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Investigating Assisting Mental Health Condition using Sentiment Analysis through NLP

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Abstract - *Conditions relating to mental health, in addition to physical health, have grown to be a major concern. Sadly, very less opportunities are existing for individuals for receiving psychological treatment. In large surroundings let alone in remote areas, are not sufficient facilities to seek support for mental health. The procedures and structure for implementing a technology-and-professional mental health support system are presented in this project. The system is an Android platform where people looking for mental health care can sign up and use features like personality tests, chat with like-minded people, track their mental state, and have a one-on-one conversation with a mental health professional. Teenagers, young adults, and people in middle age are the intended audience for the platform. In some societies, seeking mental health care is still taboo. This social dilemma of receiving mental health treatment is affecting major damage to humans, in addition to basic established facilities a virtual help system for mental health may be an option for resolving this issue. This system is made to help people with mental health problems remotely, from anywhere in the world.*

Key Words: **Mental Health, Android, Personality Tests, One-on-one Conversation**

1.INTRODUCTION

Mental health is essential at all stages of life, including childhood, adolescence, and adulthood. Although mental-health is quite an important aspect of life, it is often overseen by us. On a global level, there are approximately about 970 million humans who suffer from psychological issues. One of the biggest barriers to treating mental illness is getting professional help, for a number of reasons. In many cases, a call for professional help for a mental disorder can quickly become overwhelming Similarly, even today, social structures are often not open to visiting specialists or physicians who offer support for Mental health-related issues. The circumstance in Rural is worse still. Sometimes external circumstances create obstacles. In a busy country like India, where traffic congestion is a serious problem, are less inclined to seek out a mental health specialist. Considering all the barriers mental health care students face, a telehealth center may be the best solution. Since mental health treatment rarely requires heavy machinery, the stand can be a very useful solution. An essential area of artificial intelligence (AI) is natural language processing (NLP), which looks at how people and computers communicate using natural language. NLP for the purpose of processing human language and interacting with computers. This is field of study which combines artificial intelligence, linguistics, and computer science. Neuro-linguistic programming is a discipline for analyzing and processing huge amounts of data from natural language. The main reason for this study is to provide everyone with a unique remote solution for taking care of their mental health. Since it is one of the most neglected sectors of healthcare. People in our nation are ashamed of their mental health. Therefore, many people prefer to conduct their own research before seeking advice from a mental health professional rather than visiting a mental health facility. Because everyone has access to all of the materials, people can easily take care of their mental health by using this platform for mental health care. Attending counseling sessions while waiting for appointments with any psychiatrist is a common occurrence. Without having to leave the platform or wait a long time for an appointment, anyone using it can receive assistance. Also, since this service provides everything in one location, consumers can save money by avoiding journeys to several psychiatric clinics.

2. LITERATURE SURVEY

Paper Name: Development of NLP-Integrated Intelligent Web System for E-Mental Health [1]

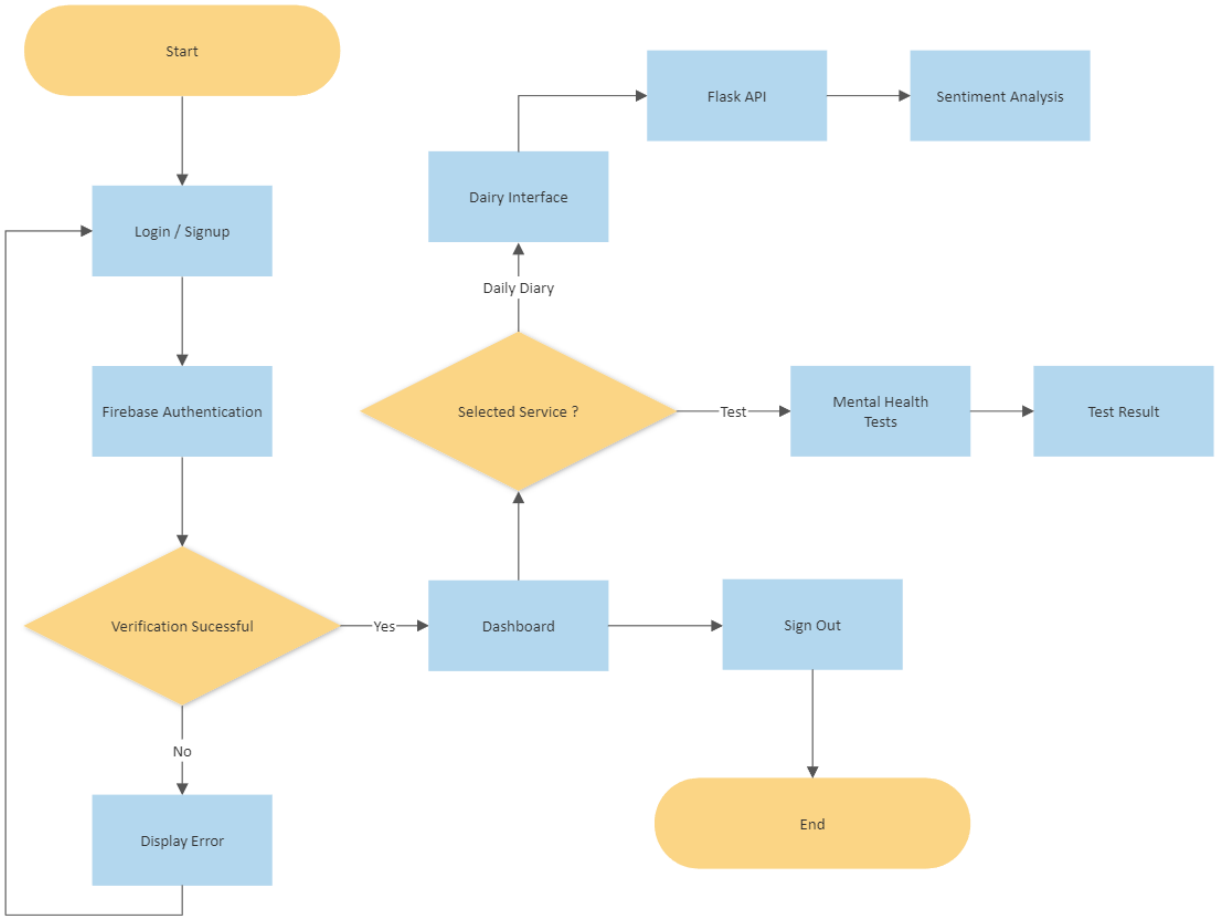

Fig -1: The System Flow Chart Diagram

Author: Monirujjaman Khan, M. D. Iftekhar Ali, Sami Bourouis Mohammad, Rifat Ahammed, Abid Hassan
Summary: The system is an online platform where users can register and use features including a personality evaluation chatbot built on NLP, conversations with others who share their interests, and video conferencing with professionals in mental-health. Video conferencing. The system also has a secure payment site and downloadable prescription functionality. Conversational NLP-based chatbots and video calls for machine vision are primary technological components.

Paper Name: Development of Android Application for Mental Health of The Students for Betterment [2]
Author: Nidhi Vashistha, Dharmendra Kumar, Ankit Bairwa
Summary: In this paper, a self-help android app for students' mental health growth is presented. In this, it is discussed how cell phones can help with mental health treatment by enabling human-self monitoring through Android application interfaces to support treatment, and gathering crucial data from patients' daily lives to screen the current state and improvement of their psychological disorders.

Paper Name: Mobile apps for Mental Health: a content analysis [3]
Author: Md. Aminul Islam, Naziat Choudhury
Summary: This study covers several aspects of mental health-related apps that were offered in the Google Play Store for a period of four years, from 2016 to 2020. It uses a list of terms, including mental health, mental illness, mental disorders, and the treatment of mental disorders and illnesses, to locate apps on the Google Play store.

Paper Name: Mobile applications for mental health self-care: A scoping review [4]
Author: Alaa A Abd-alrazaq , Anna Giannicchi, Nashva Ali Arfan Ahmed, Mohamed Ali
Summary: The goal of this evaluation is to give users who are using self care applications for mental health and the professionals who provide them with care the knowledge they need to make an informed decision. The main goal of the analysis is to observe and utilize the characteristics of

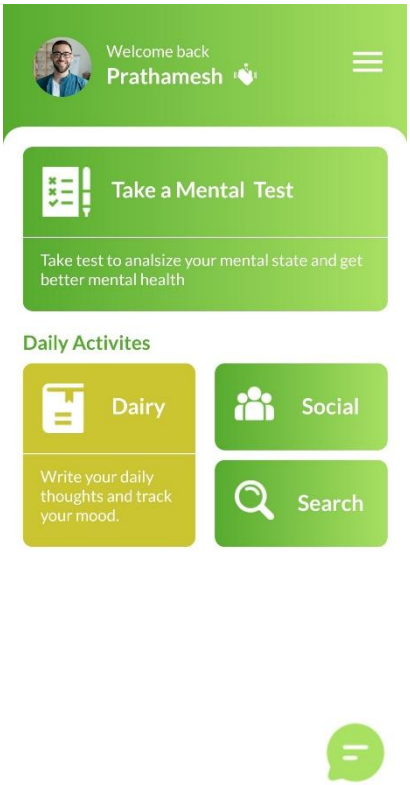

Fig -2: Home Interface

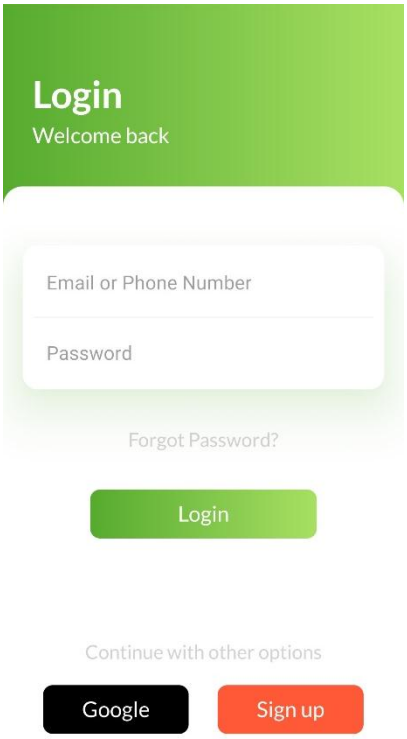

Fig -4: Login Page

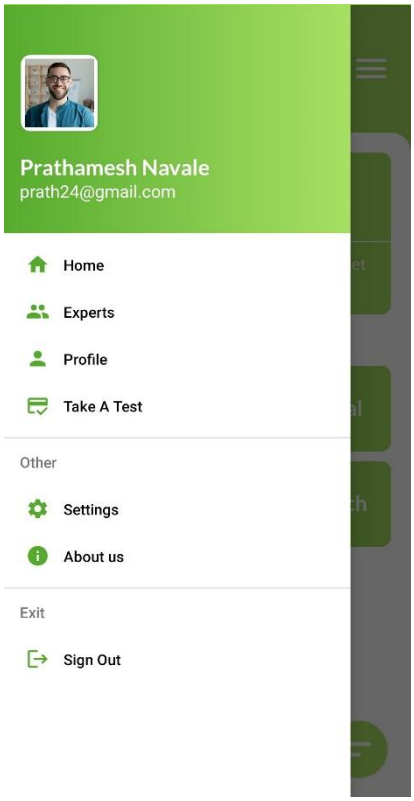

Fig -3: Navigation Drawer

modern mobile tools for mental health self care. As a result, this evaluation should ideally motivate programmers to produce fresh, empirically examined apps that successfully satiate the requirements of being both scientifically reliable and user friendly.

Paper Name: Mental health research on scheduled tribes in India [5]
Author: Maulik, Pallab K; Kallakuri, Sudha; Salam, Abdul; Devarapalli, S. V. Siddhardh Kumar.
Summary: The review of studies on mental health among STs in this study is a first of its sort. Only a little amount of low- to moderate-quality ST-focused mental health research has been done in India. It is vital to conduct research on the causes of poor mental health and the solutions available.

Paper Name: Smartphone apps for the treatment of mental health conditions: status and considerations [6]
Author: Mark E Laresen, Jennifer Nicholas, Kit Huckvale, John Torous,
Summary: This study seeks to offer a current overview of the research supporting the use of apps in the management of mental health issues, obstacles, shortfalls in important areas, and future directions for the subject. The potential of mobile

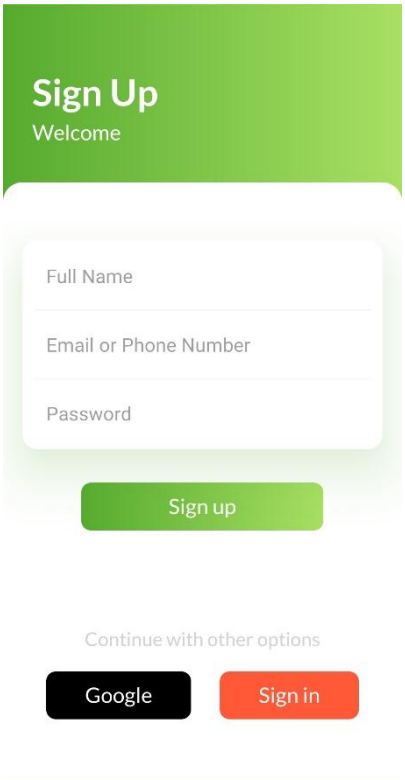

Fig -5: Sign Up Page

health apps for the management of mental health issues has drawn more clinical and research attention in recent months due to signs of consumer adoption.

Paper Name: The use and effectiveness of mobile mental health apps for treating anxiety and depression [7]
Author: Warren Bartik, Debra A Dunstan, and Jamie M Marshall
Summary: Although highlighting two distinctly different methods, this review also summarizes the most current advancements in e-mental health services. First off, a significant body of research has shown the effectiveness of a range of online mental health programmes for desktops and laptops, leading to a general acceptance of their capacity to promote a person's recovery from anxiety and depression. The second is connected to the stunning paucity of research to back up this developing subject of e-mental health, as well as the relatively recent creation of apps for tablets and smartphones.

Paper Name: Mobile Mental Health: A Review of Applications for Depression Assistance [8]
Author: Luciano Coutinho, Ivan Rodrigues, Markus Endler, Davi Viana, Ariel Teles, Francisco Silva, Ricardo Rabêlo
Summary: The purpose of this study is to define, examine, and classify the condition of mobile applications for depression as it stands right now. To do this, we thoroughly examined depression treatment applications. The findings of this study demonstrated that apps are being used for an increasing number of purposes, including chatbots, online therapy, mood monitoring, self help, educational tools, and testing.

Paper Name- User Engagement in Mental Health Apps: a Review of Measurement, Reporting, and Validity [9]
Author: Mia Minen, Michelle M Ng, Joseph Firth, and John Torous
Summary: The fact that few patients use mobile mental health apps regularly and consistently, despite the potential benefits, indicates engagement issues. This study investigated and analyzed the measurement and reporting of user engagement indicators in mental health apps. The fact that every study claims to have strong user engagement indicators despite these discrepancies points to the necessity for the sector to concentrate on engagement through the development of reporting standards and more meticulous evaluation of claims.

Paper Name- Mobile Apps for Mental Health Issues: Meta-Review of Meta-Analyses [10]
Author: Yasser Khazaal, Briana Cloutier, Marc Corbière, Audrey Francoeur, Stéphane Guay, Crystal

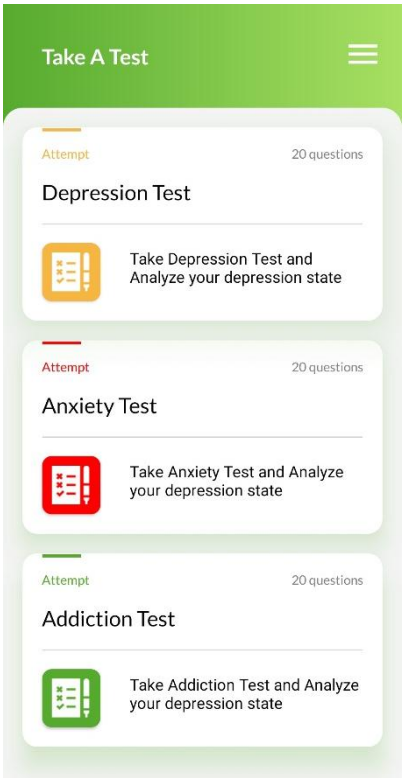

Fig -6: Test List

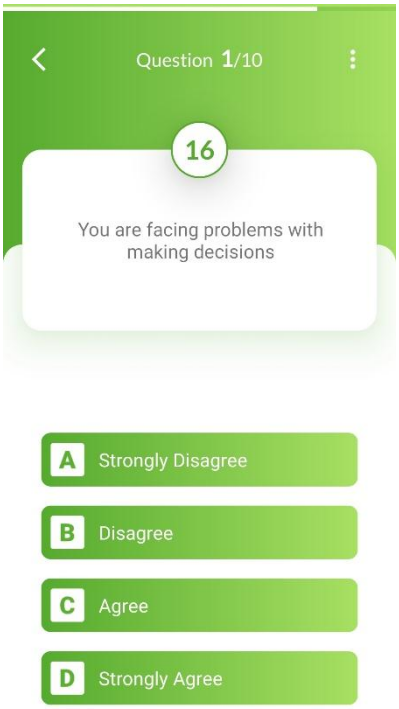

Fig -7: Test Interface

Samson, Stéphane Potvin , Antoine Pennou, Tania Lecomte
Summary: This study's objectives were to evaluate the reliability of the information already available on the utilization of mental health programs and to provide an overview of the findings thus far. Using suggestion evaluation, creation, and assessment, meta-analyses and systematic reviews were assessed, especially for mobile applications that address mental health symptoms or issues. Most of the trials with follow-ups discovered that the app had a long-lasting effect at the 11-week mark.

3. PROPOSED SYSTEM

The proposed system is an Android application developed in JAVA consisting of a dashboard that will assist the user to navigate through the application and access all the features of the application. The application contains features like Mental Health Tests, communication with a psychiatrist, communication with like-minded people, and Daily thoughts Diary. Mental health test gives the user a detailed synopsis of his mental state based on his performance on the test. The other feature is a Daily thoughts diary where the user can write his thoughts of the day. Machine Learning and NLP sentiment analysis will be used on the thoughts written in the diary to predict the user's mood and store it. This will help the user to keep track of his mood and improve accordingly. The chat section allows users to

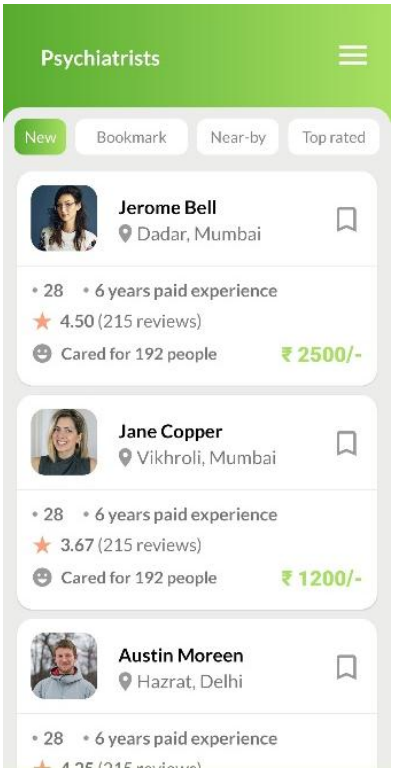

Fig -8: Psychiatrists List

Fig -9: Psychiatrist Profile

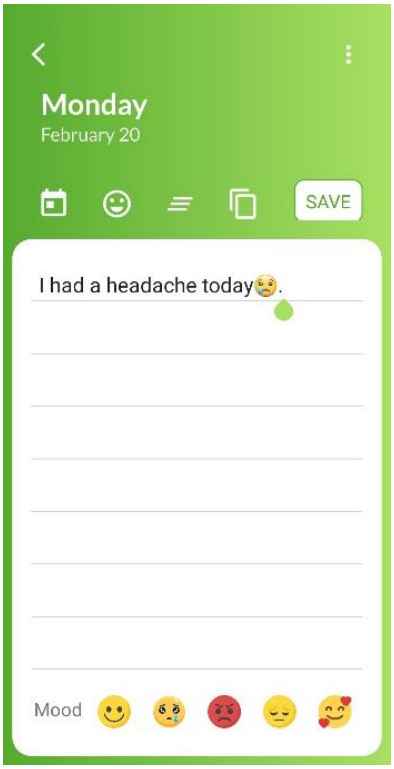

Fig -10: Daily Diary

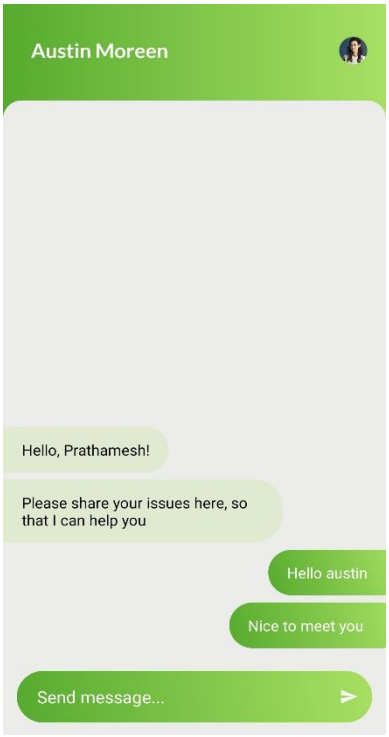

Fig -11: Chat Interface

communicate will mental health professionals and like-minded people. Other than these features application also provides authentication, profile, settings, and all other basic features required. Firebase cloud services are used for authentication, real-time database, and firebase storage.

3.1 The Android Studio Framework

The frontend user interface and backend are constructed using the android Studio framework and IDLE. In the android framework XML (Extensible Markup Language) is for designing the user interface. Different layouts such as Relative layout, Linear layout, etc. are used for placing the UI elements with appropriate margins and padding. Android provides two programming languages for writing the backend, Java, and Kotlin. In the project, Java is used for designing the backend. UI components and the Firebase cloud services are connected to the application by importing respective Java dependencies.

3.2 Firebase Cloud Services

In the application, three firebase services are used for proving authentication, database, and storing documents. The services used are Firebase authentication, Firebase Real-time database, and Firebase storage. Firebase authentication provides login and signup functionality. The application uses the user's email address and password for authentication. Firebase authentication provides an interface for creating a user account with an email address and password. Firebase real-time database provides a no-SQL database, which stores data in key-value pairs. Details about the user's profile, psychiatrist's profile, chats between users, diary predictions, and mental health test results are stored in Firebase real-time database. Firebase storage is used in the project for storing images and document files. All type of unstructured data used in the application is stored in Firebase storage.

3.3 Sentiment Analysis Model

The model is constructed and trained using machine learning and NLP libraries NLTK, Scikit learn, etc. The dataset used for the model is a movie reviews dataset, which consists of movie reviews labeled positive and negative. For feature extraction of unstructured reviews, the movie reviews are converted into vector format using TfidfVectorizer. The machine learning model is trained on this vectorized dataset. The model is trained using the supervised machine learning algorithm Linear Support Vector and gives an efficient result.

3.4 Flask Framework and Model Deployment

The Sentiment Analysis model is converted to pickle format and Flask API is created using the Flask framework. Further, the model is deployed on Heruko and

accessed using HTTP POST request from the android framework using the Volley library.

4. RESULT AND IMPLEMENTATION

4.1 Home Interface

The Home Interface shown in Fig -2 of the android application helps the user to connect to all the features of the application. The Home Page displays "Take a test", "Daily Diary", "Search", and "Chat" tabs for accessing the respective feature. It also contains a menu button that opens up a navigation drawer through which the user can navigate through the entire application. The navigation drawer shown in Fig -3 contains fields corresponding to every page of the application. The user can access his profile, app settings, and log-out option using the navigation drawer.

4.2 Login and Authentication

The Login Page shown in Fig -4 helps the user to sign in to his account and directs the user to the Home Interface. The login algorithm uses the appropriate email address and password as credentials for signing the user into his account. The user can create his/her account through Signup Page shown in Fig -5. The account creation requires the user's full name, valid email address, and a strong password. The account is created and stored through the Firebase Authentication service.

4.3 Take a Test Activity

Take a Test activity as shown in Fig -6 contains various Mental Health tests. The user can select any test and apply for it. The test algorithm selects any ten questions randomly for each attempt so that the user does not get repeated questions frequently. The test interface Fig -7 displays one question and four multiple options corresponding to the question. The options are weighted and the correct selection of the most appropriate option gives maximum weightage. At the end of the test, the application stores the result and recommends activities to the user.

4.4 Professional Guidance

This section allows the user to contact and communicate user with the Psychiatrists and seek guidance through them. Fig -8 shows the list of psychiatrists and their attributes. The user can select, bookmark, rate, and browse through the list. On selecting any psychiatrist user can see a detailed view of the psychiatrist's profile. Fig -9 displays the view of the psychiatrist's detailed profile along with the "Send Request" button. To contact psychiatrists the user needs to send a request to the respective psychiatrist from his/her profile. After acceptance of the request, the user can communicate with the psychiatrist.

4.5 Daily Thoughts Diary

Fig -10 shows the Diary activity of the android application which allows the user to write his/her thoughts. The Diary also contains formatting options like copy to clipboard, clear, emojis, etc. The diary displays the current day and date in month-day format. At the end of each day, the diary is automatically cleared. Whenever the user clicks on the "SAVE" button, sentiment analysis is performed on the thoughts of the user and the predicted sentiment along with the thoughts are stored in the Firebase Database with respect to that particular date. The user can view his predicted sentiment of any day for the past month. This helps the user to analyze his mood patterns and keep track of his sentiments throughout the month and improve himself. On clicking on the "SAVE" button, the user sees his predicted result along with the activity recommendations.

4.6 Chat Section

The chat section allows the user to chat with like-minded people i.e., other users, and also to communicate with the psychiatrists. The chat interface is shown in Fig -11.

5. CONCLUSIONS

This mental health assistance android application assists users to get guidance from professionals and provides various mental health support services. The user does not need to physically go to the psychiatrist or wait in long lines of patients, everything is available on one single platform. The users can easily send their requests to the Psychiatrists and share their problems. Such easy communication will save a lot of time for users and provide anonymity from society. People who feel awkward about having mental problems, can also find like-minded people on the application and communicate with them.

The application provides an easy interface so any user can easily navigate through the application. The application also allows users to take mental health tests and provides users with test synopsis for betterment. Applying for Mental Health tests and analyzing their result will help users improve their performance. The application uses sentiment analysis to predict the user's sentiment on the user's daily dairy. The daily dairy feature helps the user to write his thoughts and keep track of his/her sentiment. This tracking of sentiment will help users to analyze their mood patterns all over the month and change their behavior accordingly. The usage of this application will result in the overall betterment of the user's mental health without going through many difficulties. This easy access

to services will make users better at taking care of their mental health and not ignoring it.

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