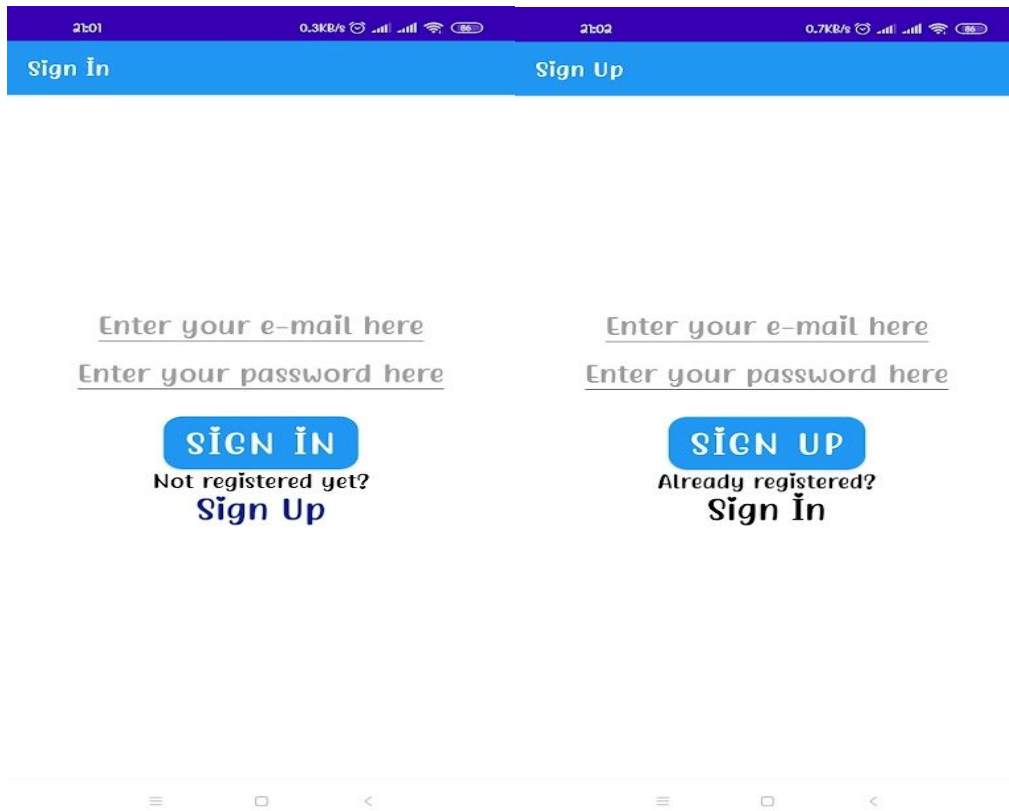


Fig 4.1.1: App Sign In/Sign Up page

After Signing in/Signing up with a valid email address and password, the user will see the hope page.



Fig 4.1.2: App Home page

The features of the App are classified in main three features. These three features have sub features in them. The **Activities**, **Help Index** and **Treasures** feature has the features as follows:



Fig 4.1.3: Sub features of the Main Features

Feature 1 Mental Disorder Identification: This feature has the ten question sets to assess about mental disorders with the general symptoms as the clues and the following screen shows some of the question from a set among them:

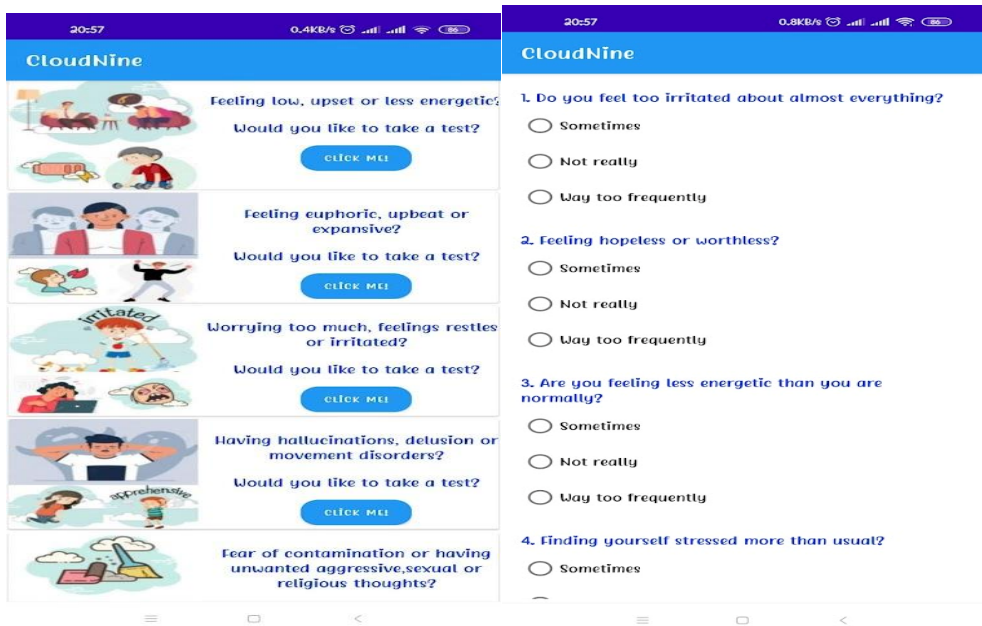


Fig 4.1.4: Test Set and Question set example from Mental Disorder Identification

Feature 2 Mind Map: This feature takes user input about the mood of the user. This data is stored in the database to provide feedback to the user.

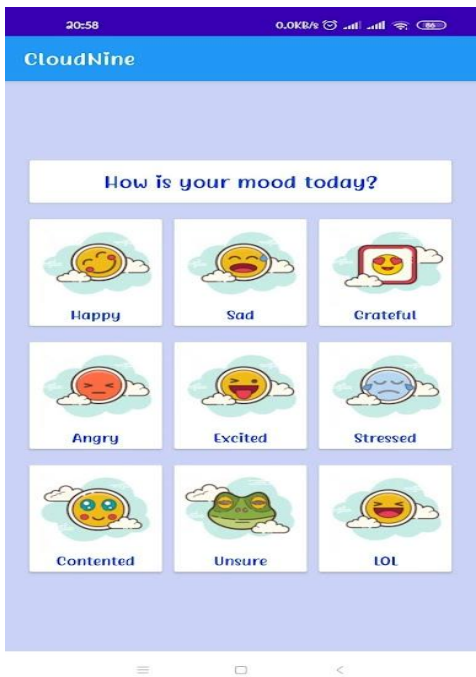


Fig 4.1.5: Mind Map

Feature 3 Daily Goals and Self Care: This feature gives user some goals to achieve every day to maintain a better mental health. The following figure shows how the goal bar turns green as the user ticks on the goals as done:

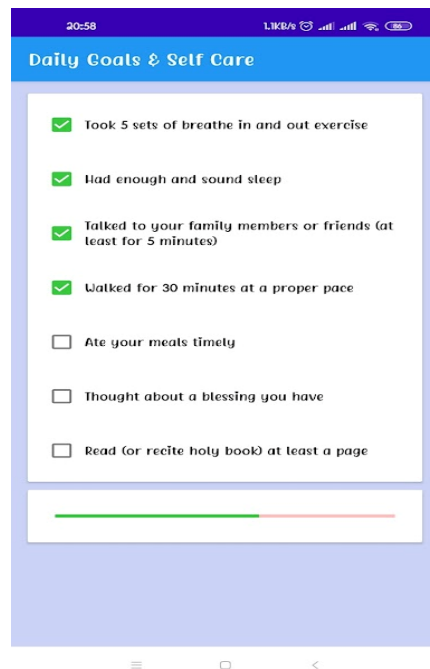


Fig 4.1.6: Daily Goals and Self Care

Feature 4 Gratitude Index: It asks the user to write about a blessing and show the list of the blessings as the Gratitude Index to feel blessed about life. It automatically saves the data in the app with the current date and time.

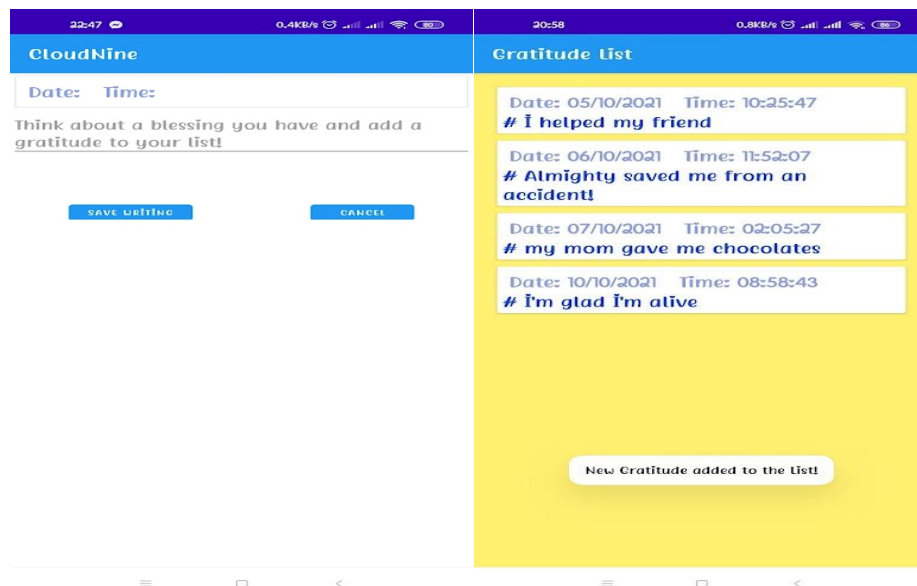


Fig 4.1.7: Gratitude Index

Feature 5 Sleep Cycle: This feature includes the Information about Sleep Cycle in different criteria. For example, how many hours a person should sleep, which position leads to a sound sleep, what is the best time for sleeping, what are some healthy habits for a better sleep, what is the ideal heart rate for sleeping, and what are the sleeping stages.

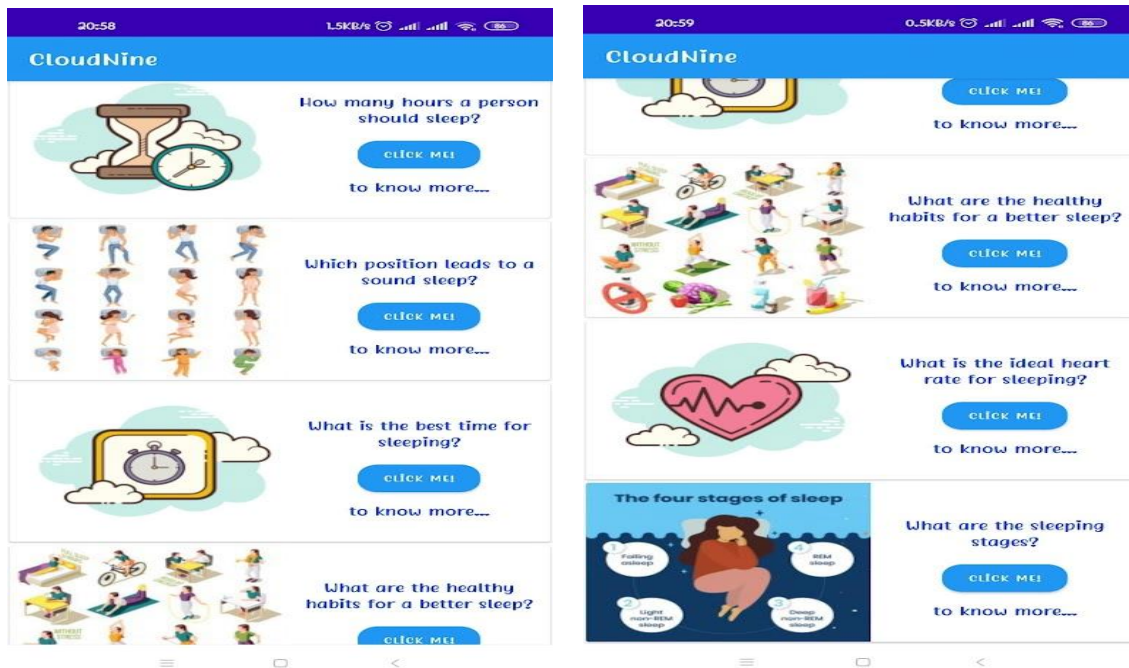


Fig 4.1.8.1: Sleep Cycle UI

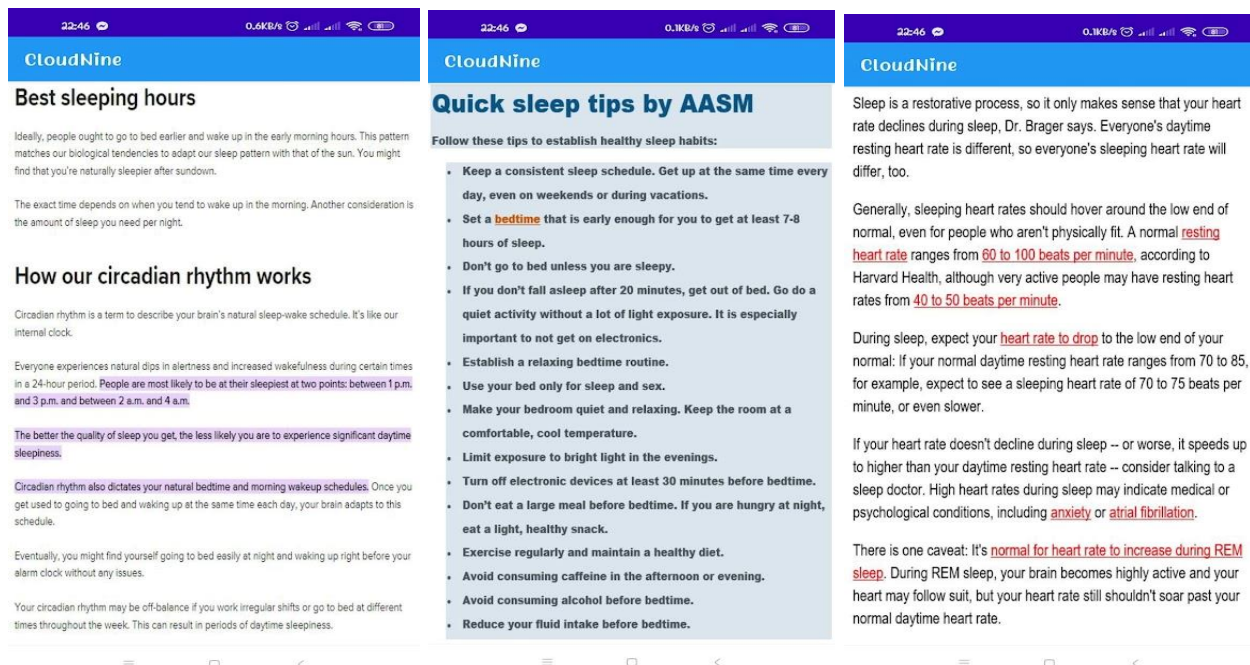


Fig 4.1.8.2: Sleep Cycle Information

Feature 6 Life Style: This feature includes the Information about Life Style. It has the links of the most visited website, videos and article that helps to maintain a better life style. The user can access to that information by clicking on those links.



Fig 4.1.9: Life Style UI

Feature 7 Helpful Exercises: This feature includes the Information about Helpful Exercises. It has the links of the most visited website, videos and article that helps to maintain a better life style. The user can access to that information by clicking on those links.



Fig 4.1.10: Helpful Exercises

Feature 8 Meditation Junction: This feature contains the Information about helpful Meditation for maintaining a better mental health.

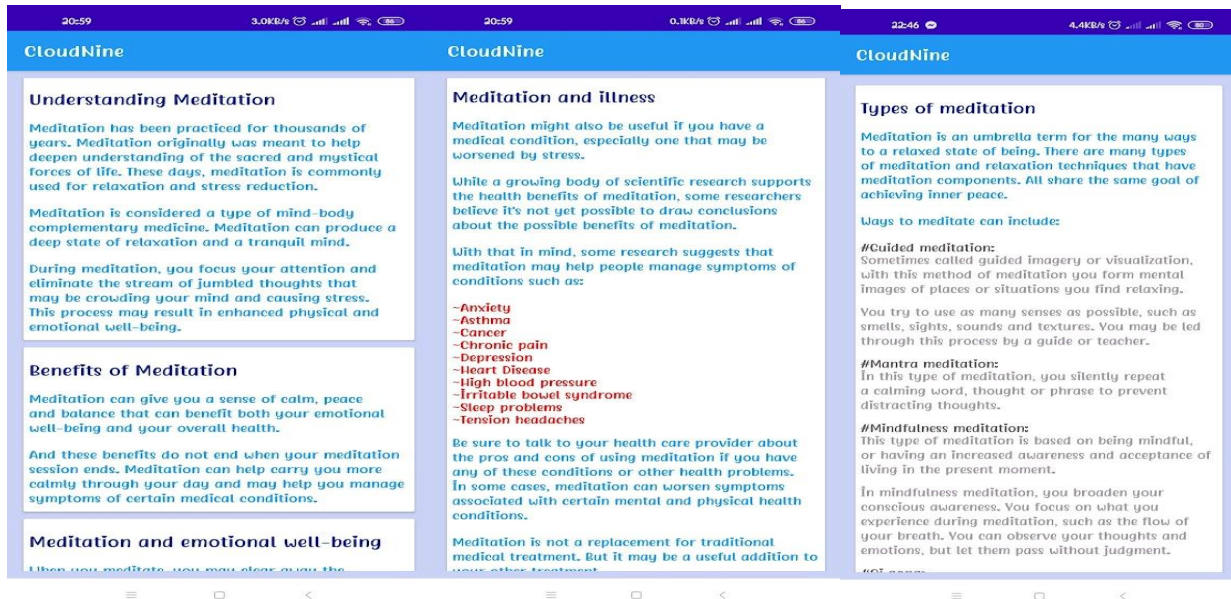


Fig 4.1.11: Meditation Junction

Feature 9 Medication: This feature contains the Information about helpful Medication, that no one should take any medication for mental health without consulting to a doctor.



Fig 4.1.12: Medication

Feature 10 Therapy: This feature contains the Information about helpful Meditation for maintaining a better mental health. There is information about types of therapy, what is therapy, what should one expect during therapy, how to select a therapist etc.

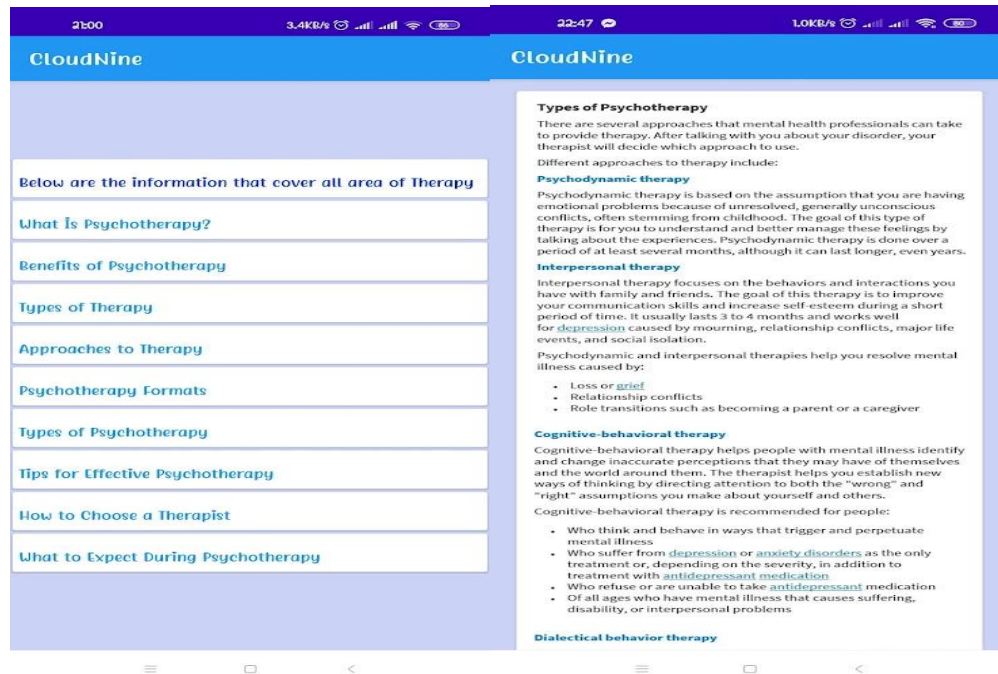


Fig 4.1.13: Therapy

Feature 11 Diary Tales: This feature takes user input about their daily life stories or events. This information is stored within the app. The user can see the tales every time he writes new tales.

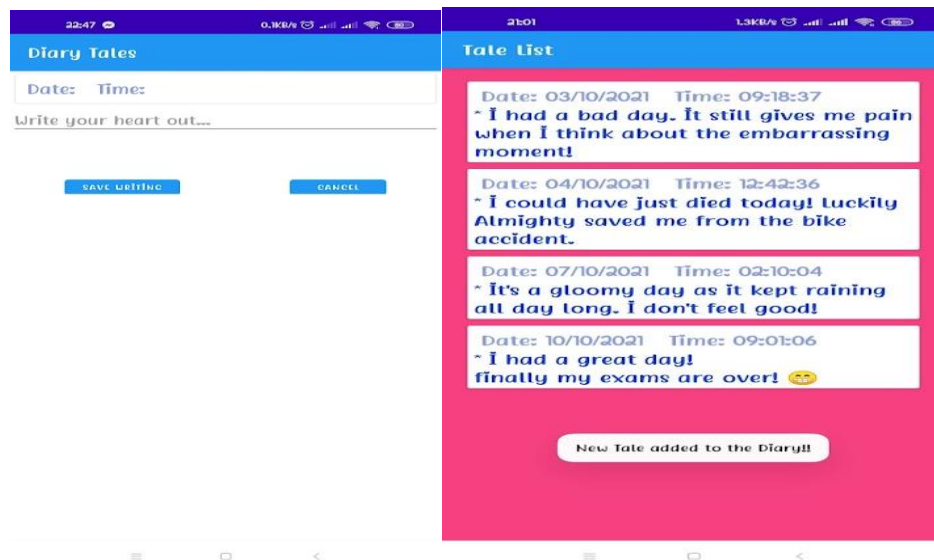


Fig 4.1.14: Diary Tales

Feature 12 Reminders: Here the user can set reminders about anything they want to. The app will show the notification on the selected date and time.

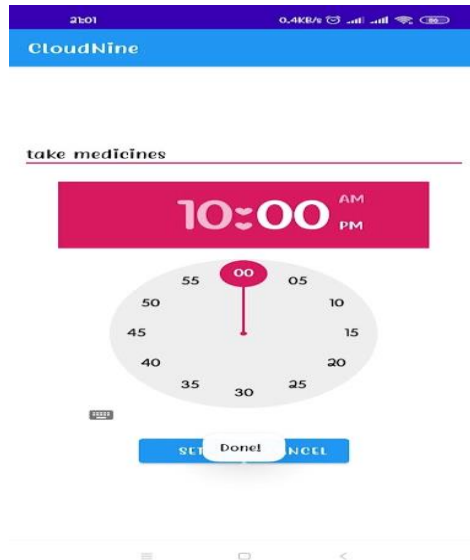


Fig 4.1.15: Reminders

4.2 Back-end Design:

For the Back-end design I have used Firebase Database. The process of back-end is divided into two different sections.

1. Authentication: It takes the user email address for the authentication process. Then stores the email address with a userID for further tracking.

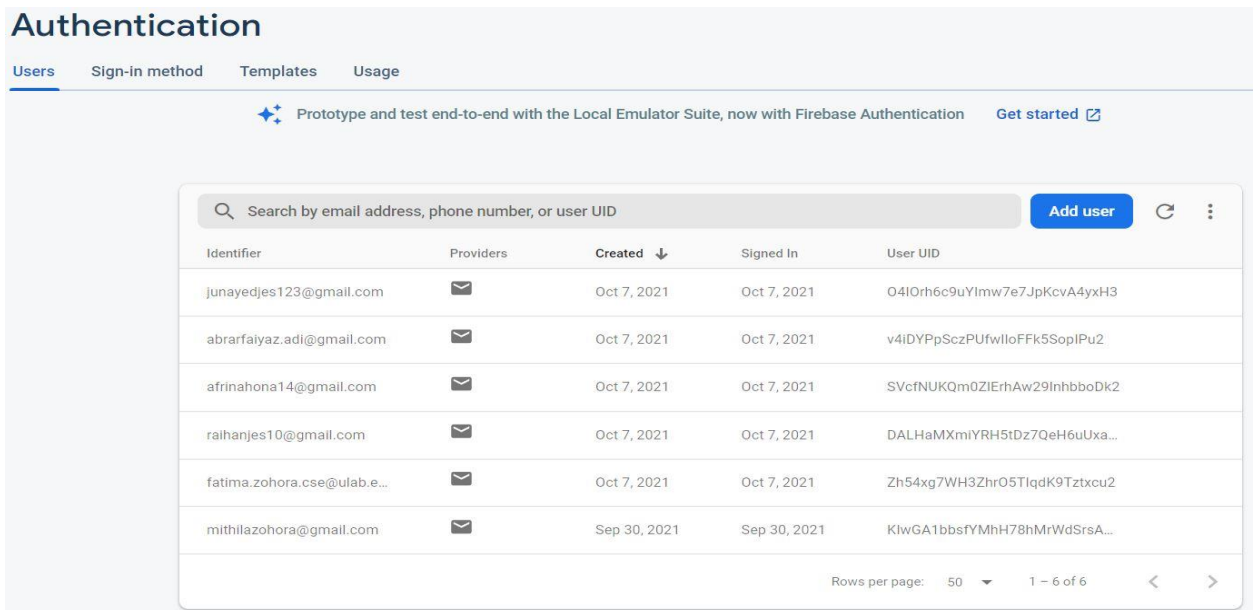


Fig 4.2.1: Authentication

2. Real-time Database: It takes the mood of the user with a specific key and stores in the database for further feedback.

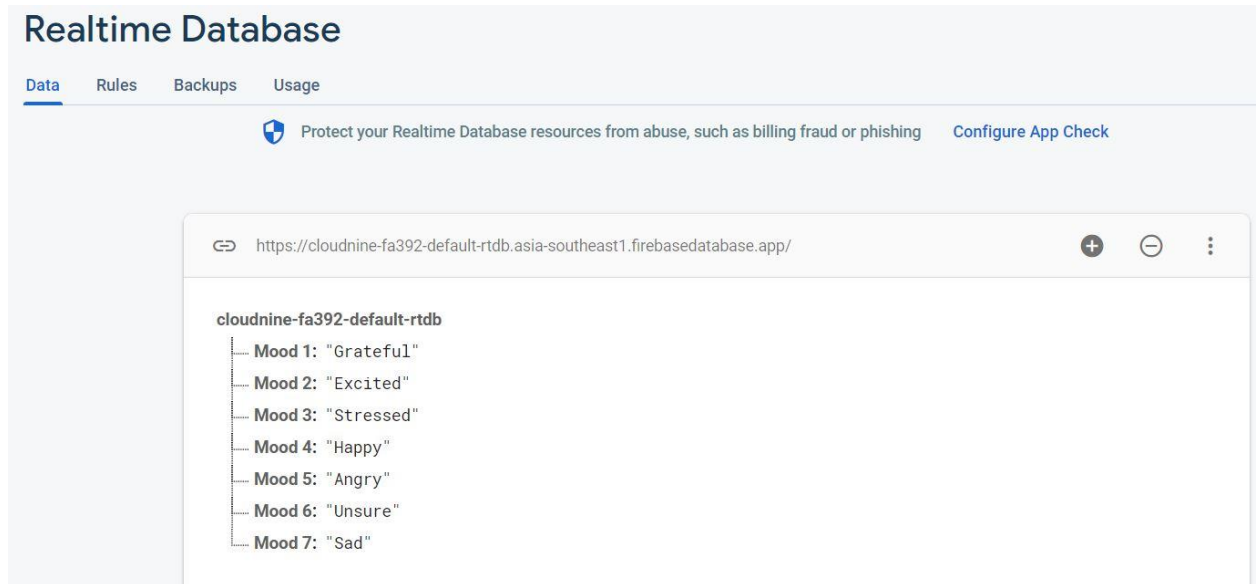


Fig 4.2.2: Real-time Database

4.3 Interaction Design and User Experience (UX):

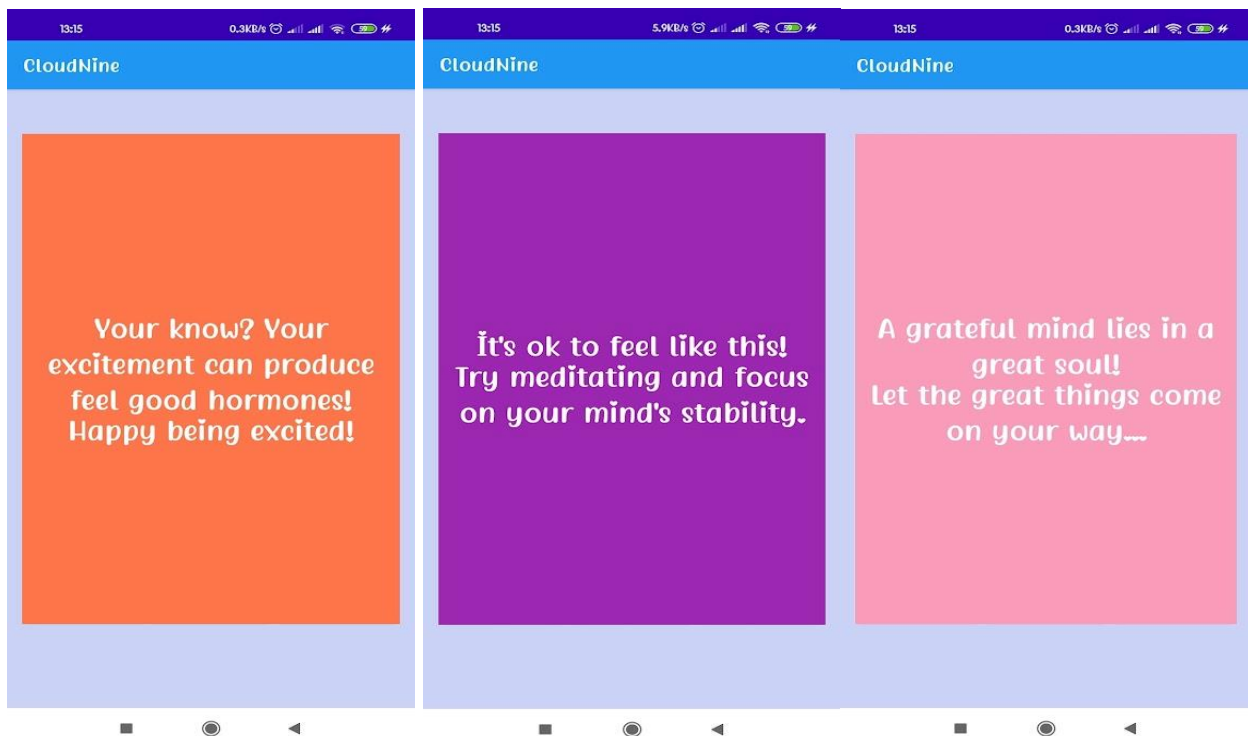


Fig 4.3.1: Interaction Design and UX of the Mind Map

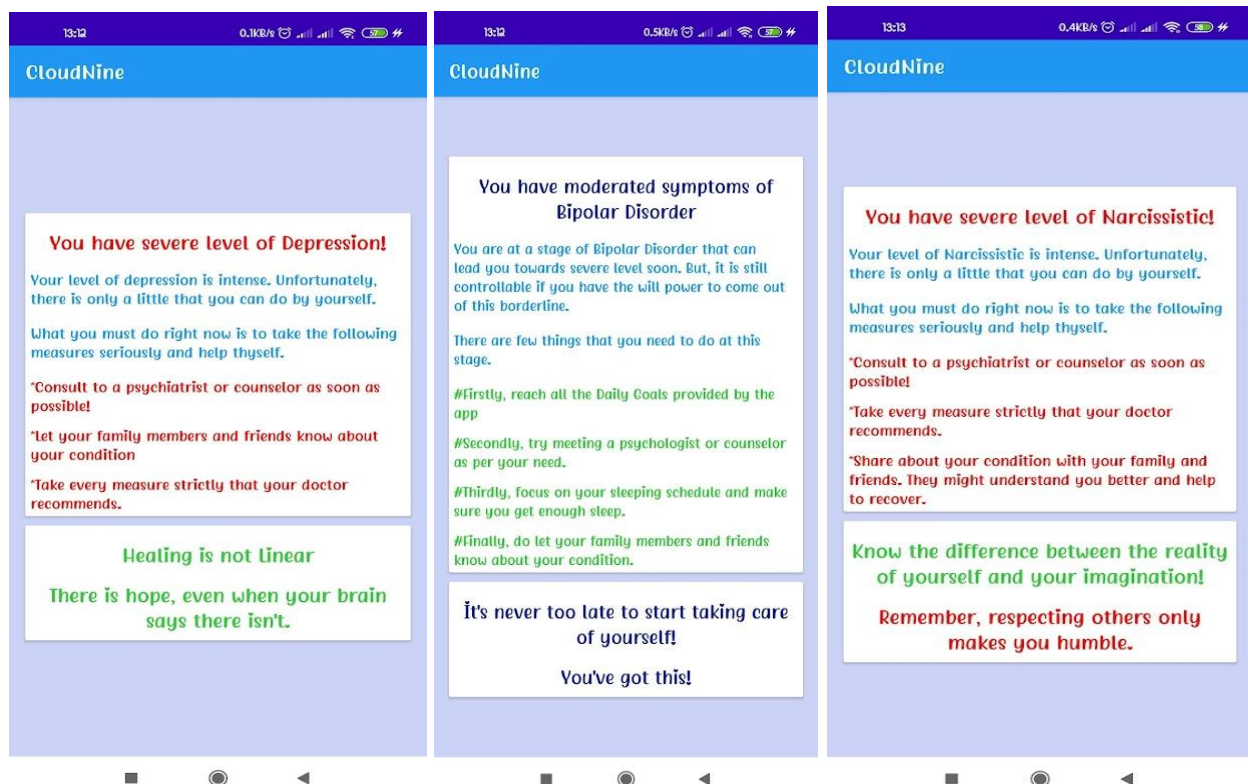


Fig 4.3.2: Interaction Design and UX of the Test set

4.4 Implementation Requirements:

The Implementation requirements of the design include:

1. Well-developed knowledge of Android Studio
2. Good understanding of Java to implement the project logically
3. The hand-in practice of XML for creating a user friendly and aesthetic interface
4. Deep learning about the Firebase database for the back-end development

Chapter 5: Implementation and Testing

5.1 Implementation of Database:

For the implementation of my database, I have used Firebase. I have used three services to connect the project with it. A brief discussion about them is given below:

1. **Authentication:** This service is used to validate the user and provide the user's authentication. It takes the user's email address to authenticate a user and create a User ID to track that specific user in the future.
2. **Real-time Database:** The real-time database takes the current mood of the user. Then it stores the mood in the database for further guidelines. Each time user clicks on a mood, it stores that with a specific key to keep track of it.
3. **Push notification:** The push notification is used to send notifications to the users about their feedback. It uses the specific key and User ID provided by the Firebase to send a notification to the specific user.

5.2 Implementation of Front-end Design:

The Front-end Design is implemented using Java and XML. Here, Java is used for logical development. Java is like the backbone of the project that creates the structure of the project. This part is completely taken care of by the developer only. On the other hand, XML is the coat on the Java structure that provides the interface for the user to interact with. The duo provides a full-fledged pack where the user's input and programmer's logic meet.

5.3 Testing Implementation:

For the implementation phase of testing, I have taken user inputs from different users. It helped me to go through the bugs better and fix them. Also, I have added different types of try-catch errors in the Java codes in the existing Activities. For example, there are NULL input errors. In many of the activities, if the user does not give any input, it shows the error text that I have set with NULL values.

Apart from the coding phase, I tested the project from different phones to see if all the functionalities work properly or not. It includes syncing the Java Activities with its layouts, syncing Java Activities with Firebase Authentication, and the Real-time database.

The project also had the test phase for the outputs given based on the tests user takes. In other words, providing the correct severity level with the identification of Mental disorders and suggestions based on that.

5.4 Test Results and Reports:

The accuracy of the test result was satisfactory as I implemented and tested the project differently for each type of test.

The project does catch all the NULL errors properly. It syncs the database with the Java coding correctly. Finally, it gives the correct feedback after taking any of the Mental Disorder Tests.

Chapter 6: Impact on Society, Environment and Sustainability

6.1 Impact on Society:

The project can be a milestone in the society of Bangladesh because there are only a few apps available related to mental health. Also, there is no app available that helps to specify mental disorders based on the symptoms of the user. I have researched and studied a wide range of Research Papers, Journals, and authentic Articles to implement this specific feature in my app. The way the mental disorder is stigmatized in our society, we all are afraid to talk about it openly. We do not even trust our near and dear ones to share about our mental health. So, this app is handy in this context that it helps the user assess their mental health thyself. Also, the data given by the user are all secured and have proper privacy protection.

6.2 Impact on Environment:

Human resource is a vital component of the environment. The way the number of people with mental disorders increasing the app is a useful tool. It focuses on the mental health of human beings, and mental health is one of the biggest assets of human beings. Ensuring better mental health is one of the goals of this project. So, the app is going to contribute to the environment in enormous ways.

6.3 Ethical Aspects:

As a developer, I have taken care of the ethical aspects of the App in all possible ways. Some of the points are given below:

- The app does not contain anything unethical
- All the functionalities and logic of the application are made by me, it does not contain any copyright contents
- The privacy of the user is ensured in every step
- All the Research papers, journals, and articles are mentioned in the reference chapter from where I have taken data from

6.4 Sustainability Plan:

For the sustainability of the project, I have planned to work on the features for more efficiency. As my supervisor suggested, all the user input will be stored in the database for research work on this project. Thus, it will open a new window for providing feedback more efficiently and identify the mental disorders as correctly as possible. Also, publish it in the Google Play Store to make it available for users of Bangladesh and worldwide as well for the sustainability of the project.

Chapter 7: Conclusion and Future Scope

7.1 Discussion and Conclusion:

I am the biggest motivation for the project due to my mental disorder. Being a Bipolar Disorder patient, it has been a dream come true for me to make the Android App out of my imagination. I was not so sure if I could make it, but ultimately, I won. I learned a lot of new things in Android Studio and Firebase that I explored due to the project requirements. This project taught me about self-assessment, patience, and how to manage the timeline for a specific work. I learned how to get my work done even if I am unknown in that field. It made me realize the power of willpower. The methodology I followed taught me to develop a project efficiently. The discussions with my supervisor and classmates who have worked in this field helped me to create a better version of the app. Lastly, thanks to ULAB for allowing me to work on this project and assigning Bijan Paul Sir as my supervisor.

7.2 Scope for Further Developments:

For further developments, I already have thought to implement some new features. Those ideas came from being inspired by some apps available online. For that, I have to connect cloud messaging and consulting options. To implement the new features, I will need to connect certified psychiatrists, psychologists, neurologists, and counselors who can talk to the users directly. In this way, this app will be more reliable to the users.

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