COVID COMPANION

Submitted in partial fulfillment of the requirements of the degree of

B.E in COMPUTER ENGINEERING

by

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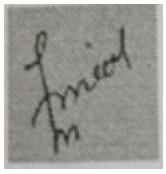
2021-2022

CERTIFICATE

This is to certify that the project entitled **"Covid Companion"** is a bonafide work of "**Rishika Ahuja(02), Ann Zachariah(07), Aishwarya John(35), Anashwara Kurien(42)** " submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of B.E. in Computer Engineering



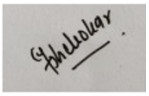
Mrs. Jayashri Mittal

Guide

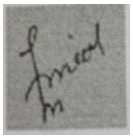
Project Report Approval for B.E.

This project report entitled '*Covid Companion*' by '*Rishika Ahuja, Ann Zachariah, Aishwarya John, Anashwara Kurien*' is approved for the degree of *B.E. in Computer Engineering.*

Examiners



1. **Dr. Narendra M. Shekokar**



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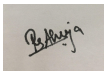
Date: 04-05-2022

Place: Mumbai

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will cause disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Rishika Ahuja 02



Ann Zachariah 07

Aishwarya John 37

Anashwara Kurien 44

Abstract

The COVID-19 outbreak, declared as a pandemic by the World Health Organization (WHO), rapidly spread across the globe spreading havoc in its wake. Having suddenly distorted each and every person's routine lifestyle, this pandemic has induced a considerable degree of fear, worry and concern in the population at large. COVID-19 is putting our mental health at risk since it has been proven stressful for plenty of people. Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make healthy choices. Being social beings, humans were not meant to live in isolation. Community is critical for us to thrive, especially for someone with mental illness who is already experiencing the common symptoms of loneliness and isolation.Thus there has been an exponential increase in the number of people suffering from mental disorders with the pandemic taking over the globe.

In this project we have tried to quantify the effect of COVID-19 on the mental health of the users of our system and then suggest to them some basic ways to help them cope with it.

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List of Abbreviations

Sr. No.	Abbreviation	Expanded form
i	DSS	Decision Support System
ii	CAS	Covid Anxiety Scale
iii	PCA	Principal Component Analysis
iv	ICA	Independent Component Analysis
v	SAS	Self-rating Anxiety Scale
vi	SDS	Self-rating Depression Scale

1. INTRODUCTION

The COVID-19 outbreak, which first emerged in China, has been declared as a pandemic by the World Health Organization (WHO). As the coronavirus pandemic rapidly sweeps across the world, it is inducing a considerable degree of fear, worry and concern in the population at large. COVID-19 is putting our mental health at risk since it has been proven stressful for plenty of people. A person's mental health affects how they handle stress, relate to one another and make decisions. It also influences the way individuals look at themselves, their lives and others in their lives. Studies show that at least 1 in 5 children and adolescents have a mental health disorder at any given time. Yet, fewer than one in five of these children receive the mental health services they need. Among young people, at least 1 in every 10 has a serious emotional disturbance at any given time. We're social beings, and we are not meant to live in isolation. Community is critical for us to thrive, especially for someone with mental illness who is already experiencing the common symptoms of loneliness and isolation. Thus, there has been an exponential increase in the number of people suffering from mental disorders with the COVID-19 pandemic wreaking havoc all over the globe.

Therefore, our project aims to judge the effect of COVID-19 on the mental health of the users and then suggest to them some basic ways to help them cope with it.

1.1 Description

As COVID-19 has occurred suddenly and is highly contagious, this will inevitably cause people anxiety, depression, etc. In such times the study on the public psychological states and its related factors during the COVID-19 outbreak is of practical significance. Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make healthy choices. Mental health is important at every stage of life, from childhood and adolescence through adulthood.

Mental health is important because it can help you to cope with the stresses of life, be physically healthy, have good relationships, make meaningful contributions to your community, work productively and realize your full potential. Mental health is also important because it can affect

physical health. For example, mental disorders can raise your risk for physical health problems such as stroke, type 2 diabetes, and heart disease. Over time, mental health can change when one may be dealing with a difficult situation, such as the current COVID-19 scenario. The situation may wear a person out and overwhelm their ability to cope with it. This can worsen their mental health. This project is aimed at tackling the sudden downgrading of mental health of the general population that is brought about by the onset of the global pandemic. It has a huge societal impact and is the need of the hour.

1.2 Problem Definition

To create a companion system for an individual which helps to analyze the mental health of the being during Covid-19 pandemic and provides precise suggestions based on their mental condition.

1.3 Motivation

With the sudden outbreak of COVID-19 which caused complete closure of schools, colleges, work and social life in general and the infectious power of the virus, it is inevitable to see a drastic rise in anxiety, depression and other stress reactions. With the new limitations on daily life and social activities for an unknown period of time, the population will inevitably suffer from stress and anxiety and eventually may lose confidence in life, ultimately taking a toll on the mental health of society. Thus to help every individual through these socially distanced times we decided to take up the project to make a Covid Companion app. An App that will help individuals assess themselves as per their habit inputs if they are likely to have any sort of mental health problems and thus suggest a solution to help cope through the problems in ways that may bring significant changes to one’s daily lives.

1.4 Problem Solution

In this project, a model is prepared based on the dataset which contains the mental health information of people during the Covid-19 pandemic. The dataset is cleaned and processed using the appropriate algorithms and the relevant features from the dataset are selected which helps in training the model. The model then forms the basis for the COVID Companion app. The user's

features are collected in the app and given to the previously trained model. The mental health of the user is analyzed and suggestions are given which help to improve the mental health of the user.

1.5 Scope of the Project

This project aims to increase the mental wellbeing of the users and reduce their depressive symptoms. We aim to increase mental health awareness among the general public and help them cope with the stress and hardships caused by the sudden onset of this pandemic. By raising awareness, mental health can now be seen as an illness which can be managed by treatment. People with mental disorders can get better, and many of them recover completely. Our project hopes to build a website that proves to be a worthy companion to the mental health of those suffering in these hard times by helping them access the state of their mental well being and providing simple measures to help them cope with it and begin their journey on the path of recovery.

Chapter 2

2. Review of Literature

[1]Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China

Data:

600 valid questionnaires were received. The Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) were used.

A total of 605 psychological state questionnaires were distributed to the general population through online questionnaires from February 6 to 9, 2020. 600 valid questionnaires were received, and the response rate was 99.17%.600 valid answers, resulting in a 100% effective rate. Inclusion criteria include the following: (1) 18 years old and above and (2) completed questionnaire. Exclusion criteria include the following: (1) 17 years old and below and (2) questionnaire responses are not logical.

Method:

In this study, the Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS)were used. The Self-Rating Scale questionnaire was completed by the following survey items according to the unified guidance methods. The contents include the following: (1) General information includes name, gender, age, education level, occupation and residence; (2) SAS is used to evaluate the subjective feelings of anxiety; and (3) SDS is used to measure the degree of depression.

The two independent self-assessment scales mainly assess the frequency of symptoms of the respondents in the past week, each with 20 items, using a 4-level score (1 for a little of the time, 2 for some of the time, 3 for a good part of the time and 4 for most of the time).

Standard score = 1.25 × total score.

Anxiety levels were graded as the following: standard score below 50 = non-anxiety; 50–59 = mild anxiety; 60–69 = moderate anxiety; and above 70 = severe anxiety.
Depression levels were graded as the following: standard score below 53 = non-depression; 53–62 = mild depression; 63–72 = moderate depression; and above 73 = severe depression.
The data were organized and analyzed using SPSS 23.0 software. The surveyed population was divided into anxiety groups and non-anxiety groups according to the SAS scoring criteria. According to the SDS scoring standard, the surveyed population was divided into depression groups and non-depression groups.

The analysis of the relationship between gender, age, education level, occupation, region and anxiety or depression initially used the chi-square test. The variables with $p < 0.1$ were entered in the multiple logistic regression analysis model. The correlation between SAS and SDS standard scores was analyzed by Spearman correlation analysis, and $p < 0.05$ on double sides was statistically significant.

[2]COVIDiSTRESS Global Survey dataset on psychological and behavioral consequences of the COVID-19 outbreak

Data:
This N = 173,426 social science dataset was collected through the collaborative COVIDiSTRESS Global Survey – an open science effort to improve understanding of the human experiences of the 2020 COVID-19 pandemic between 30th March and 30th May, 2020.
The dataset contains demographic background variables as well as measures of Asian Disease Problem, perceived stress (PSS-10), availability of social provisions (SPS-10), trust in various authorities, trust in governmental measures to contain the virus (OECD trust), personality traits (BFF-15), information behaviors, agreement with the level of government intervention, and compliance with preventive measures, along with a rich pool of exploratory variables and written experiences

Method:

3,426 people accessed an online survey link to provide their experiences over a period of 62 days (30th March to 30th May. The stored dataset represents 125,306 people who met inclusion criteria (18 years of age and older and gave informed consent)

[3]Coronavirus Anxiety Scale: A brief mental health screener for COVID-19 related anxiety

Data:

The Coronavirus Anxiety Scale (CAS) is a mental health screener to identify probable cases of dysfunctional anxiety associated with the COVID-19 crisis. The dataset was created through an online survey from 11-30 March 2020 out of a total of 775 adults. The objective of this study was to develop and evaluate the properties of the CAS.

Methods Used:

This 5-item scale, based on 775 adults with anxiety over the coronavirus, demonstrated solid reliability and validity. A pool of 20 candidate items was created based on the psychology of fear and anxiety literature

The PCA was used to identify the five most robust and representative symptoms of coronavirus anxiety.

CFA was run to test whether or not the five symptoms identified in the previous PCA cohered together into a single, coronavirus anxiety construct. CAS scores were strongly, positively correlated with functional impairment, alcohol or drug coping, extreme hopelessness, and passive suicidal ideation. A CAS score 9 for ROC optimally classified adults as having or not having dysfunctional levels of anxiety with a false positive rate of 15%. Thus, these results support the CAS as a diagnostically accurate mental health screening tool with strong classification features.

CAS scores were strongly, positively associated with functional impairment, alcohol or drug coping, negative religious coping, extreme hopelessness, and passive suicidal ideation. The results of this study also support the CAS as a useful mental health screener, as its diagnostic qualities (90% sensitivity and 85% specificity) are comparable to other psychiatric screening tests.

Chapter 3

3. SYSTEM ANALYSIS

3.1 Functional Requirements:

USER INTERFACE: The user interface will be an application that takes input from the user based on a pre-decided Questionnaire. Based on the User inputs the user interface will provide the user with various suggestions as to how to better his/her Mental Health and better cope with the situation.

PROPER PREDICTION: The System should properly predict the degree to which the users mental health is being affected based on the user inputs.

SUGGESTIONS TO IMPROVE MENTAL HEALTH : According to the results of the assessment of the user's mental health, the system must display accurate suggestions that help improve the user's mental health.

DATABASE: The database consists of the user's personal information such as name, age, contact number, marital status, past medical history, etc. The feedback given by the user would be stored in the database and used in order to improve the system. A second database would consist of the names and contact information of a few psychiatrists so that a patient having severe anxiety and mental health issues could be referred to them.

3.2 Non-Functional Requirements:

Platform Independent:

The application would be platform-independent if all the requirements are installed in the device.

Performance:

The application should have better accuracy and should provide the information in less time.

Capacity:

The capacity of the storage should be high so that a large amount of data can be stored in order to train the model.

Performance Requirements

1. The System should be able to accurately predict the state of the mental health of the user.
2. Once the mental health is assessed the System should be able to display accurate suggestions for the betterment of the user's mental health based on the amount of harm caused to the same.

Security Requirements:

Since our project updates automatically, changes should not be made in the dataset by anyone, including the admin or the viewer. In case of a server crash, existing data must not be wiped out. The source code must not be tampered with under normal circumstances with the exception of maintenance or update. The user's details should always stay anonymous under any circumstances.

3.3 Specific Requirements

Hardware Requirements:

- CPU --Intel Core i5 9300H
- MotherBoard -- Intel 810 or above
- Hard Disk Space -- 1TB
- Display -- 1080 FHD 13 inch
- Memory -- 2666Hz 8gb DDR4 ram
- Other Devices – Laptop

Software Requirements:

- Operating System: Windows 10
- Application : Colab Notebook
- Programming Language : Python, HTML, CSS, JS, Bootstrap, PHP

3.4 Use case Diagram and description

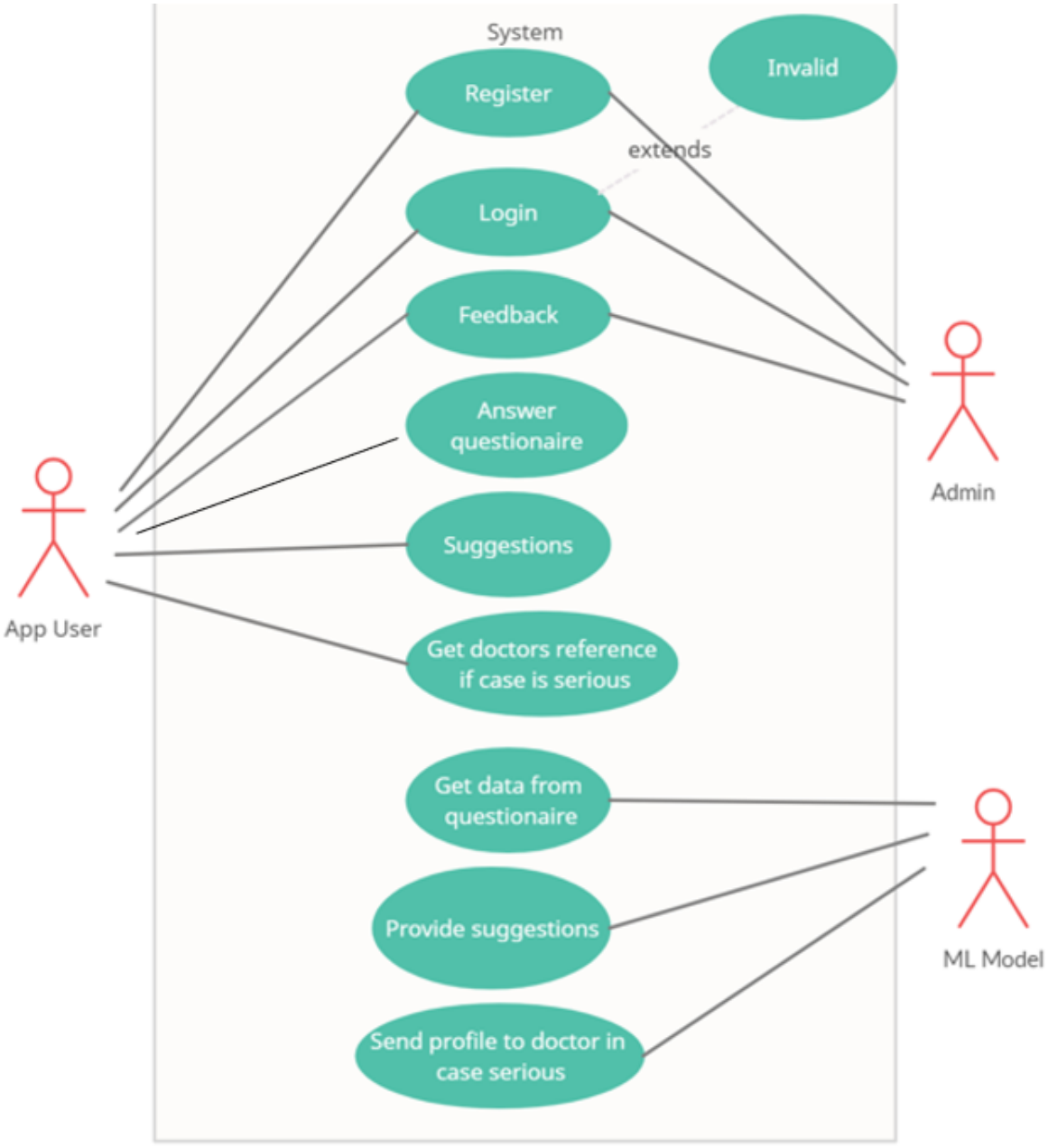


Fig.3.4.1. Use Case Diagram

In this use case diagram, the app user registers himself into the system. The user can login into the system using the credentials and can answer the questions that are asked by the system. These

answers are collected by the system and trained by the model using the valid algorithms. The mental health of the user is calculated and suggestions are given by the model based on the scores generated. If the condition of the user is serious then the model sends the profile of the user to a doctor or psychiatrist.

Use Case Description:

Login	
User	**End User**
Input	Username, Password
Output	Home Page
Prerequisites	Must have registered username and password

Table 3.4.2. Login

Register	
User	**End User**
Input	Name, email-id, password
Output	Message: Registered Successfully
Prerequisites	Email-id, password

Table 3.4.3. Register

Feedback	
User	**End User**
Input	How beneficial the suggestion was, any improvements needed.
Output	Message: Thank you for your feedback!
Prerequisites	Must be registered user, should have filled the questionnaire.

Table 3.4.4. Feedback

Answer Questionnaire	
User	**End user**
Input	Fill n the questionnaire
Output	Quantitative anxiety measure, suggestions to deal with it, psychiatrist's reference if case is too serious.
Prerequisites	Must fill questionnaire correctly and should be a registered user.

Table 3.4.5. Answer Questionnaire

Suggestions	
User	
Input	Filled Questionnaire
Output	Suggestions based on level of anxiety
Prerequisites	Must fill questionnaire correctly and should be a registered user.

Table 3.4.6. Suggestions

Get data from questionnaire	
User	ML model
Input	The questionnaire filled by the patient
Output	Feed data to model. Predict anxiety level based on it.
Prerequisites	Model must be trained and tested prior to this.

Table 3.4.7. Get data from Questionnaire

Get Doctor's reference if case is serious	
User	Patient
Input	Filled questionnaire, consent to share information by user
Output	Psychiatrist reference details
Prerequisites	Must fill questionnaire correctly and should be a registered user.

Table 3.4.8. Doctors Reference

Provide suggestions	
User	ML model
Input	Filled questionnaire by the user
Output	Anxiety level and suggestions to overcome it.
Prerequisites	Model must be checked for accuracy prior to giving any suggestions.

Table 3.4.9. Provide suggestions

Send profile to doctor in case serious	
User	**ML model**
Input	Patient medical profile and predicted anxiety level.
Output	Send patient profile to one of the psychiatrists present in the database and alert the patient about the same.
Prerequisites	Patient consent is mandatory before any sharing of information.

Table 3.4.10. Send profile to doctor

Chapter 4

4. ANALYSIS MODELING

4.1 ER Diagram

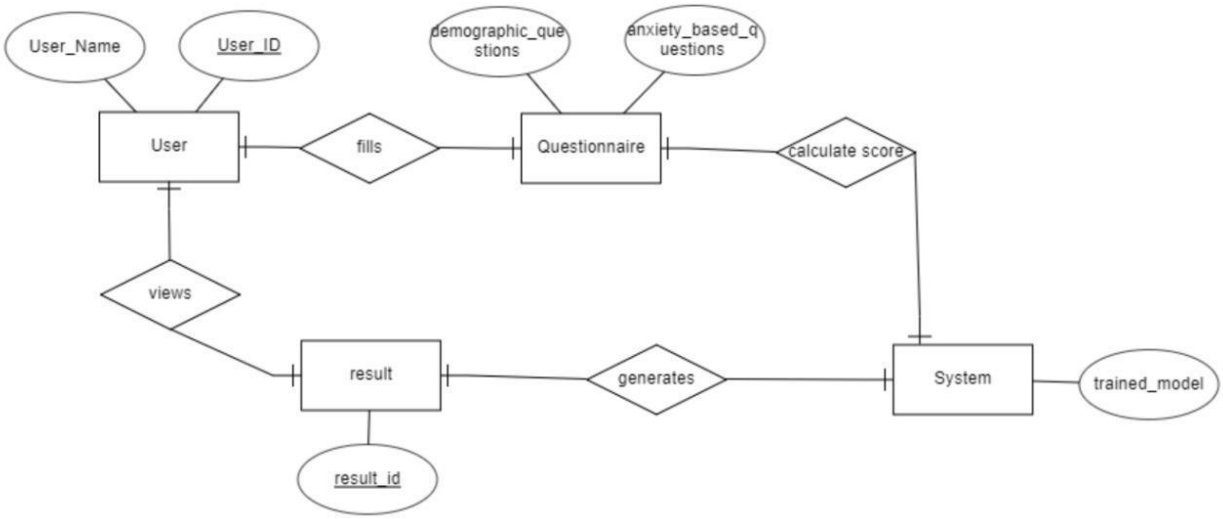


Fig.4.1. ERD

4.2 Activity Diagrams / Class Diagram

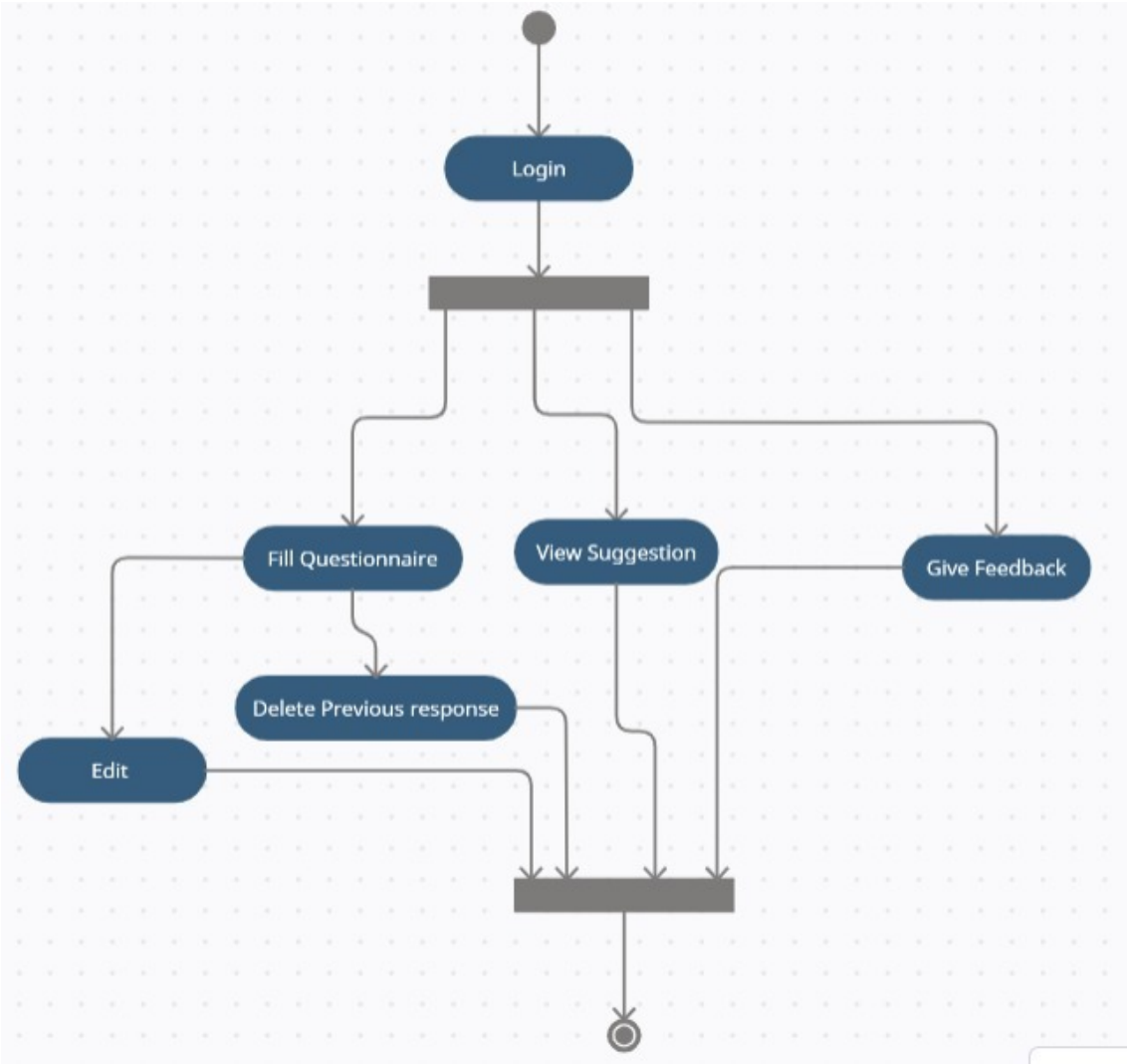


Fig.4.2. Activity Diagram

4.3 Functional Modeling

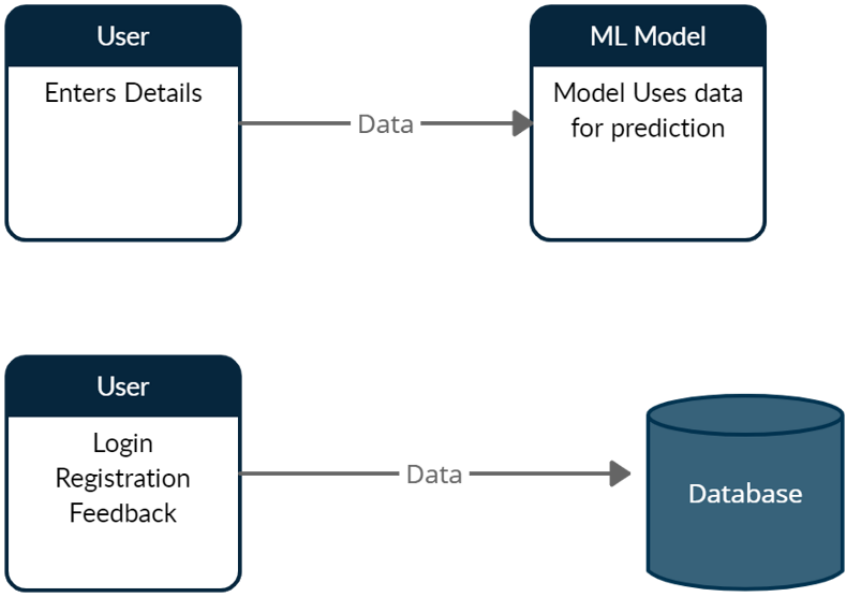
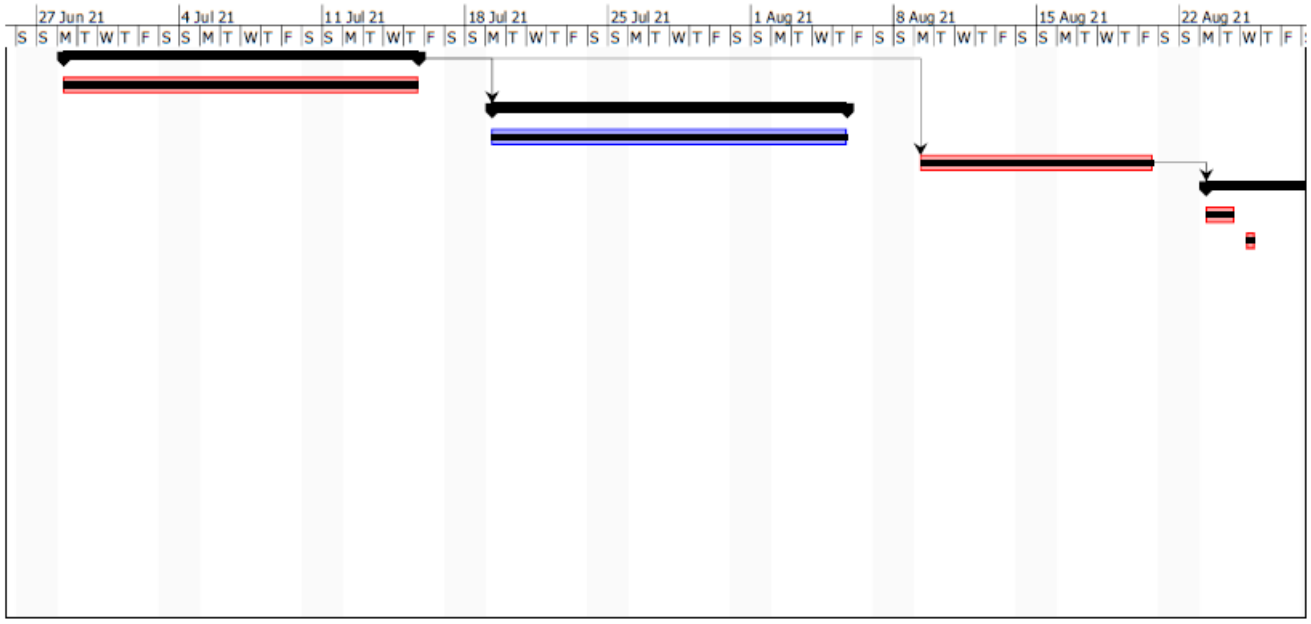
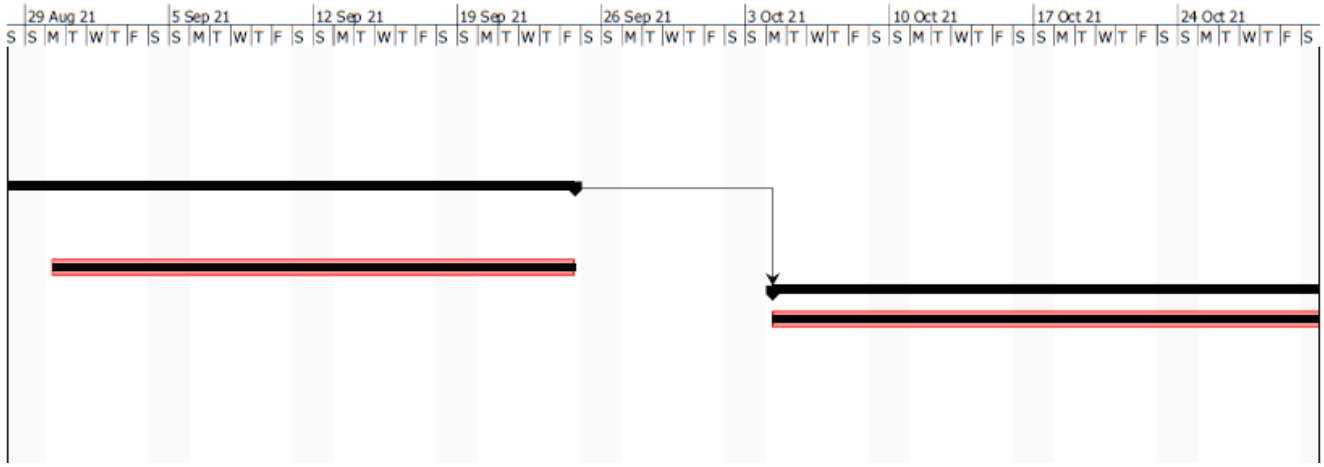


Fig.4.3. DFD

4.4 Timeline Chart

	Name	Duration	Start	Finish	Predecessors	Resource Names
1	**Project Ideation**	**14 days**	**28/6/21 8:00 AM**	**15/7/21 5:00 PM**		
2	Identify modules, scope,...	14 days	28/6/21 8:00 AM	15/7/21 5:00 PM		
3	**Literature Review**	**14 days**	**19/7/21 8:00 AM**	**5/8/21 5:00 PM**	**1**	
4	Find out algorithms used...	14 days	19/7/21 8:00 AM	5/8/21 5:00 PM		
5	Find dataset	10 days	9/8/21 8:00 AM	20/8/21 5:00 PM	1	
6	**Data Preprocessing**	**25 days**	**23/8/21 8:00 AM**	**24/9/21 5:00 PM**	**5**	
7	Remove null values	2 days	23/8/21 8:00 AM	24/8/21 5:00 PM		
8	Select algorithm for feat...	1 day	25/8/21 8:00 AM	25/8/21 5:00 PM		
9	Use algorithm for dimens...	20 days	30/8/21 8:00 AM	24/9/21 5:00 PM		
10	**Model Training**	**64 days**	**4/10/21 8:00 AM**	**30/12/21 5:00 PM**	**6**	
11	Perform training on vario...	60 days	4/10/21 8:00 AM	24/12/21 5:00 PM		
12	Choose the activation fu...	2 days	29/12/21 8:00 AM	30/12/21 5:00 PM		
13	**Front end**	**26 days**	**1/2/22 8:00 AM**	**8/3/22 5:00 PM**	**10**	
14	Home Page	4 days	1/2/22 8:00 AM	4/2/22 5:00 PM		
15	MusicRecommendation	6 days	7/2/22 8:00 AM	14/2/22 5:00 PM		
16	WorkoutRecommendation	2 days	16/2/22 8:00 AM	17/2/22 5:00 PM		
17	Questionnaire	1 day	21/2/22 8:00 AM	21/2/22 5:00 PM		
18	Other pages	10 days	23/2/22 8:00 AM	8/3/22 5:00 PM		
19	Deploying back end on fro...	12 days	16/3/22 8:00 AM	31/3/22 5:00 PM	10;13	
20	Documentation	20 days	1/4/22 8:00 AM	28/4/22 5:00 PM	19	
21	Model Testing	10 days	3/1/22 8:00 AM	14/1/22 5:00 PM	10	
22	Evaluate accuracy	5 days	18/1/22 8:00 AM	24/1/22 5:00 PM		

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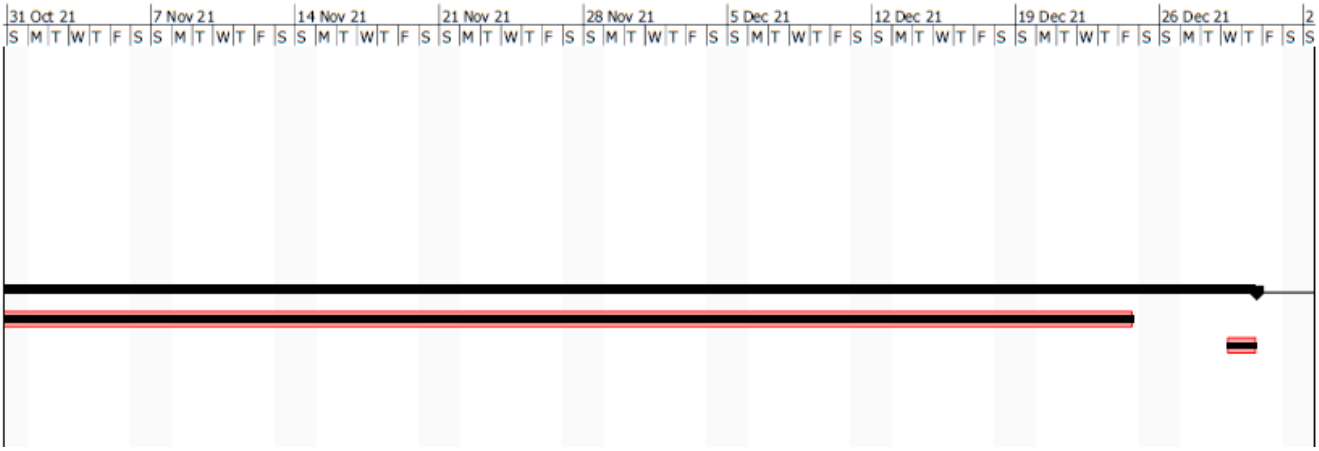
12 Sep 21
19 Sep 21
26 Sep 21
3 Oct 21
10 Oct 21
17 Oct 21
24 Oct 21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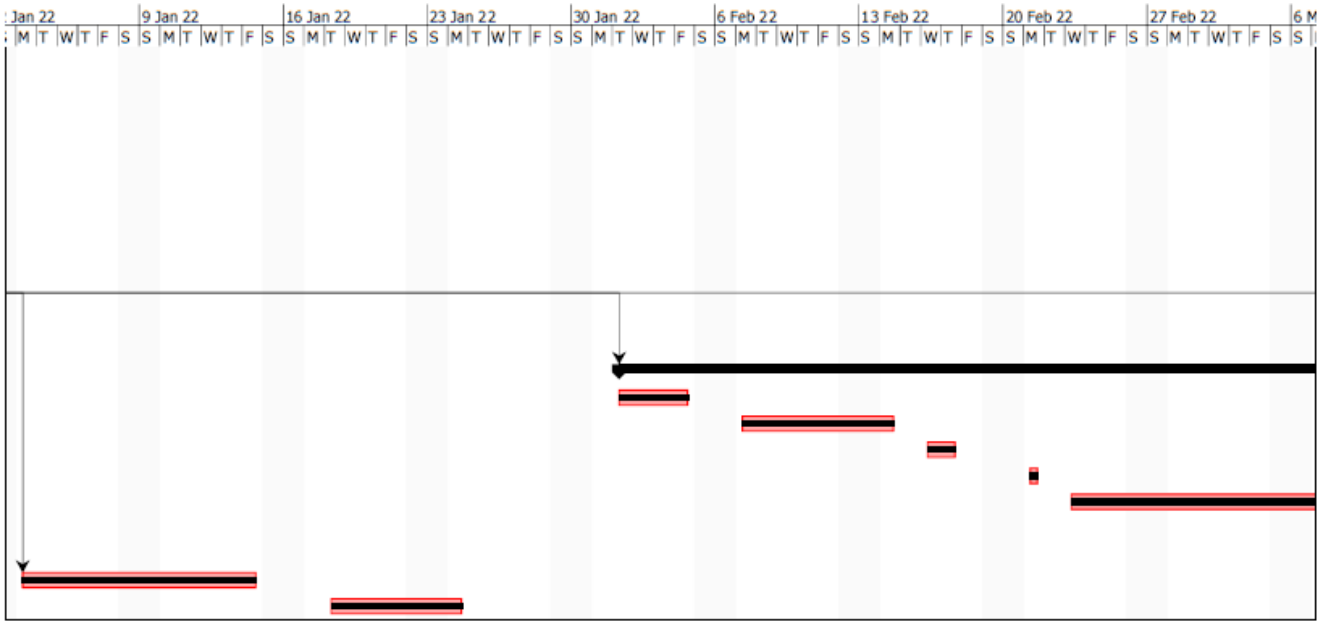
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6 Feb 22
13 Feb 22
20 Feb 22
27 Feb 22

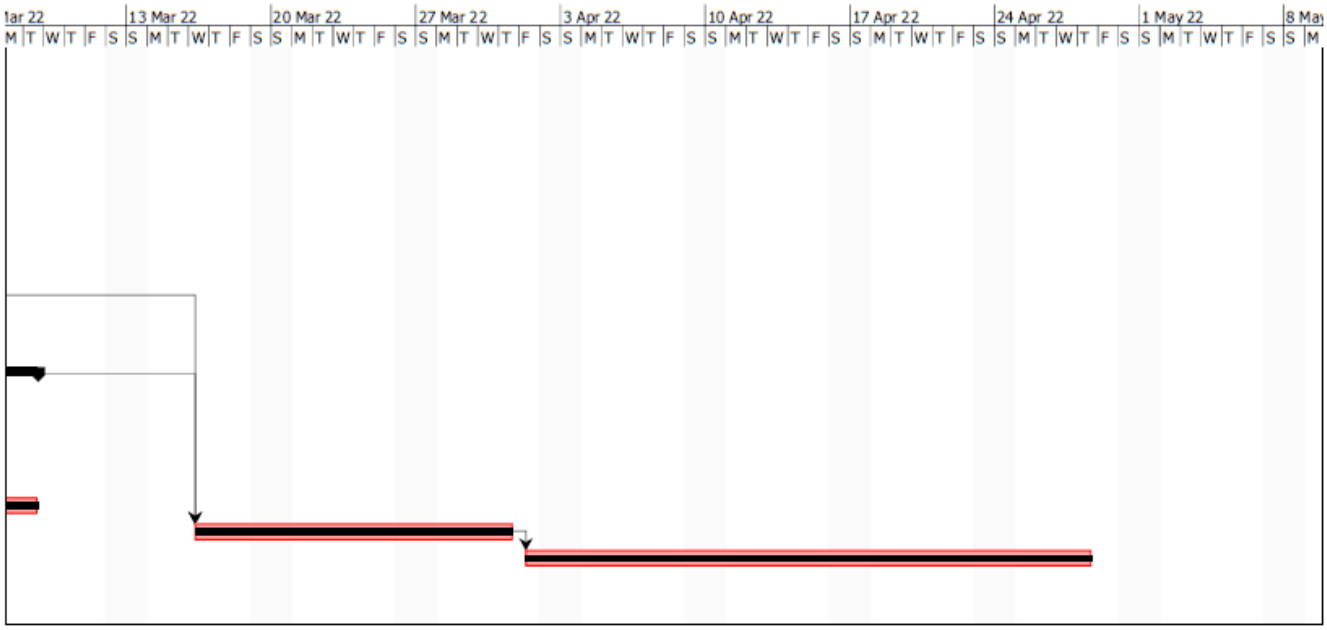

Fig.4.4. Timeline Chart

Chapter 5

5. DESIGN

5.1 Architecture Design:

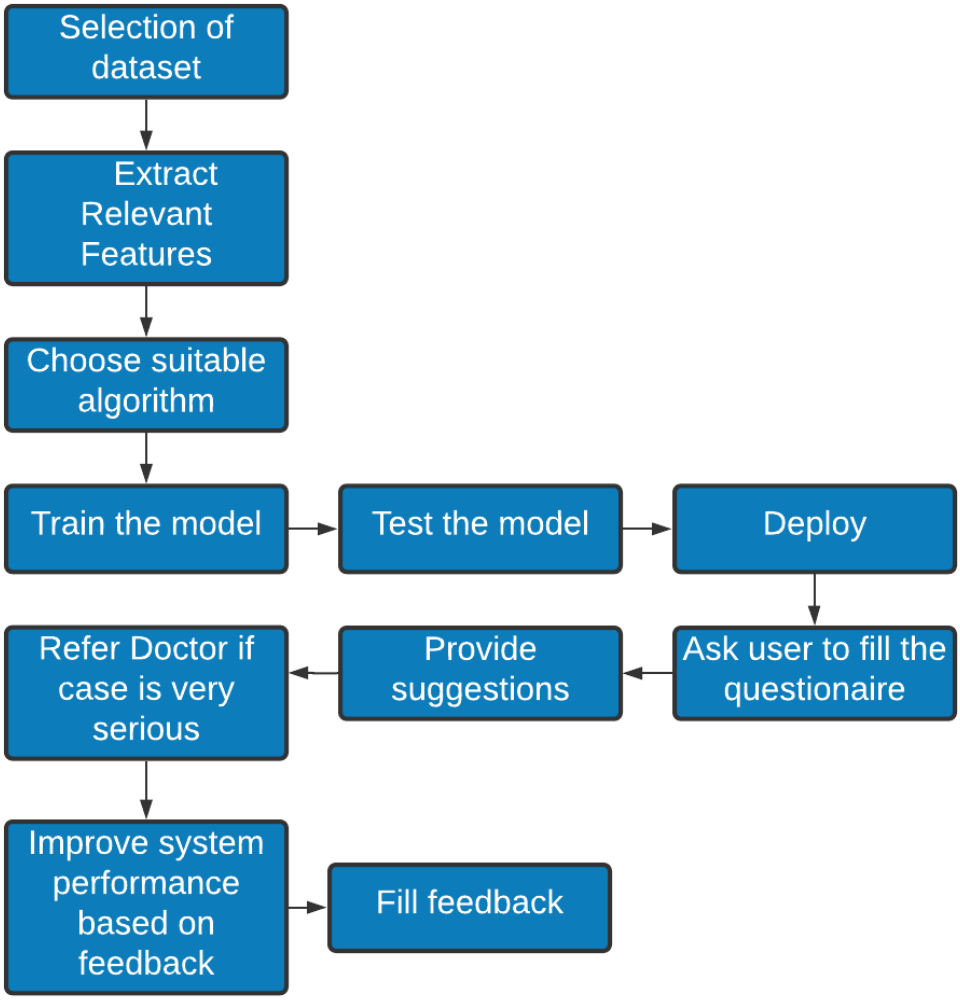

Fig.5.1. Architecture Design

5.2 User Interface Design

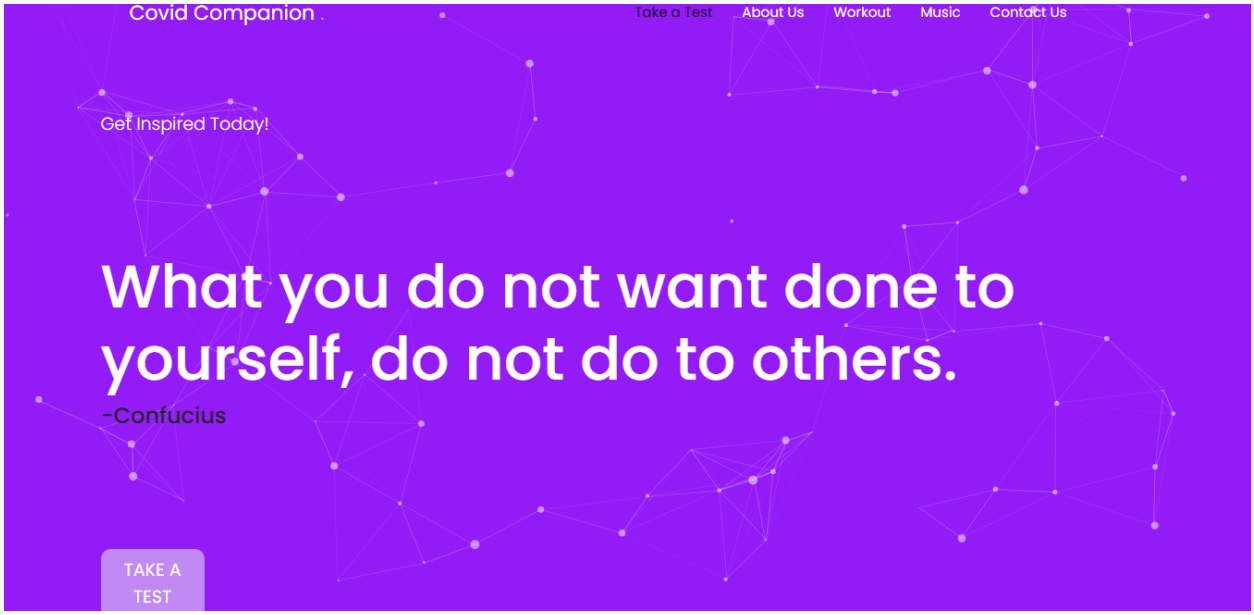

Fig.5.2.1. Home Page

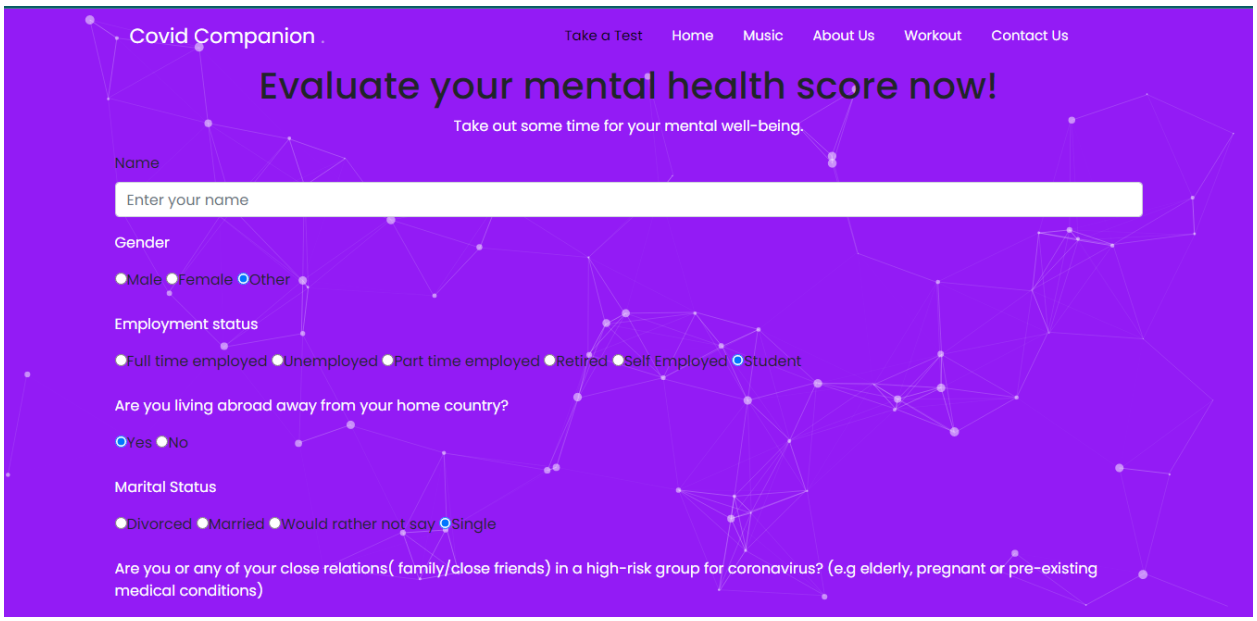

Fig.5.2.2. Demographic Questionnaire Page(1)

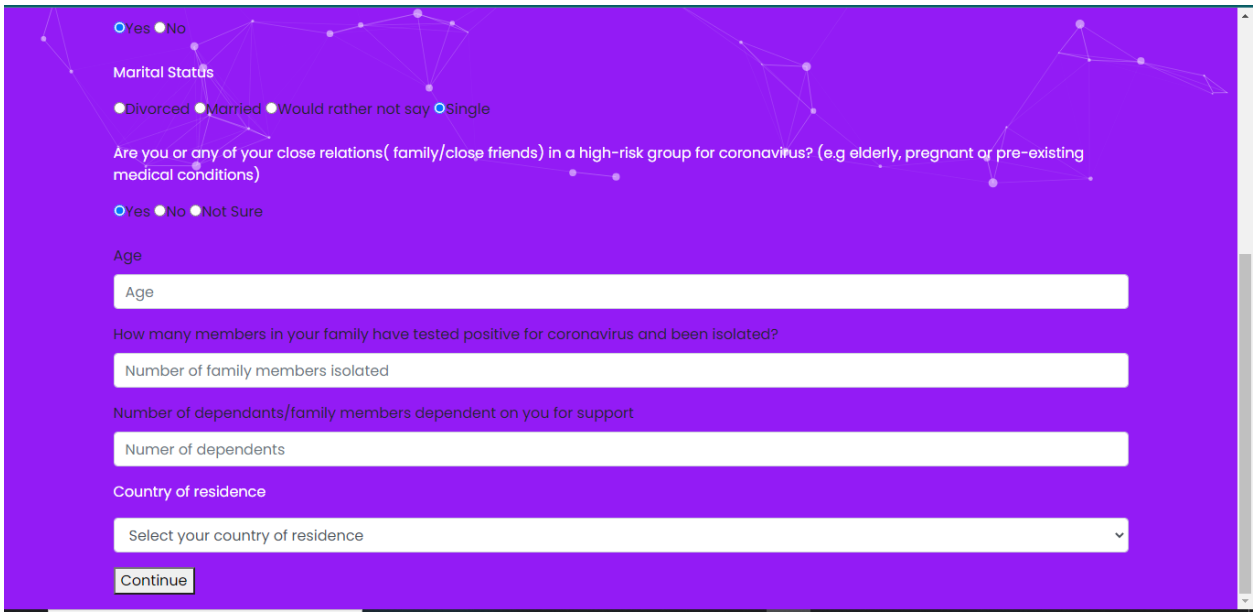

Fig.5.2.3. Demographic Questionnaire Page(2)

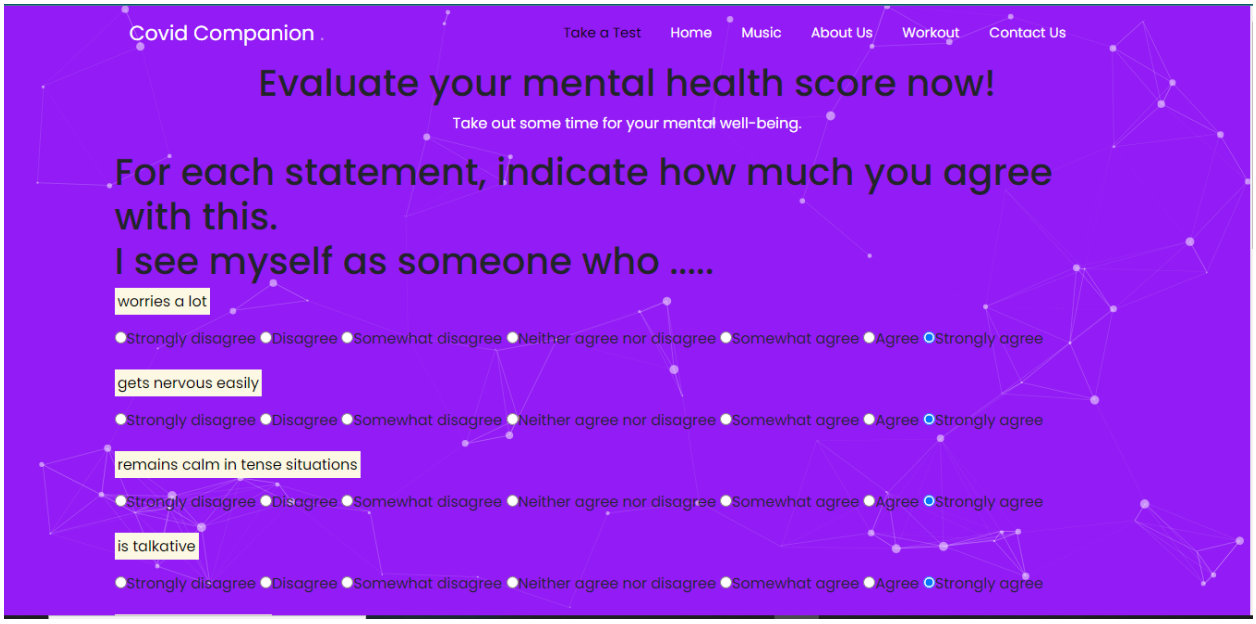

Fig.5.2.4. Personality based Questionnaire Page (1)

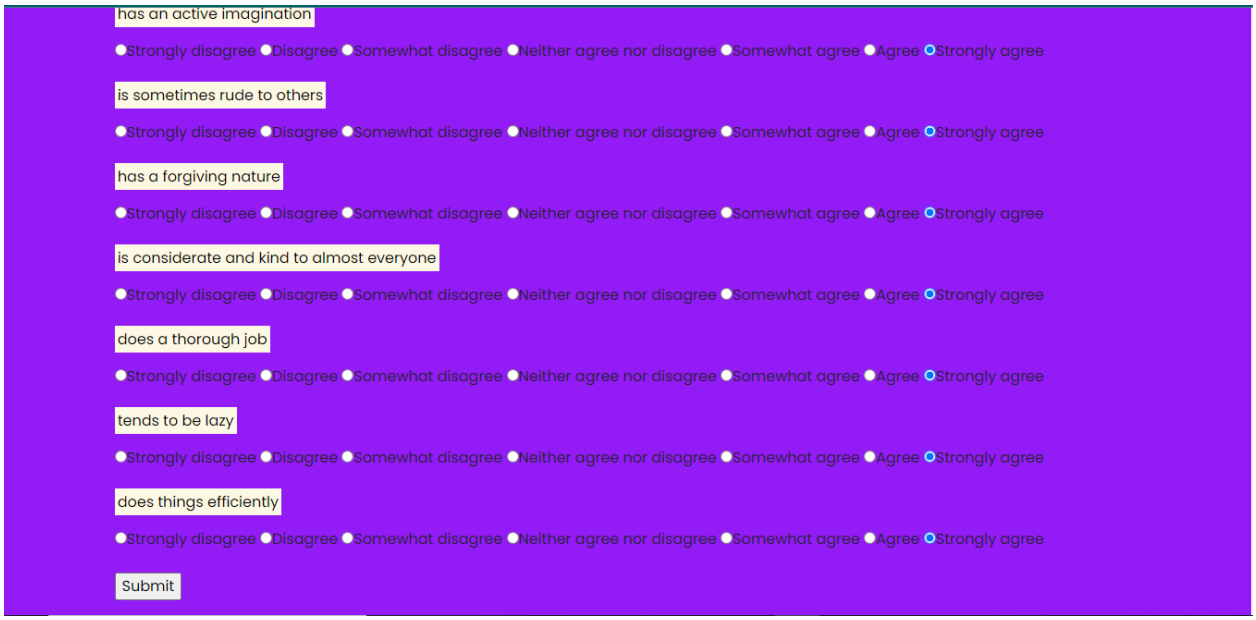

Fig.5.2.5. Personality based Questionnaire Page (2)

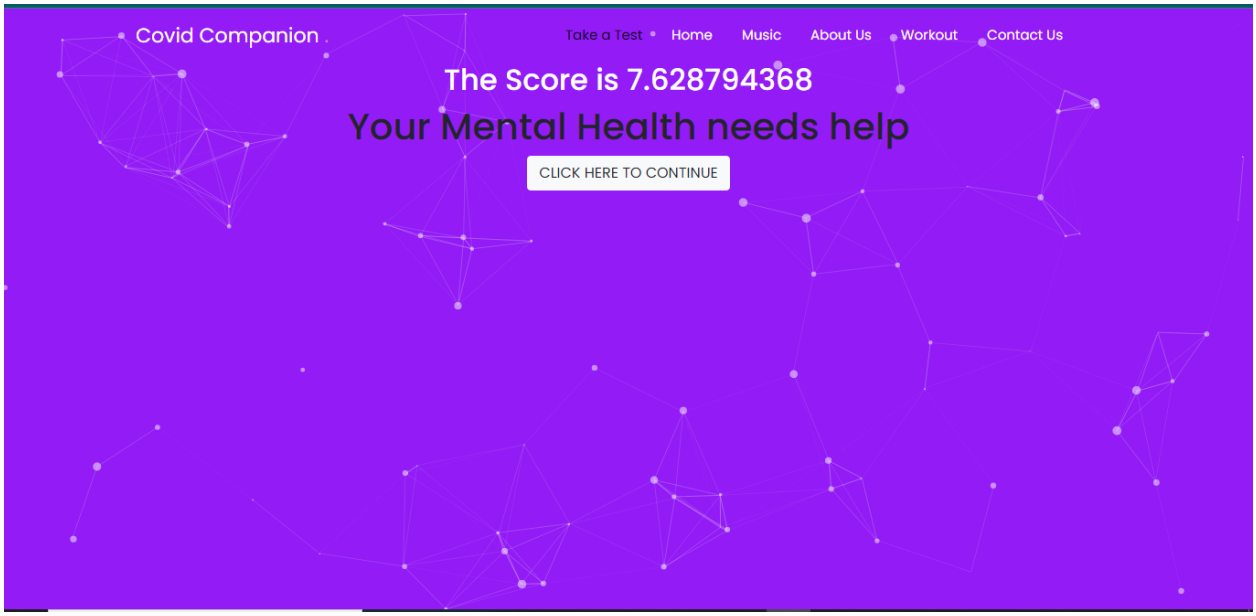

Fig.5.2.6. Mental health score page

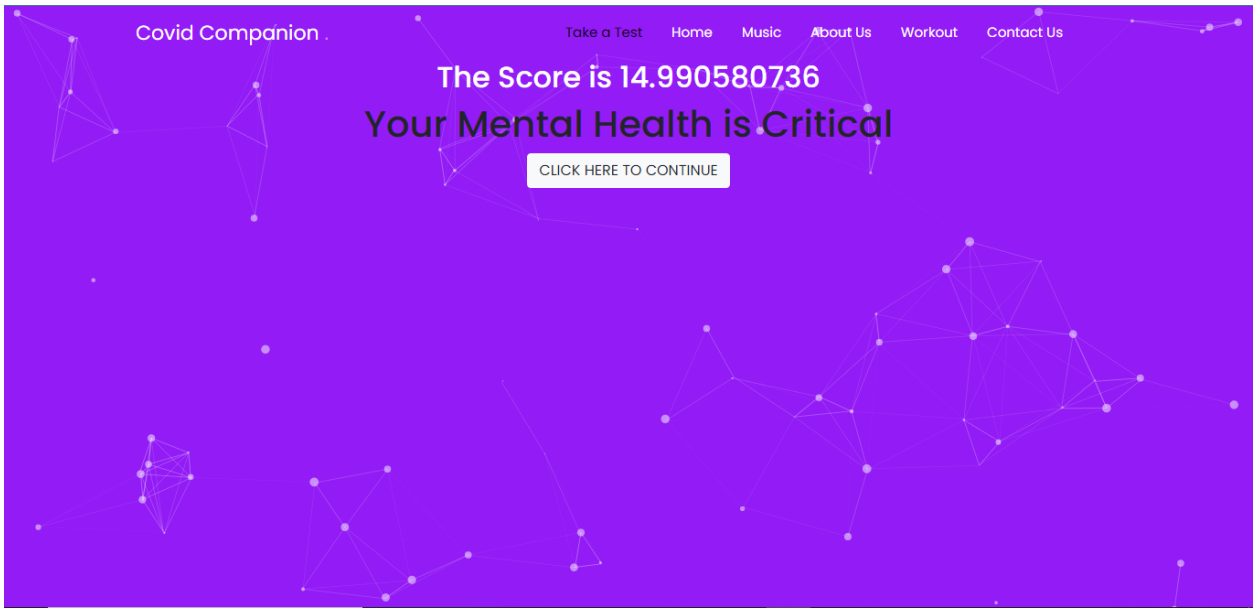

Fig.5.2.7. Critical mental health score page

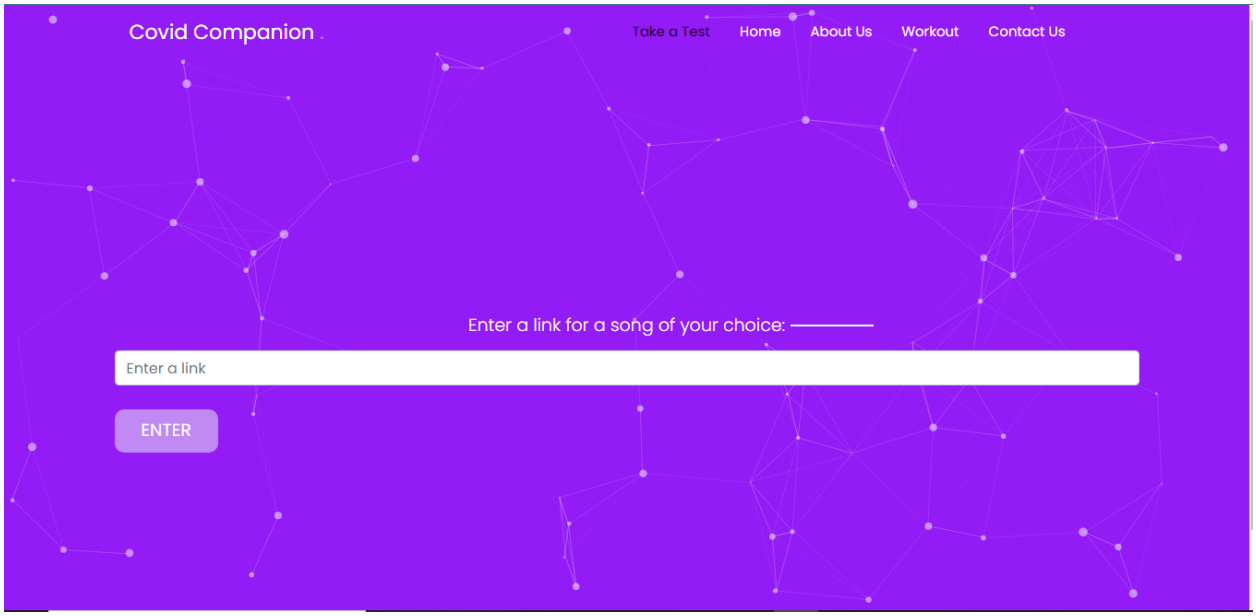

Fig.5.2.8. Music Recommendation Page (1)

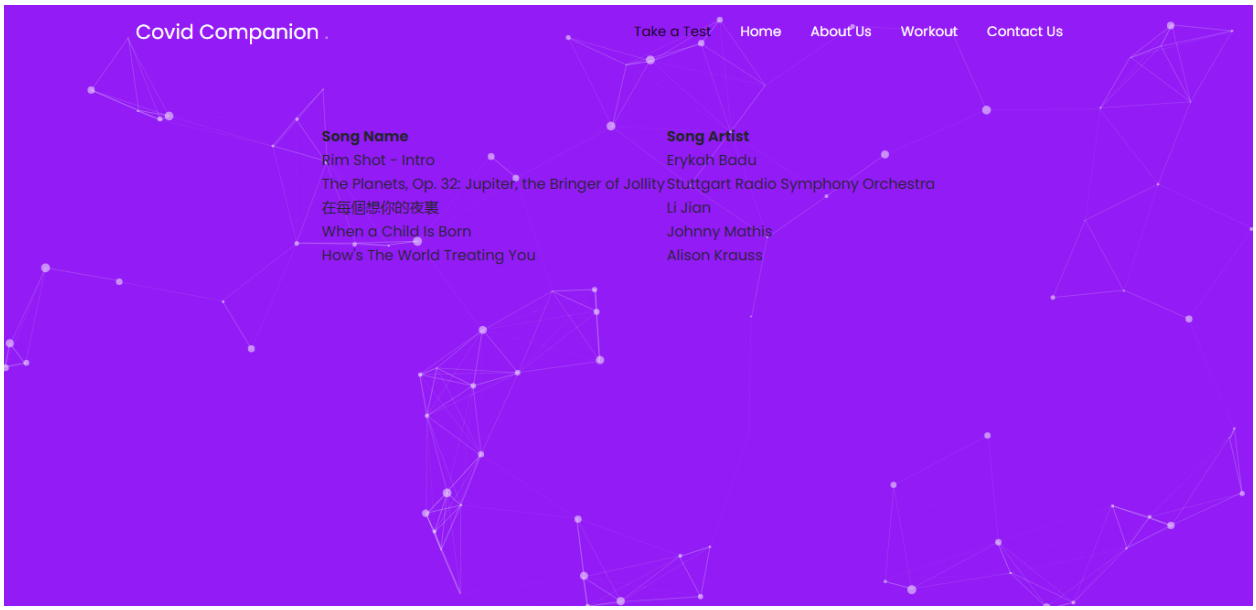

Fig.5.2.9. Music Recommendation Page(2)

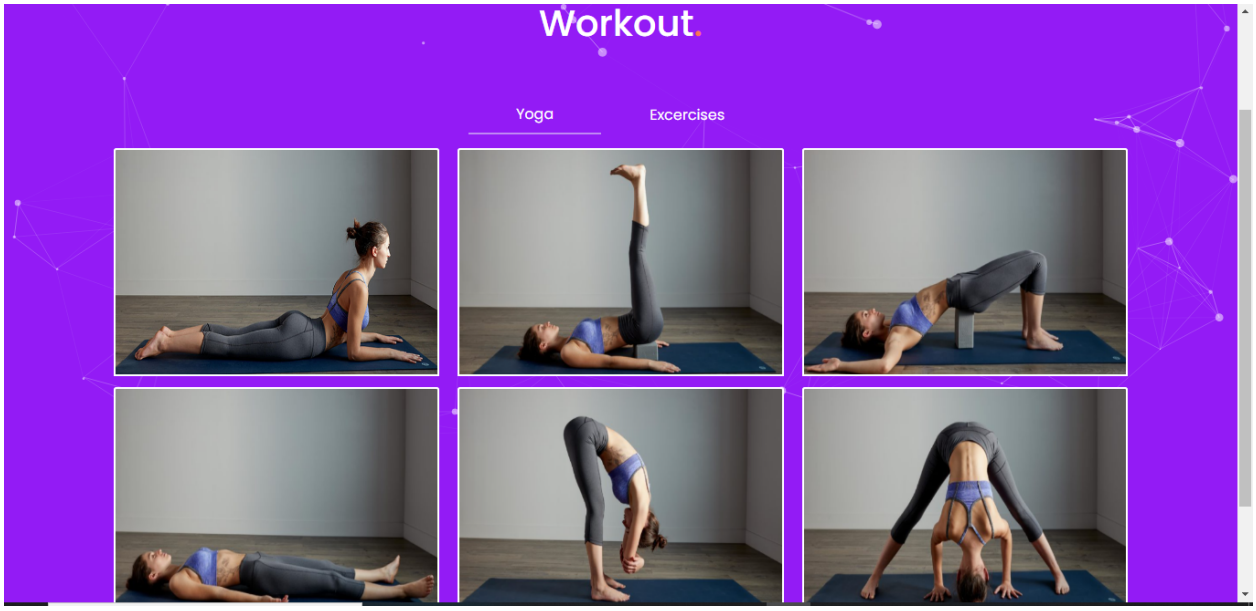

Fig.5.2.10. Workout Recommendation Page (1)

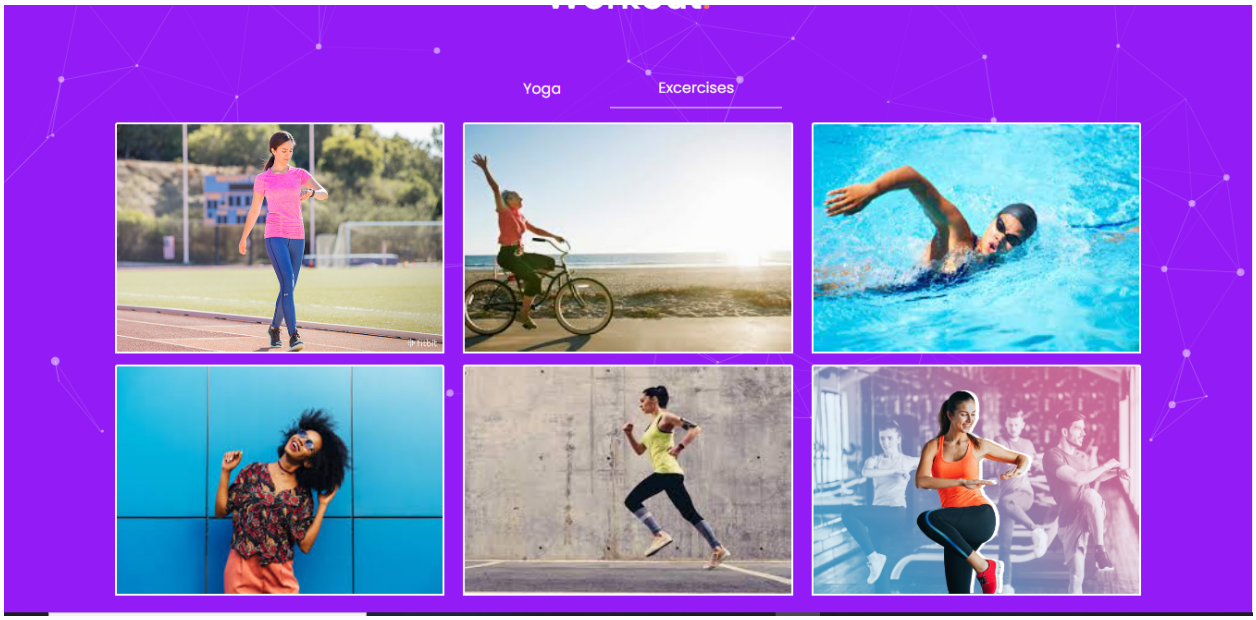

Fig.5.2.11. Workout Recommendation Page (2)

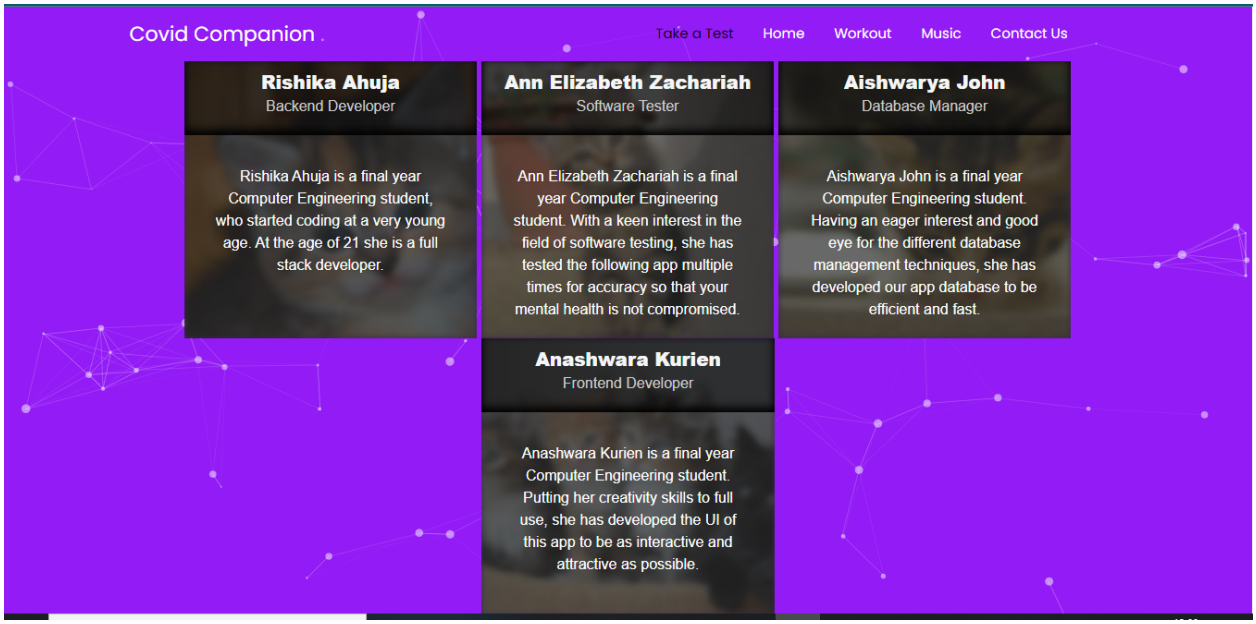

Fig.5.2.12. About Us Page

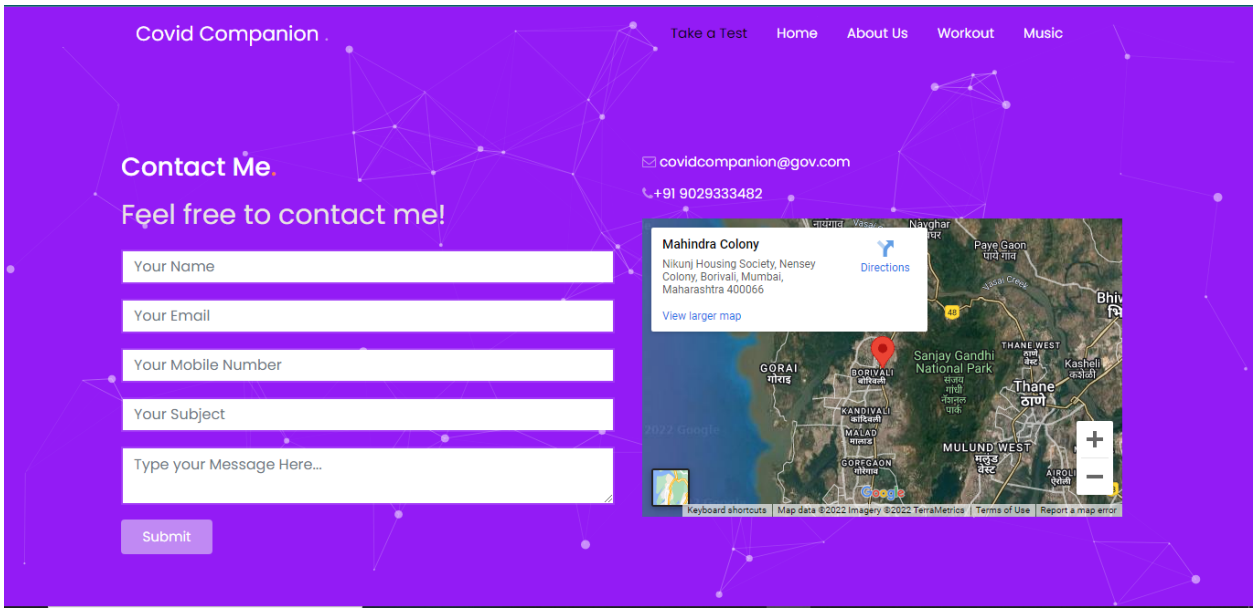

Fig.5.2.13. Contact Us Page

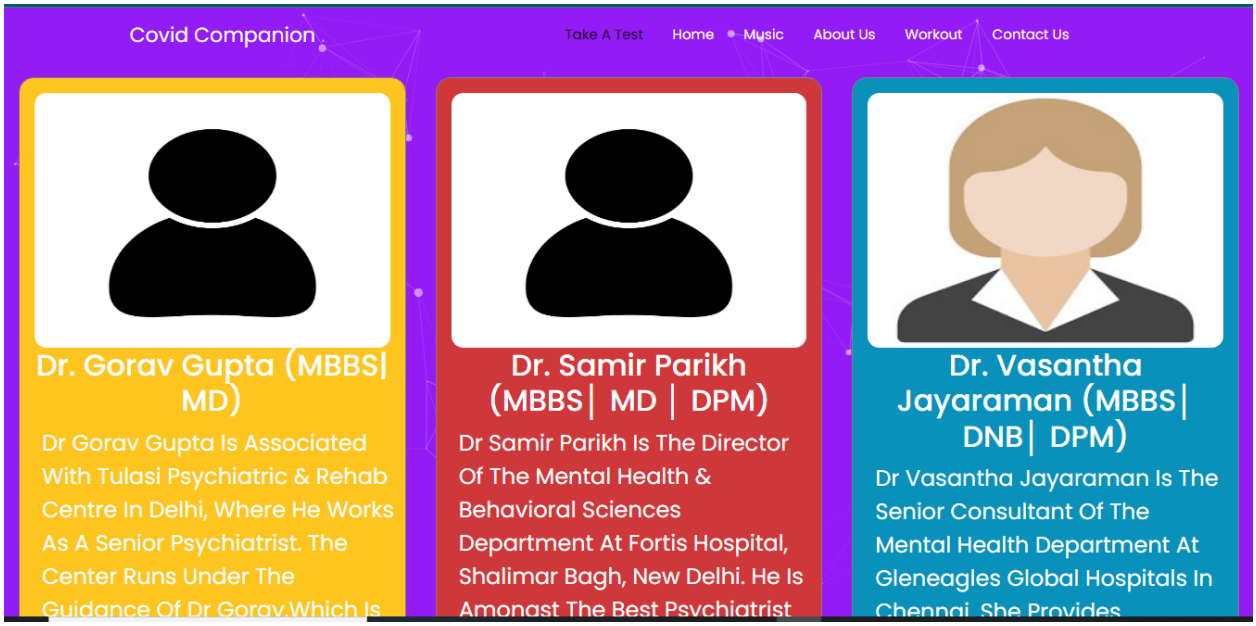

Fig.5.2.14. Psychiatrist Recommendation Page

USER INTERFACE: The user interface will be an application that takes input from the user based on a pre-decided Questionnaire. Based on the User inputs the user interface will provide the user with various suggestions as to how to better his/her Mental Health and better cope with the situation.

PROPER FORECASTING: The System should properly predict the degree to which the users mental health is being affected based on the user inputs.

SUGGESTIONS TO IMPROVE MENTAL HEALTH: According to the results of the assessment of the user's mental health, the system must display accurate suggestions that help improve the user's mental health.

Chapter 6

6. IMPLEMENTATION

6.1 Algorithms / Methods Used:

Data Cleaning and Preprocessing:

- **Null Values were padded to zero**
- **Irrelevant columns deleted**
- **Various Scales were calculated using the dataset**
- **Scales were Standardized**
- **For Dimensionality reduction PCA(Principal Component Analysis) was used:**

  The Dataset used for this project has 125306 rows. Large datasets such as this one are often difficult to interpret.

  Between Principal component analysis (PCA) and Independent Component Analysis(ICA) we chose PCA as ICA gives rise to underfitting in the model.

  PCA is a technique for reducing the dimensionality of such datasets, increasing interpretability but at the same time minimizing information loss. It does so by creating new uncorrelated variables that successively maximize variance. Finding such new variables, the principal components, reduces to solving an eigenvalue/eigenvector problem, and the new variables are defined by the dataset at hand, not a priori, hence making PCA an adaptive data analysis technique.

  PCA was applied on the scales prepared during preprocessing in order to calculate the mental health score.

- **Countries were replaced with their GDPs**
- **Get Dummies was used for data manipulation of the categorical data**

Algorithm Proposed:

Neural Network: A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.

How Neural Networks Work:

A simple neural network includes an input layer, an output (or target) layer and, in between, a hidden layer. The layers are connected via nodes, and these connections form a "network"– the neural network – of interconnected nodes. A node is patterned after a neuron in a human brain.
In the Neural network used in this project, sequential Classifiers were used. TheNeural Network had an input layer, 7 additional layers and an output layer. Activation Function Used is 'Relu'.

The Adam optimizer is used and mean absolute error is used as the loss function.

The code was run for 500 epochs and an accuracy of 76 was obtained, along with a final loss of 0.3436.

6.2 Working of the Project:

Initializing app in flask:

```
from flask import Flask

def create_app():
  app=Flask(__name__)
  app.config['SECRET_KEY'] = 'COOKIE1234'
  from .views import views
  from .auth import auth
  app.register_blueprint(views, url_prefix='/')
  return app
```

Create app:

```
from app import create_app
app=create_app()
if __name__=='__main__':
  app.run(debug=True)
```

Create paths and manage input and output:

```
from flask import Blueprint, render_template,request,redirect
import music
import quotes
import model
views = Blueprint('views', __name__)

@views.route('/')
```

```
def hello():
  quote=quotes.run()
  return render_template('base.html',quote=quote)

@views.route('/questionnaire',methods=["GET","POST"])
def questionnaire():
  if request.method == "POST":
     return redirect('/questions')
  return render_template('questionnaire.html')

@views.route('/predict', methods=["GET","POST"])
def predict():
  X=[]
  age = request.form.get("age")
  age=int(age)
  X.append(age)
  dep = request.form.get("dependents")
  dep=int(dep)
  X.append(dep)
  iso = request.form.get("isolation")
  iso=int(iso)
  X.append(iso)
  gender = request.form.get("gender")
  if gender=='female':
     X.append(1)
     X.append(0)
     X.append(0)
  elif gender=='male':
     X.append(0)
     X.append(1)
     X.append(0)
  else:
     X.append(0)
```

```
    X.append(0)
    X.append(1)

employ = request.form.get("employment")
if employ == 'full':
    X.append(1)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)

elif employ == 'not':
    X.append(0)
    X.append(1)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)

elif employ == 'part':
    X.append(0)
    X.append(0)
    X.append(1)
    X.append(0)
    X.append(0)
    X.append(0)

elif employ == 'retired':
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(1)
```

```
    X.append(0)
    X.append(0)

elif employ == 'self':
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(1)
    X.append(0)

elif employ == 'student':
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(1)

demo = request.form.get("demographic")
if demo=='no':
    X.append(1)
    X.append(0)
else:
    X.append(0)
    X.append(1)

marital = request.form.get("marital")
if marital=='divorced':
    X.append(1)
    X.append(0)
    X.append(0)
    X.append(0)
```

```
elif marital=='married':
    X.append(0)
    X.append(1)
    X.append(0)
    X.append(0)
elif marital == 'wrns':
    X.append(0)
    X.append(0)
    X.append(1)
    X.append(0)
else:
    X.append(0)
    X.append(0)
    X.append(0)
    X.append(1)
risk = request.form.get("highrisk")
if risk=='yes':
    X.append(0)
    X.append(0)
    X.append(1)
elif risk=='no':
    X.append(1)
    X.append(0)
    X.append(0)
else:
    X.append(0)
    X.append(1)
    X.append(0)

country = request.form.get('residence')
gdp= model.calgdp(country)

X.append(gdp)
```

```
    model.inp1(X)

    return render_template('questions.html',X=X,country=country)

@views.route('/questions',methods=["GET","POST"])
def questions():
    return render_template('questions.html',X=X,country=country)

@views.route('/fpredict', methods=["GET", "POST"])
def fpredict():
    Y=[]

    original = int(request.form.get('original'))
    artistic = int(request.form.get('artistic'))
    active = int(request.form.get('active'))
    open = (original + artistic + active) / 3
    Y.append(open)

    thorough = int(request.form.get('thorough'))
    lazy = int(request.form.get('lazy'))
    efficient = int(request.form.get('efficient'))
    con = (thorough + lazy + efficient) / 3
    Y.append(con)

    talk = request.form.get('talk')
    talk = int(talk)
    social = int(request.form.get('social'))
    reserved = int(request.form.get('reserved'))
    extro = (talk + social + reserved) / 3
    Y.append(extro)

    rude = request.form.get('rude')
    rude = int(rude)
```

```
    forgive = int(request.form.get('forgive'))
    kind = int(request.form.get('kind'))
    agree = (rude + forgive + kind) / 3
    Y.append(agree)

    worry = request.form.get('worry')
    worry=int(worry)
    nervous = int(request.form.get('nervous'))
    calm = int(request.form.get('calm'))
    neuro = (worry + calm + nervous) / 3
    Y.append(neuro)
    model.inp2(Y)
    score=model.score()
    return render_template('predict.html',score=score)

@views.route('/about')
def about():
    return render_template('about.html')

@views.route('/contact')
def contact():
    return render_template('contact.html')

@views.route('/mrs')
def mrs():
    return render_template('mrs.html')

@views.route("/musicrecomm/", methods=["POST"])
def home():
    link = request.form.get("track")
    result = music.inp(link)
    return render_template('musicresult.html',result=result)
```

```
@views.route('/psychiatristrecc')
def psychiatristrecc():
  return render_template('psychiatristrecc.html')

@views.route('/workout')
def workout():
  return render_template('workout.html')
```

Quotes module:

```
import pandas as pd # Returns the current local date
def quotes():
 df = pd.read_csv("quotes.csv")
 quo=df.sample()
 quote = dict()
 for ind in quo.index:
    quote[quo['quoteText'][ind]] = quo['quoteAuthor'][ind]
 return(quote)

def run():
  quote = quotes()
  return(quote)
```

Music Module:

```
import tekore as tk
import pandas as pd
import numpy as np
from numpy.linalg import norm

class authorization:
  @classmethod
  def authorize(cls):
```

```
    CLIENT_ID = "921b553383e14c309375959c6d11d9ac"
    CLIENT_SECRET = "1fc4b7d9f2df4e1fa6b08e339caa382a"
    app_token = tk.request_client_token(CLIENT_ID, CLIENT_SECRET)
    return tk.Spotify(app_token)

def distance(p1, p2):
  distance_x = p2[0] - p1[0]
  distance_y = p2[1] - p1[1]
  distance_vec = [distance_x, distance_y]
  norm = (distance_vec[0] ** 2 + distance_vec[1] ** 2) ** (1 / 2)
  return norm

df = pd.read_csv("valence_arousal_dataset.csv")
df["mood_vec"] = df[["valence", "energy"]].values.tolist()
sp = authorization.authorize()

def recommend(track_id, ref_df, sp, n_recs=5):
  # Crawl valence and arousal of given track from spotify api
  track_features = sp.track_audio_features(track_id)
  track_moodvec = np.array([track_features.valence, track_features.energy])

  # Compute distances to all reference tracks
  ref_df["distances"] = ref_df["mood_vec"].apply(lambda x: norm(track_moodvec -
np.array(x)))
  # Sort distances from lowest to highest
  ref_df_sorted = ref_df.sort_values(by="distances", ascending=True)
  # If the input track is in the reference set, it will have a distance of 0, but should not be
recommendet
  ref_df_sorted = ref_df_sorted[ref_df_sorted["id"] != track_id]

  # Return n recommendations
  songs= ref_df_sorted.iloc[:n_recs]
  op=dict()
```

```
  for ind in songs.index:
    op[songs['track_name'][ind]]=songs['artist_name'][ind]
  return(op)

def inp(link):
  # link=input("What are you listening to Today")
  code = link.split("track/")
  cd = code[1]
  track = cd[:22]
  op=recommend(track_id = track, ref_df = df, sp = sp, n_recs = 5)
  return(op)
```

Prediction Module:

```
import pandas as pd

def calgdp(country):
  gdpdf = pd.read_csv('gdp_csv.csv')
  for j in gdpdf.index:
    if country == gdpdf['Country Name'][j]:
      return(gdpdf["Value"][j])
final=[]

def inp1(x):
  for item in x:
    final.append(item)

def inp2(y):
  i=2
  for item in y:
    final.insert(i,item)
    i=i+1

def predict(final):
```

```
  k = []
  k.append(final)
  print(k)
  from keras.models import load_model
  saved_model = load_model('final.h5')
  y_pred = saved_model.predict(k)
  return y_pred

def score():
  score = predict(final)
  final.clear()
  return score
```

Model training:

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from keras.callbacks import EarlyStopping
from keras.callbacks import ModelCheckpoint

# Importing the dataset
dataset = finalDf
X = dataset.iloc[:, 2:].values
y = dataset.iloc[:, 1].values

# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, random_state = 0)

# Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
```

```
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)

# Part 2 - Now let's make the ANN!
# Importing the Keras libraries and packages
import keras
from keras.models import Sequential
from keras.layers import Dense
# Initialising the ANN
classifier = Sequential()
# Adding the input layer and the first hidden layer
classifier.add(Dense( activation = 'relu', input_dim = 27, units=2000))
# Adding the second hidden layer
classifier.add(Dense(units = 1500, activation = 'relu'))
classifier.add(Dense(units = 1000, activation = 'relu'))
classifier.add(Dense(units = 500, activation = 'relu'))
classifier.add(Dense(units = 250, activation = 'relu'))
classifier.add(Dense(units = 150, activation = 'relu'))
classifier.add(Dense(units = 50, activation = 'relu'))
classifier.add(Dense(units = 25, activation = 'relu'))

# Adding the output layer
classifier.add(Dense(units = 1, activation = 'relu'))
# Compiling the ANN
classifier.compile(optimizer = 'adam', loss = 'MeanAbsoluteError')
# Fitting the ANN to the Training set
es = EarlyStopping(monitor='loss', mode='min', verbose=1, patience=200)
mc = ModelCheckpoint('best_model.h5', monitor='loss', mode='min', verbose=1,
save_best_only=True)
# fit model
history= classifier.fit(X_train, y_train, batch_size = 500, epochs = 500, callbacks=[es, mc])
```

Chapter 7

7. TESTING

7.1 Test Case

TestCaseID:TD_1

Module Name: Questionnaire:

Test Priority: Medium

Steps	Test Steps	Test Case Data	Expected result	Actual Result	Result
1.	Click on Take a Test	To Check if given age is 18 and above or not	If age is below 18 system throws an error	System alerted the user about the age limit	Pass
2.	Click on Take a Test	To test whether the user inputs are fully provided or not	If a user input is missed system throws an error message	System throws an error if an input field is missed.	Pass

Table 7.1.1. Test Case 1

TestCaseID:TD_2

Module Name: Model Result:

Test Priority: High

Steps	Test Steps	Test Case Data	Expected result	Actual Result	Result
1.	Calculate the Mental Health Score	To check whether the score is in bounds	The Score should be between 5 and 12	The predicted scores were found to be between 5 and 12	Pass
2.	Calculate the Mental Health Score	To Check whether the output is in accordance with inputs provided	Scores should be varying	The Scores are found to vary with different inputs accordingly.	Pass

Table 7.1.2. Test Case 2

7.2 Type of Test Used

Black Box Testing:

Black box testing, also known as Behavioral Testing, is a software testing method in which the internal structure/design/implementation of the item being tested is not known to the tester. These tests can be functional or non-functional, though usually functional. This type of testing is based entirely on the software requirements and specifications. In Black Box Testing we just focus on inputs and output of the software system without bothering about internal knowledge of the software program.

White Box Testing:

White Box Testing is the testing of a software solution's internal coding and infrastructure. It focuses primarily on strengthening security, the flow of inputs and outputs through the application, and improving design and usability. White box testing is also known as Clear Box testing, Open Box testing, Structural testing, Transparent Box testing, Code-Based testing, and Glass Box testing. It is one of two parts of the "box testing" approach of software testing. Its counterpart, blackbox testing, involves testing from an external or end-user type perspective. White-box testing usually involves tracing possible execution paths through the code and working out what input values would force the execution of those paths.

Integration Testing:

Integration Testing is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing. Components are tested as a single group or organized in an iterative manner. After the integration testing has

been performed on the components, they are readily available for system testing. Interfaces of the software modules with the database could be erroneous. External Hardware interfaces, if any, could be erroneous. Inadequate exception handling could cause issues.

Chapter 8

8. RESULT AND DISCUSSIONS

Based on the questionnaire filled by the user, the system correctly calculates the mental health score and provides psychiatrist recommendations if the mental health is deteriorating badly. For mild to moderate cases it suggests certain activities like workout, yoga and listening to music in order to boost mental health. Factors such as demographics and anxiety scales are the most prominent ones in determining the extent to which mental health has been affected. Demographics of the user can provide us with valuable information such as how badly the given area was affected by the pandemic, total number of casualties, total number of people vaccinated and the quality of healthcare and other services provided based on the country's GDP.

Other factors considered were the habitual behavior of the user and the number of people directly related to the user who were affected by this pandemic. The system then found relationships among demographics and other factors and provided the user with a mental health score.

This system can work accurately in correctly predicting how badly a human being is affected either directly or indirectly because of the Covid-19 pandemic and can prove to be of great help to both users and psychiatrists in learning about the different factors that affect mental health and how to overcome them successfully.

Chapter 9

9. CONCLUSION & FUTURE SCOPE

As COVID-19 has occurred suddenly and is highly contagious, this will inevitably cause people anxiety, depression, etc.In such times the study on the public psychological states and its related factors during the COVID-19 outbreak is of practical significance.Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make healthy choices. Mental health is important at every stage of life, from childhood and adolescence through adulthood.

Since this project is aimed at tackling the sudden downgrading mental health of the general population that is brought about by the onset of the global pandemic it has a huge societal impact and is the need of the hour.

In the future we could develop this application and widen the scope of this project for various other diseases like cancer, cardiovascular problems, etc. We could add into this a module which provides a platform for online consultations with psychiatrists and other physicians.

Literature Cited

[1] Yenan Wang, Yu Di, Junjie Ye & Wenbin Wei,” Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China, Psychology, Health & Medicine”, 2020

[2]Yamada, Y., Ćepulić, DB., Coll-Martín, T. et al.,” COVIDiSTRESS Global Survey dataset on psychological and behavioural consequences of the COVID-19 outbreak. Sci Data 8”, 3, 2021

[3] Sherman A. Lee, ” Coronavirus Anxiety Scale: A brief mental health screener for COVID-19 related anxiety, Death Studies”, 2020

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