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Mindpill: A Mental Health Prediction Application

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Abstract: During the outbreak of Covid-19 people suffered a lot to maintain their psychomotor equilibrium. Covid -19 beinga global threat has made the life of people miserable. Stress, fear, worry, depression and many more causes uncertainty in people's minds. They have faced unemployment, working from home, online education, insufficient physical communication with friends, family members, colleagues etc caused physical as well as mental retardation. They have faced the problem of how to maintain the unstable state of mental health. Apart from all these it also caused the shortage of Psychiatrist and Psychologist and the taint related to mental health problems downhearted people from personal consultation, it led to the dependency of mobile apps for their take over from mental health issues. This raised the idea of developing a mental health tracking app which provides the preventive measures of intellectual difficulties. It could be used by both children as well as adults and also any category of age group.

I. INTRODUCTION

The increase of mental health problems and the need for effective mental health tracker have led to an investigationof machine learning that could be applied in mental health problems. Mental illness have serious aftermaths across societies. It is diagnosed based on the self-report that uses questionnaires designed for the detection of specific patterns of feelings. So, here in this paper we aimed to build an android app for mental health tracking. The app's working is based on the constructed machine learning model. The machine modelis built using supervised learning techniques which are more commonly used for illness predictions. The authors use a random forest method to calculate the probability of mental disorder. Random forest is being used in this paper because it has lower error rates compared with other methods.

II. PROPOSED SYSTEM

The task of the proposed system to identify the psychomotorissue and provide the task to get better from that. The user is first asked to login by entering the login credentials. The details are checked and directed to the dashboard. Dashboard provides a quiz set of questions with corresponding options. User answers each and every question by selecting the pertinent options. Then based on the answers , the users are categorized and provide tasks that belong to their specific category. Apart from that, by using machine learning classification model Random forest we can also predict the category that most of the people belong to a specific class like age, place etc.

III. SYSTEM DESCRIPTION

A. Architecture
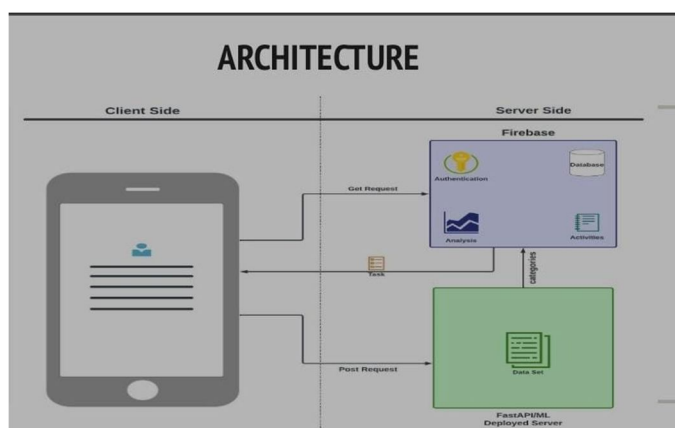
The system is partitioned as client side and server side. The system begins with registration of a new user by entering his/her details like email id, name, age, gender and other details etc and the user takes the quiz. The entered information is stored in the database of firebase. Then the firebase server verifies whether the user details are correct or not. For each answer selected by the user there is a predefined score for every option. After collecting all answers and calculating scores, users are categorized based on the score using if- else classification. Each category has its own corresponding task. And then the tasks are given to users. The database has details about all the users and their categories and tasks. Here Fast API acts as an independent server. Using random forest classification it provides the category that most of the people belong to a specific attribute such as age group between 20 to 25 Or based on gender etc.

B. System module

Thr system mainly consists of the Authentication module, Survey module, Activity module and Real time Data Visuali- sation module

1) Implementation of Authentication Module

It deals with new user registration and login. It is done by an admin. Registration is done by entering details like name, mailid, age, gender etc. Already registered users can directly login to the system by entering the email id. This entered information is stored in the firebase database which can be monitored by the admin.
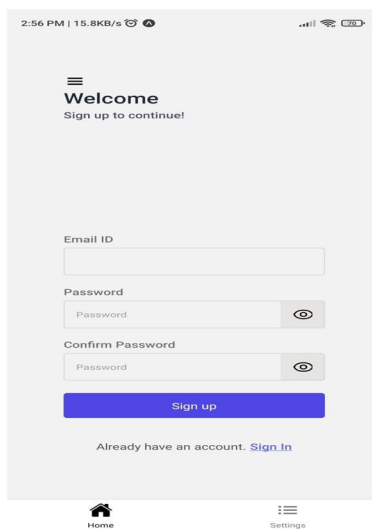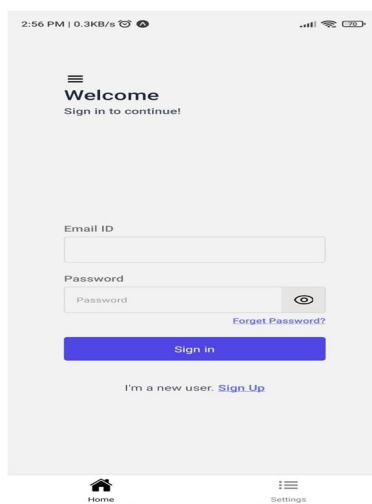

Fig. 1. Registration module

Fig. 2. Login module

2) Implementation of Survey Modules

The dashboard contains the Survey module. Survey module usually consists of questionnaires to evaluate their feelings. The questionnaire is the actuarial dataset. Each answer to the question is mapped with a numerical value. So, by taking the questionnaire the user gets categorized into a classification label based on the scores according to the if-else classifier. Each question has five options having score 1,2,3,4 and 5. Ten questions are provided to evaluate the mental state/ category. Out of 50 marks we are taking the score.

The range from

a) 1-10 belong to category Anxiety
b) 11-20 belongs to category Apathy
c) 21-30 belong to category Boredom
d) 31-40 belong to category Control
e) 41-50 belong to category Flow

3) Activity module

Activity module deals with tasks related to each category. Users are categorized and tasks related to corresponding cate- gories are given to the user profile. So that he/she can access the task and complete it. The progress after completing every task should be displayed in the user's profile. This module is also displayed in the dashboard.
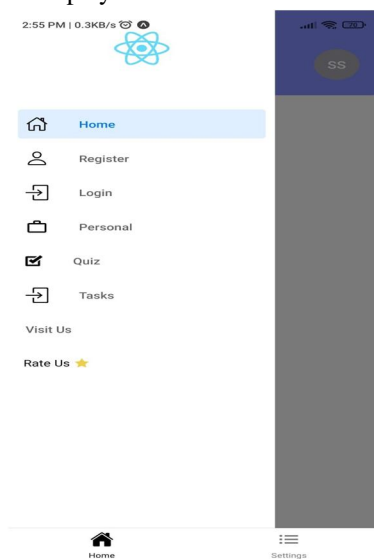

Fig. 3. Dashboard module

4) Real time Data Visualization Module

In this module using FastApi server we are taking the partic- ular category that most of the users belong to based on either age group or gender or any attributes using random forest classifer. So that we can predict category of people belong to that attributes and can also make a report regarding this.

IV. MODELS USED

A. Rule Based Classifier

Rule-based classifiers are just another kind of classifier which makes the category decision depending by using vari- ous "if..else" rules. These rules are easily interpretable and thus these classifiers are generally accustomed to generate descriptive models. The condition used with "if" is named the antecedent and therefore the predicted class of every rule is named the ensuing. Properties of rule-based classifiers: Coverage: the share of records which satisfy the antecedent conditions of a selected rule. The rules generated by the rule-based classifiers are generally not mutually exclusive, i.e. many rules can cover the identical record. The rules generated by the rule-based classifiers might not be exhaustive, i.e. there could also be some records which don't seem to be covered by any of the principles. The decision boundaries created by them are linear, but these will be far more complex than the choice tree because the various rules are triggered for the identical record.

B. Random forest classifier

A randomly chosen portion of the training data is usedby the Random forest classifier to generate a collection of decision trees. Essentially, it is a collection of decision trees (DT) created from a subset of the training data that was chosen at random. To make the ultimate prediction, it compiles the votes from various decision trees. Numerous decision trees make up the algorithm. The random forest algorithm's generated "forest" is trained via bagging or bootstrap aggrega-tion. A collective meta-algorithm called bagging improves theaccuracy of machine learning algorithms. The (random forest)algorithm produced a result that confirmed the choice trees' predictions. By using the frequency or mean of the resultsfrom other trees, it makes predictions. The precision improvoesas the number of trees grows.

The Random Forest Algorithm's Features
1) It is more accurate.
2) It offers a practical method for dealing with missing data.
3) Without hyper-parameter adjustment, it can generate areasonable prediction.
4) Overfitting in decision trees is resolved as a result.
5) At the node's splitting point in every random forest tree,a subset of features is chosen at random.
6) Exactly random forest.

The foundation of a random forest algorithm are decisiontrees. A decision support method that has a tree-like structure is called a decision tree. We will learn about decision trees and how random forest methods function. Decision nodes, leaf nodes, and a root node are the three parts of a decision tree. A training dataset is divided into branchesby a decision tree algorithm, which then separates those branches further. This process keeps going until a leaf nodeis reached. Further segregation of the leaf node is not possible.
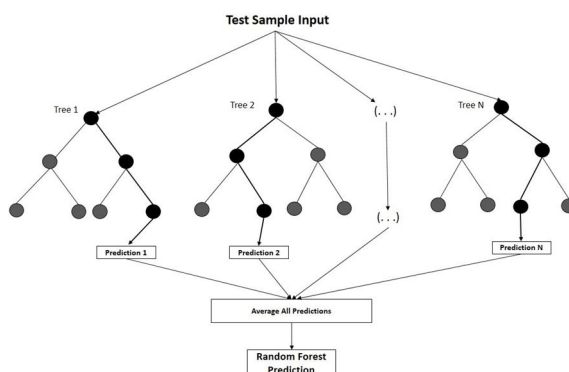
V. SYSTEM REQUIREMENTS

1) *Expo-ReactiveNative* - React Native is a JavaScript framework for writing real, native rendering mobile ap- plications for iOS and Android. It i's based on React, Facebook's JavaScript library for building user interfaces, but instead of targeting the browser, it targets mobile plat-forms.It is a framework and a platform for universal Reactapplications. Expo is a set of tools and services built around React Native and native platforms that help you develop, build, deploy, and quickly iterate on iOS, An- droid, and web apps from the same JavaScript/TypeScriptcodebase.
2) *Cloud Firestore* - The cloud Firestore is a NoSQL document database that provides services like a store, sync, and query through the application on a global scale. Data is stored in the form of objects also knownas Documents. It has a key-value pair and can store all kinds of data like strings, binary data, and even JSON trees.
3) *FastAPI* -It is a modern, fast (high-performance), web framework for building APIs with Python 3.6+ based on standard Python type hints.
4) *Scikit-Learn* - It is a free machine learning library for Python. It supports both supervised and unsupervised machine learning, providing diverse algorithms for classi-fication, regression, clustering, and dimensionality reduc-tion. The library is built using many libraries you may already be familiar with, such as NumPy and SciPy. It also plays well with other libraries, such as Pandas and Seaborn.

VI. RELEVANCE

1) Machine learning algorithms could help determine key behavioral biomarkers to aid mental health professionals in deciding if a patient is at riskof developing a particular mental health disorder.Additionally the algorithms may assist in tracking effectiveness of a treatment plan

2) The system can easily be accessible to all. Mostof the time mentally depressed individual have acomplex where they are not interested in others knowing their mental state and making compassion. So the system provides privacy.

VII. FUTURE SCOPE

The data collected from the system could be used for business, governmental, mental health research aswell as pharmaceutical applications. The system can also be converted to a government initiative program so that the more users can access the system. Early prediction of mental health problems may reducethe aggressive behavior of people, further it maybring down the chances of increase of ferocity in uncontrolled society. Preliminary forecasts of mentalillness of individuals in a particular age group or society etc can be used for applications like job recruitment , military recruitment or any other salientapplications. By performing this we can reduce the consequences after selection an unfit person for thejob.

VIII. CONCLUSION

The existing studies and research show that machine learning can be a useful tool in helping understand psychiatric disorders. Besides that, it may also help dis- tinguish and classify the mental health problems among patients for further treatment. Newer approaches that use data that arise from the integration of various sensor modalities present in technologically advanced devices have proven to be a convenient resource to recognize the mood state and responses from patients among others.

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