Project report on

THE MIND GUARDIAN

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A PROJECT REPORT SUBMITTED TO GUJARAT TECHNOLOGICAL UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF BACHELOR OF ENGINEERING IN INFORMATION TECHNOLOGY

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VISHWAKARMA GOVERNMENT ENGINEERING COLLEGE

CHANDKHEDA, AHMEDABAD

CERTIFICATE

This is to certify that project work embodied in this report entitled "The Mind Guardian" was carried out by ***Krishna Piyushkumar Pandya (17017011 6023), Fenil Milankumar Parmar (170170116027), Aman Manojkumar Patel (170170116028), and Harsh Ashokan Reddiar (17017 0116047)*** *at* ***Vishwakarma Government Engineering College*** *offer fulfillment of B.E. degree to be awarded by Gujarat Technological University. This project work has been carried out under my supervision and is to the satisfaction of the department.*

Date :

Place:

Internal Guide:	**Head Of Department:**
Name: Dr.Vibha D. Patel	Name: Dr.Vibha D. Patel
Signature:	Signature:

ACKNOWLEDGEMENT

This project would not have been possible without the kind support and help of many individuals and organizations. We would like to extend my sincere thanks to all of them.

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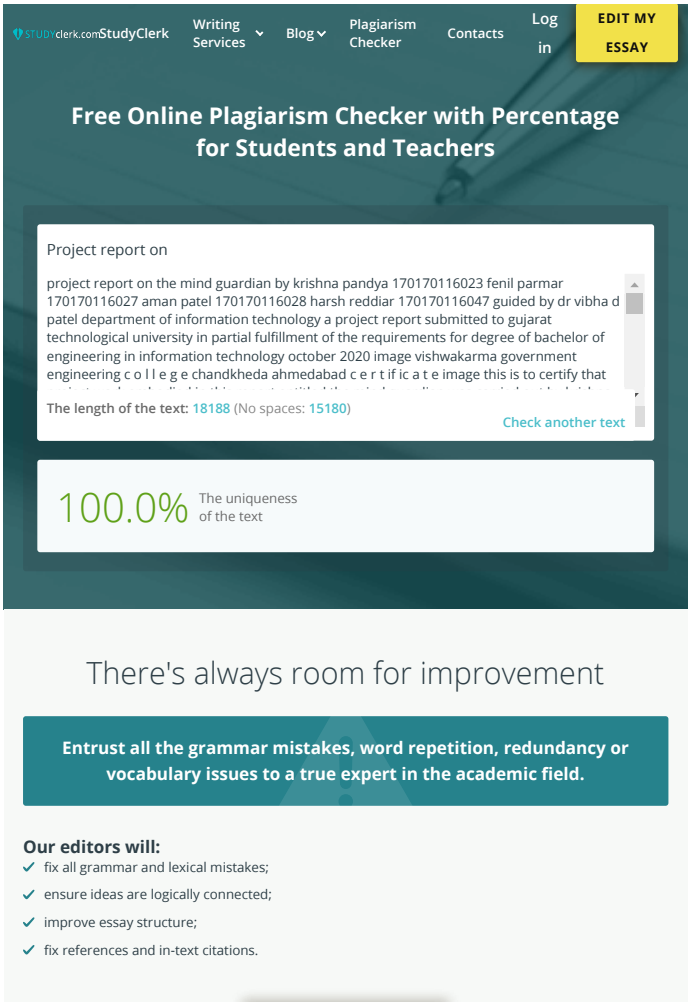
Plagarism Report



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Chapter 1

Introduction

1.1 Problem Summary

India has the most noteworthy suicide rate in the South-East Asian area, as indicated by the World Health Organization's most recent report[1]. The report delivered a day fixed India's suicide rate at 16.5 suicides per 100,000 individuals. Around 800,000 individuals commit suicide on the planet, as indicated by the WHO report. This is when suicide avoidance highlights in one of the Sustainable Development Goal (SDGs) Suicide was the subsequent driving reason for death among geriatrics, asserting 200,000 lives in 2016, beat simply by street injury. Suicide is the third-generally fatal for 15-19 years age gathering. More than 50% of the suicides all around the world were submitted by individuals more aged than 45 years. Likewise, it included, 90% of the people who kill themselves are from low-and middle income nations.

In the years somewhere in the range of 2010 and 2016, it was seen that worldwide suicide rates diminished by 9.8 percent. Despite the fact that most areas are seeing a decrease in suicide rates, the current pace of decline isn't sufficient to meet global targets to diminish suicide mortality.

1.1.1 Trends

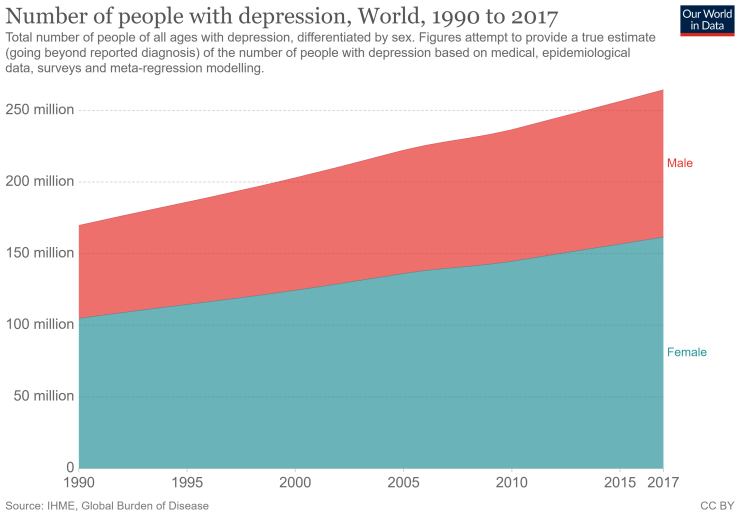

Figure 1.1: number of people with depression [2]

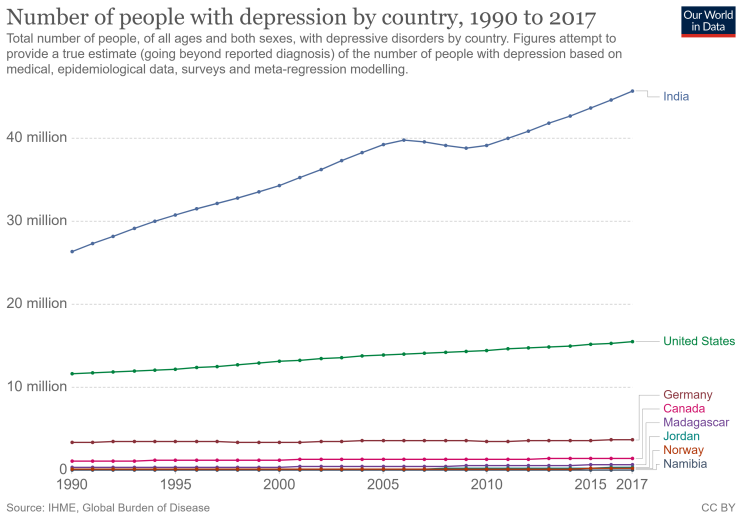

Figure 1.2: number of people with depression by country [3]

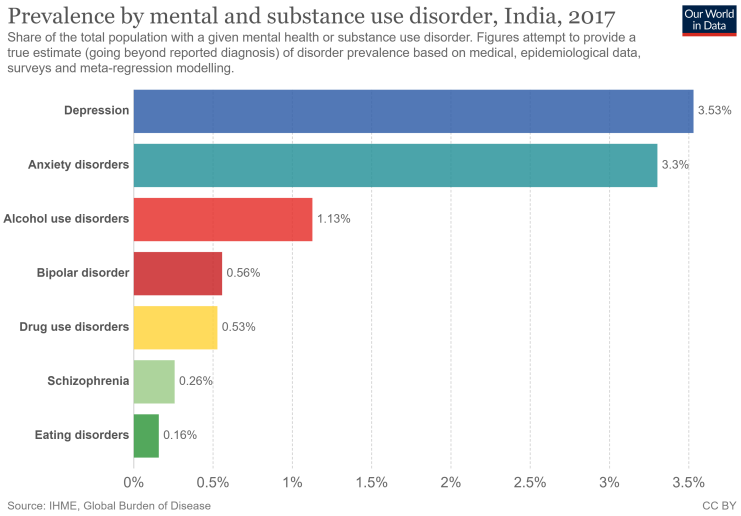

Figure 1.3: pevalence by mental and substance use disorder [4]

1.2 Aim and Objectives of the Project

The topic of the day is mental health. Mental Health has become a severe issue that leads to suicide. Mental pressure can't be eradicated, but it can be decreased. In this project, we have tried to provide a solution to this problem by a machine learning model and an application. We have trained a model such that it predicts the sentiments of the user by using his tweets. We have also developed an application which tracks application usage of the user, creates awareness of different mental health disease and also integrated Twitter model with the application. In future work, we are planning to develop a model that studies the human brain and predicts whether a person is suffering from depression or not.

The objectives of this system are three fold

- Our objective is to reduce the mental pressure of all the age groups by our model and application.
- By reducing mental pressure, we aim to drastically reduce the number of suicides all over the world.
- Using our application, guardians can continuously monitor activities of their loved ones so that they can guide them which application to be used how much.

1.3 Literature Review

1.3.1 Social Media Data Analysis System and Method

A framework breaks down information to decide an action around an item. The framework incorporates a UI arranged to empower at least one information experts to give input information and a procurement module coupled to UI and arranged to recover online media information because of the info information. The online media information is gotten from one more web-based media stages. The framework further incorporates handling hardware coupled to the securing module and incorporates an examination module arranged to investigate the online media information to generate prepared information and characterize the handled information dependent on a majority of measures and a perception module coupled to the examination module and designed to produce a majority of visual portrayals of characterized information.[5]

1.3.2 Text Data Sentiment Analysis Method

The strategy for text information investigation included gaining text information, performing semantic examination and extricating substances and realities from the information dependent on aftereffects of investigation. It incorporates highlights like deciding indication of notion, total capacity of the content information, dissecting social temperament and grouping text information.[6]

1.3.3 Mental health digital behavior monitoring system and method

An emotional wellness computerized conduct checking emotionally supportive network is unveiled including Software Agent(s) to screen furthermore, gather information concerning computerized practices, for example, yet not restricted to, telephone movement, web action, actually created network traffic, and area designs (area administrations). Practices are observed by a product operator introduced on a Cell phone, cell phone, PC, tablet, or a product specialist introduced on a distant worker designed to screen Software as a Service (SaaS) arrangements -, for example, online email accounts (for example Hotmail, Gmail), informal organization activity(e.g. Facebook, Linkedln), different sorts of web action -, for example, publishing content to a blog and recreational action - such recreational action may incorporate any type of web perusing sound/video utilization, for example, YouTube, Netflix, Pandora, iTunes, and comparable new applications as they show up, including any sort of quantifiable substance. Quantifiable substance incorporates all types of sound, visual, text, and information.[7]

1.3.4 Sentiment analysis of context items

This includes naming at least one segments of a substance thing and having investigated for conclusion. A GUI may acknowledge contributions from a client that demonstrate a segment of the substance thing ought to be marked and the client may give a related conclusion to the

item(for eg positive, negative or then again unbiased) which are put away and reanalyzed the substance to mirror client's naming.[8]

1.3.5 Sentiment and Influence Analysis of tweets

The current innovation identifies with approaches to extricate and arrange sentiment data from Twitter tweets and comparable postings, including web-based media destinations and to score the impact or clout of the individual related with said postings.[9]

1.3.6 Mental health monitoring with multimodal sensing and machine learning: A survey

Personal associate degreed omnipresent sensing technologies like smartphones have allowed the continual assortment of knowledge in an unassertive manner. Machine learning ways are applied to continuous detector information to predict user discourse info like location, mood, physical activity, etc. Recently, there has been a growing interest in investing omnipresent sensing technologies for psychological state care applications, thus, permitting the automated continuous observation of various mental conditions like depression, anxiety, stress, and so on. This paper surveys recent analysis works in psychological state observation systems (MHMS) victimisation detector information and machine learning. It tend to centered on analysis works concerning mental disorders/conditions such as: depression, anxiety, manic depression, stress, etc. we tend to propose a classification taxonomy to guide the review

of connected works and gift the general phases of MHMS.[10]

1.3.7 SAD: Social Anxiety and Depression Monitoring System for College Students

Mental health issues square measure extremely prevailing and increasing in frequency and severity among the school student population. The upsurge in mobile and wearable wireless technologies capable of intense, longitudinal chase of people, offer tremendously valuable opportunities in mental state analysis to look at temporal patterns and dynamic interactions of key variables. during this paper, we tend to gift associate degree integrative framework for social anxiety and depression (SAD) observation, 2 of the foremost common disorders within the college boy population. we've developed a smartphone application and therefore the supporting infrastructure to gather each passive detector information and active event-driven information. This supports intense, longitudinal, dynamic chase of anxious and depressed faculty students to guage however their emotions and social behaviors amendment within the faculty field surroundings. The data can offer vital information concerning however student mental state issues square measure maintained and, ultimately, however student patterns on field shift following treatment.[11]

1.3.8 DeepMood: Forecasting Depressed Mood Based on Self-Reported Histories via Recurrent Neural Networks

Depression is a triumphing problem and is an growing hassle in lots of humans's lives. Without observable diagnostic criteria, the symptoms and symptoms of melancholy may work unnoticed, ensuing in excessive call for for detecting depression earlier automatically. This paper tackles the hard hassle of forecasting critically depressed moods primarily based totally on self-stated histories. Despite the huge quantity of studies on knowledge man or woman moods which includes melancholy(depression), anxiety, and pressure primarily based totally on behavioral logs gathered with the aid of using pervasive computing gadgets inclusive of smartphones, forecasting depressed moods continues to be an open question. This paper develops a recurrent neural community set of rules that includes express embedding layers for forecasting melancholy(depression). We gathered huge-scale data from 2,382 self-declared depressed humans to behavior the experiment. Experimental effects display that our approach forecast the critically depressed temper of a person primarily based totally on self-stated histories, with better accuracy than SVM. The effects additionally confirmed that the long-time period historic facts of a person improves the accuracy of forecasting depressed temper.[12]

1.3.9 BrainNET: A Deep Learning Network for Brain Tumor Detection and Classification

The increased use of technology had a sway to the welfare. Health specialists have more and more taken advantage of those technologies therefore generating a ascendible improvement within the space of health care. due to this, there's paradigm shift from manual observation toward additional correct virtual observation with minimum proportion of error within the space of health care. Advances in artificial intelligence (AI) leads to sensible accuracy for medical imaging and could be a key technique for future applications in health care. brain tumour detection is a very essential task in medical image process. Early detection of brain tumors plays a very important role in rising treatment potentialities and therefore increasing the survival rate of the patients. Manual detection of the brain tumors for cancer designation from an outsized quantity of imaging pictures generated in clinical routines could be a tough and time overwhelming task because of complexness and variance of tumors and medical information. So, there's a necessity for automatic brain tumour detection from brain imaging pictures or MRI. With the assistance of deep learning networks, we will automate the detection method. For that, we've planned a brand new network called BrainNET that reads the MRI images returning from the machine, and then, it detects further as classifies the brain tumour if there.[13]

1.3.10 Classification using deep learning neural networks for brain tumors

Deep Learning could be a new machine learning field that gained loads of interest over the past few years. it had been wide applied to many applications and established to be a strong machine learning tool for several of the advanced issues. during this paper we have a tendency to used Deep Neural Network classifier that is one amongst the DL architectures for classifying a dataset of sixty six brain MRIs into four categories e.g. normal, brain tumor, cancer and pathological process bronchogenic cancer tumors. The classifier was combined with the discrete wavelet transform (DWT) the powerful feature extraction tool and principal elements analysis (PCA) and therefore the analysis of the performance was quite sensible over all the performance measures.[14]

1.4 Model Understanding

1. **Logistic Regression:** Roughly 70% of issues in Data Science are classification problems. the logistics regression is simple and is a useful regression method for solving the binary classification problem. Logistic regression is a statistical method for predicting two classes. The target variable is dichotomous in nature. It means there are only two possible classes. The model uses a log of odds as the dependent variables. Logistic Regression predicts the probability of occurrence of an event utilizing a sigmoid function.[15]

$$p = 1/1 + e^{-(\beta 0 + \beta 1 X1 + \beta 2 X2 ..... \beta n Xn)}$$

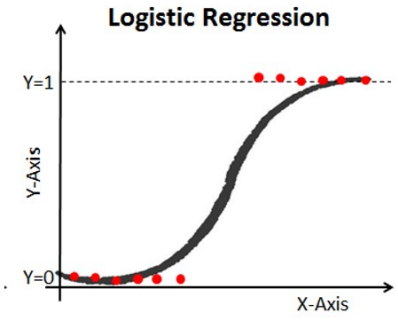

Figure 1.4: logistic regression

2. **Extreme Gradient Boosting:** XGBoost is member to a family of boosting algorithms and the model uses the gradient boosting (GBM) framework as its core module. GBM is an optimized distributed gradient boosting library. And it can be used for regression or classification algorithms.[16]

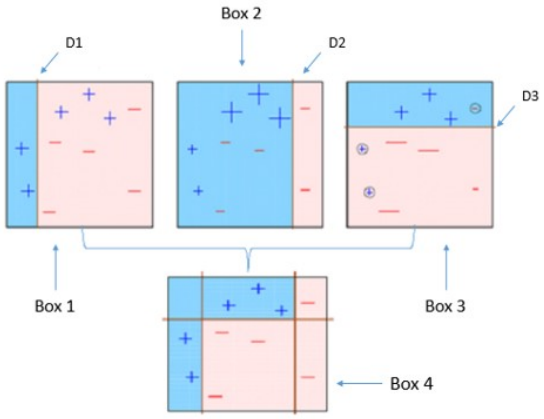

Figure 1.5: XGBoost

Boosting is a consecutive procedure which deals with the standard of a troupe. It joins a lot of feeble learners and conveys improved forecast precision. At any moment t, the model results are weighed dependent on the results of past moment t-1. The results anticipated accurately are given a lower weight and the ones miss-arranged are weighted higher. Note that a feeble student is one which is marginally in a way that is better than

irregular speculating. For instance, a choice tree whose forecasts are marginally in a way that is better than half. How about we comprehend boosting as a rule with a basic representation.

3. **Support Vector Machines:** SVM is supervised machine learning algorithms. Support Vector Machines is viewed as a characterization approach, it yet can be utilized in the two kinds of classification and regression issues. It can without much of a stretch handle numerous consistent and unmitigated factors. SVM develops a hyperplane in multidimensional space to isolate various classes. SVM produces ideal hyperplane in an iterative way, which is utilized to limit a blunder. The center thought of SVM is to locate a greatest minor hyperplane(MMH) that best partitions the dataset into classes.[17]

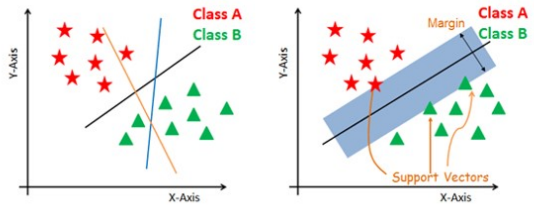

Figure 1.6: Support Vector Machines

4. **Random Forests Classifiers:** It actually is an outfit strategy (in light of the gap and-overcome approach) of choice trees created on a randomly split dataset. This assortment of choice tree classifiers is otherwise called the the forest. The individual choice trees are produced utilizing a trait choice marker, for example, data gain, gain proportion, and Gini file for each quality. Each tree relies upon an autonomous irregular example. In an arrangement issue, each tree votes and the most well known class is picked as the eventual outcome. On account of relapse, the normal of all the tree yields is considered as the end-product. It is more straightforward and all the more remarkable contrasted with the other non-direct grouping calculations.[18]

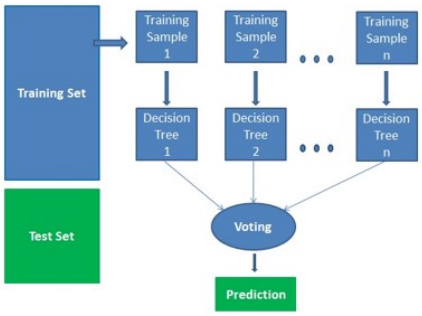

Figure 1.7: Random Forests classifier

5. **Vanilla U-Net:** This U-Net model comprises four levels of blocks containing two convolutional layers with batch normalization and ReLU activation function, and one max pooling layer in the encoding part and up-convolutional layers instead in the decoding part. The number of convolutional filters in each block is 32, 64, 128, and 256. The bottleneck layer has 512 convolutional filters. From the encoding layers, skip connections are used to the corresponding layers in the decoding part. Input image is a 3-channel brain MRI slice from pre-contrast, FLAIR, and post-contrast sequences, respectively. Output is a one-channel probability map of abnormality regions with the same size as the input image. It can be transformed to a binary segmentation mask by thresholding.

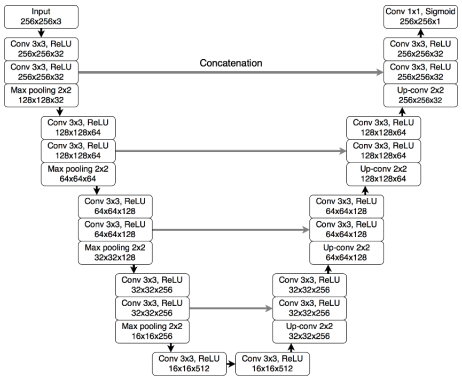

Figure 1.8: Vanilla U-net

6. **FPN(Feature Pyramid Network) :** By introducing a clean and simple framework for building feature pyramids inside the convolutional neural network (CNN), significant improvements are shown. Two methods: -

   - The bottom-up pathway is the feedforward computation of the backbone ConvNet. It is defined that one pyramid level is for each stage. The output of the last layer of each stage will be used as the reference set of feature maps for enriching the top-down pathway by lateral connection.
   - The higher resolution features is up-sampled spatially coarser, but semantically stronger, feature maps from higher pyramid levels. More specifically, the spatial resolution is up-sampled by a factor of 2 using the nearest neighbor for simplicity.

   the feature maps from bottom-up pathway undergoes 1×1 convolutions to reduce the channel dimensions. And the feature maps from the bottom-up pathway and the top-down pathway are merged by element-wise addition. Finally, a 3×3 convolution is appended on each merged map to generate the final feature map, which is to reduce the aliasing effect of upsampling.

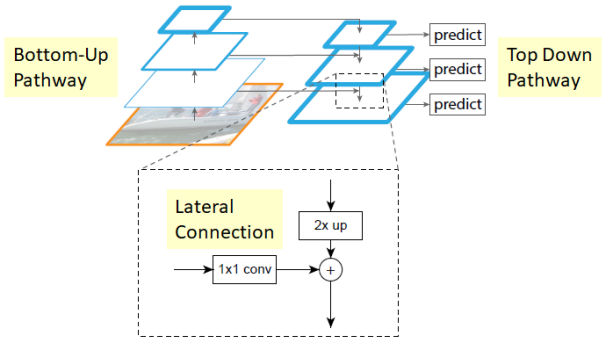

Figure 1.9: FPN

7. **ResNext50:** The model name, ResNeXt, contains Next. It means the next dimension, on top of the ResNet. This next dimension is called the cardinality dimension. ResNeXt is a simple, highly modularized network architecture for image classification. Our network is constructed by repeating a building block that aggregates a set of transformations with the same topology. Our simple design results in a homogeneous, multi-branch architecture that has only a few hyper-parameters to set which exposes cardinality dimension.

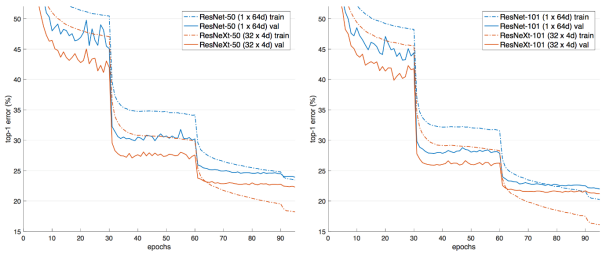

Figure 1.10: ResNext50

8. **VGG-16:** The 16 in VGG16 refers to it has 16 layers that have weights. This network is a pretty large network and it has about 138 million (approx) parameters. The model achieves 92.7% top-5 test accuracy in ImageNet, which is a dataset of over 14 million images belonging to 1000 classes. It makes the improvement over AlexNet by replacing large kernel-sized filters (11 and 5 in the first and second convolutional layer, respectively) with multiple 3×3 kernel-sized filters one after another.

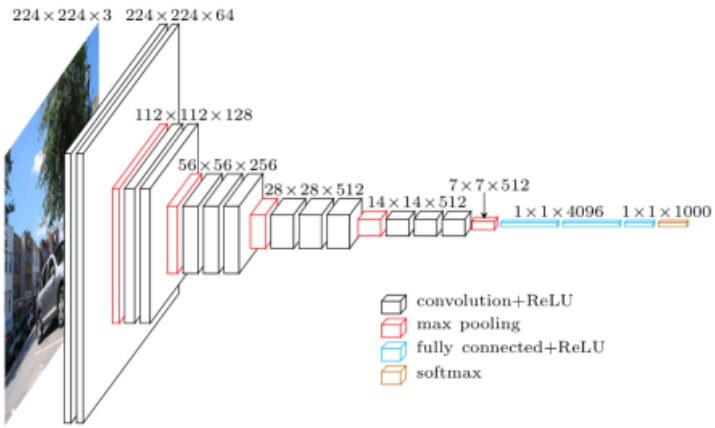

Figure 1.11: VGG-16

9. **InceptionV3:** Inception-v3 is a pre-trained convolutional neural network model that is 48 layers deep. It is a version of the network already trained on more than a million images from the Imagenet database. Inception v3 is a widely-used image recognition model that has been shown to attain greater than 78.1% accuracy on the ImageNet dataset and around 93.9% accuracy in top 5 results. It is similar to and contains all the features of Inception V2 with following changes/additions : Use of RMSprop optimizer, Batch Normalization in the fully connected layer of Auxiliary classifier, Use of 7×7 factorized Convolution and Label Smoothing Regularization.

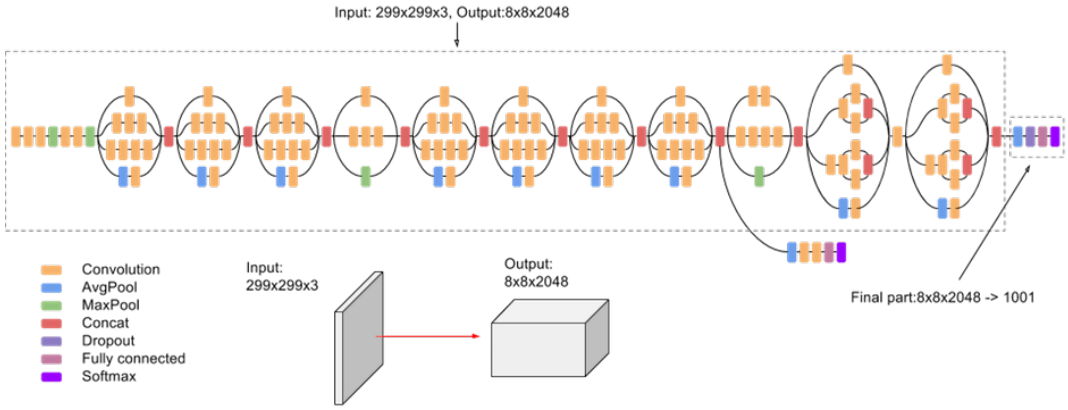

Figure 1.12: InceptionV3

10. **Resnet50:** Resnet50-is a convolutional neural network that is 50 layers deep. You can load a pretrained version of the network trained on more than a million images. The pretrained network can classify images into 1000 object categories.You can use classify to classify new images using the ResNet-50 model. The ResNet-50 model consists of 5 stages each with a convolution and Identity block. Each convolution block has 3 convolution layers and each identity block also has 3 convolution layers. The ResNet-50 has over 23 million trainable parameters.

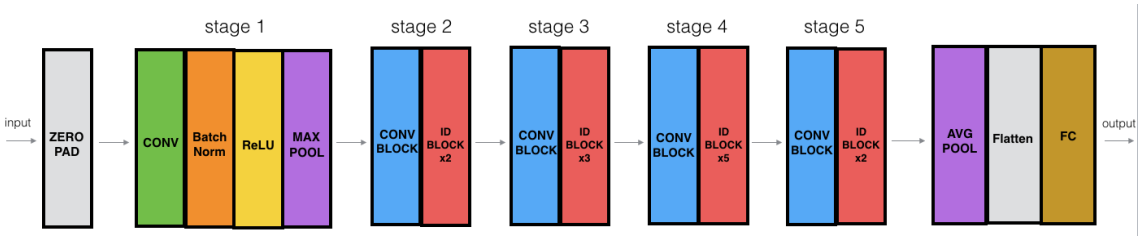

Figure 1.13: Resnet50

1.5 Materials / Tools / Technologies Required

Tools :

- Google Colab Notebook
- Android Studio (Flutter)
- Framer
- Firebase
- Visual Studio Code

Technology/Languages/Libraries :

- Python
- Scikit Learn
- Numpy
- Pandas
- nltk
- Flutter
- Dart
- TensorFlow
- Keras
- tflite

Dataset for Sentiment Analysis[19] :

- 0 or 4 values(4 for positive and 0 if negative)
- Unique id - Time of the tweet
- Name of username who tweeted
- Content of the tweet

Dataset for Brain Tumor Detection :

- 0 or 1 values(0 for positive and 1 for negative)
- Brain MRI images with brain tumor
- Brain MRI images without brain tumor

Chapter 2

Design

2.1 Use Case Diagram

Figure 2.1: use case diagram

2.2 Flow Chart

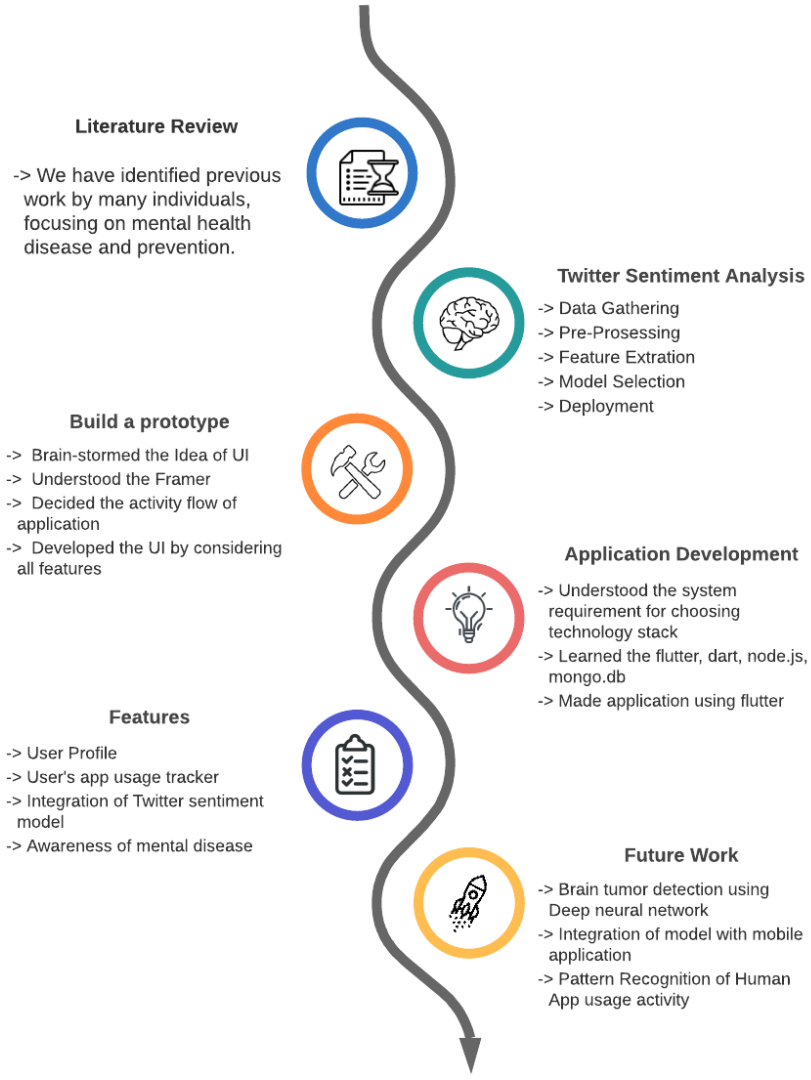

Figure 2.2: flow diagram of development of project

2.3 Proposed Methodology (Block Diagram)

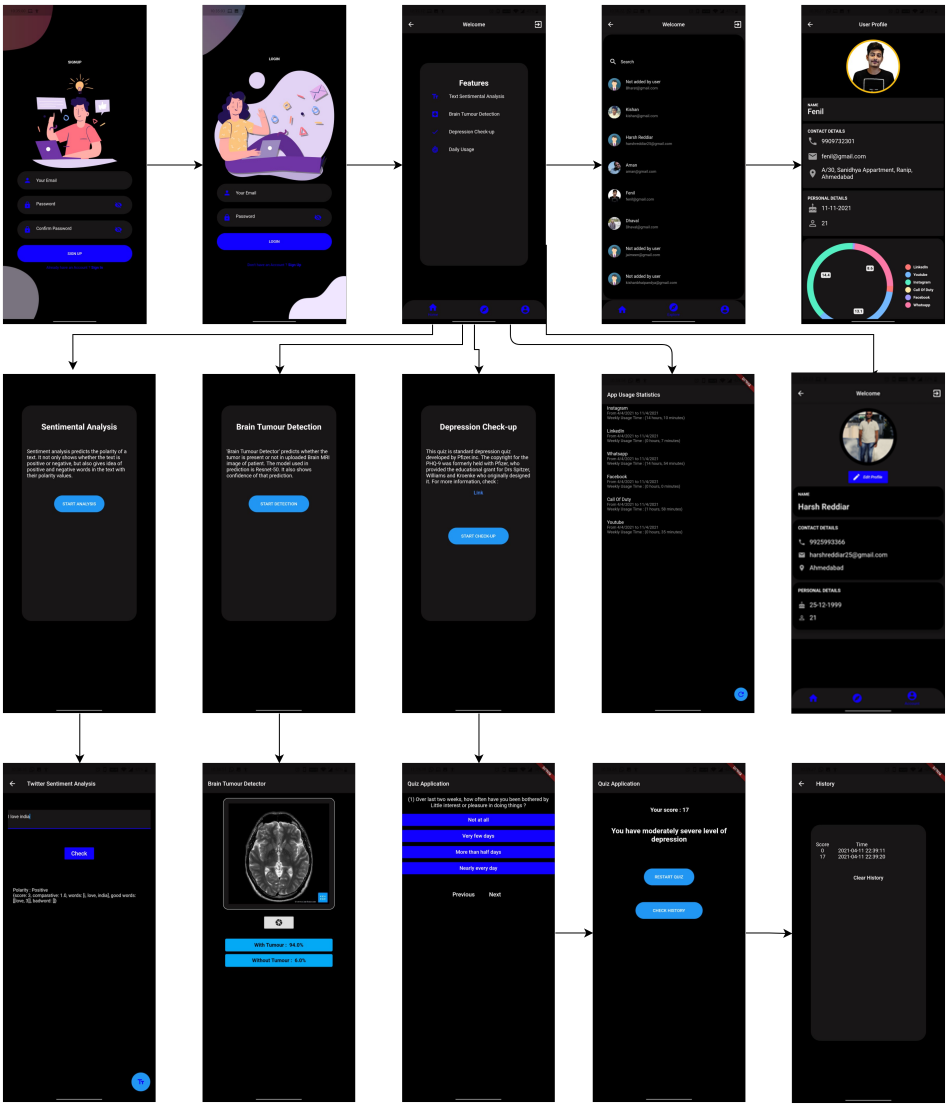

Figure 2.3: flow diagram of android application

2.4 Design Canvas

2.4.1 AEIOU Canvas

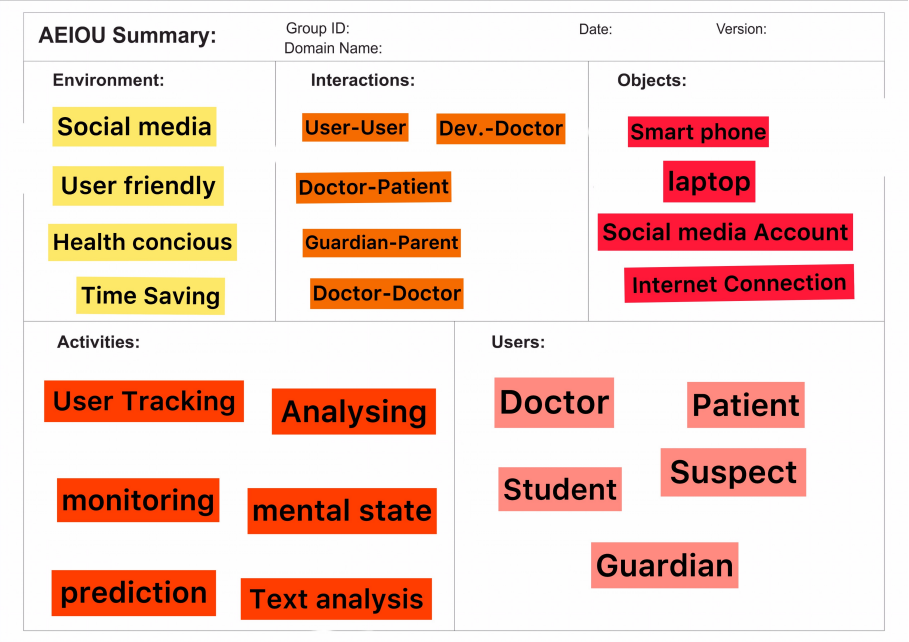

Figure 2.4: AEIOU Canvas

2.4.2 Empathy Maping

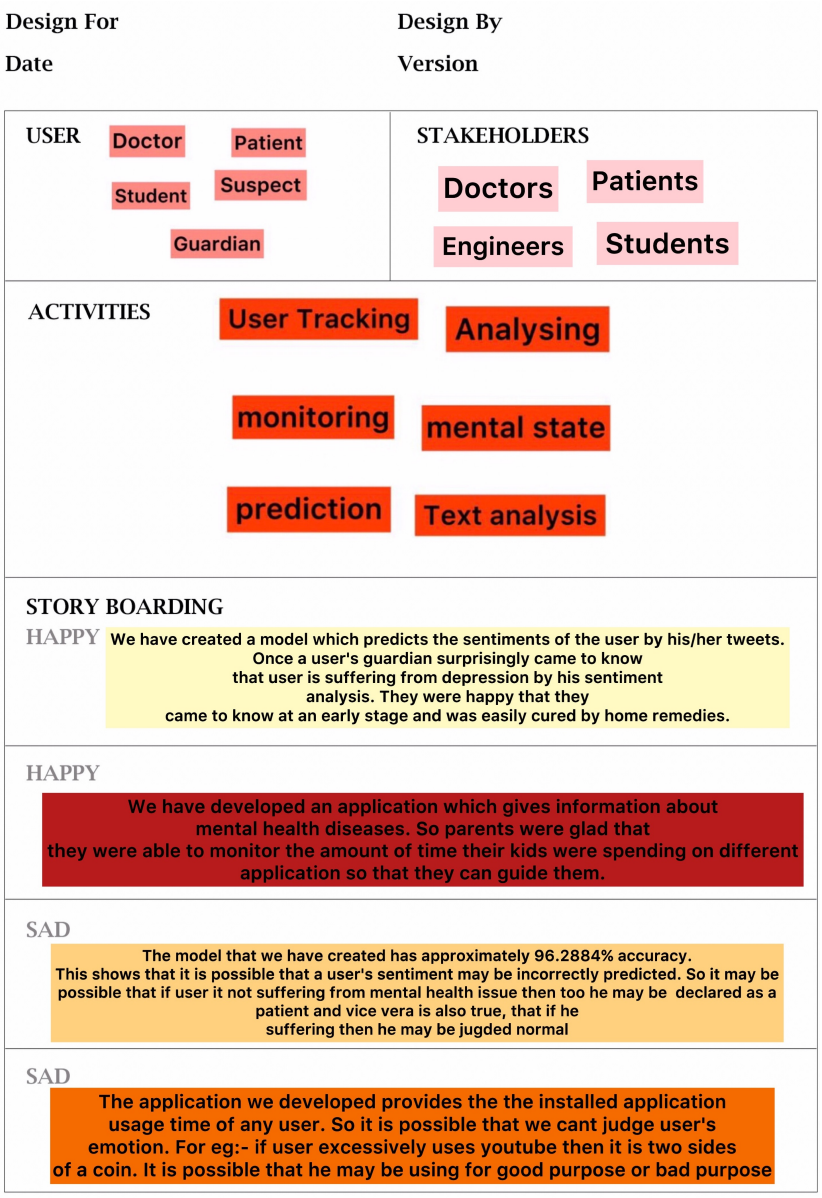

Figure 2.5: Empathy Maping

2.4.3 Ideation Canvas

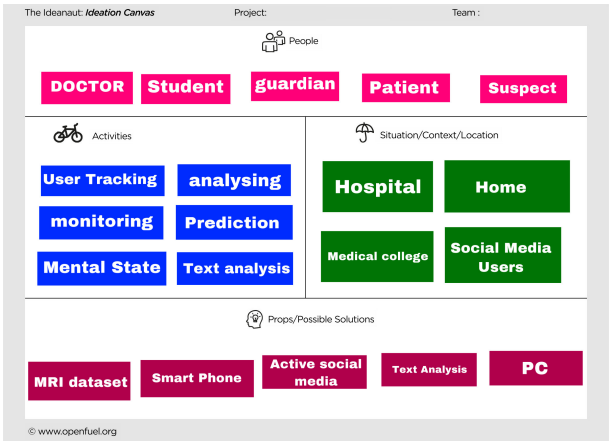

Figure 2.6: Ideation Canvas

2.4.4 Product Development Canvas

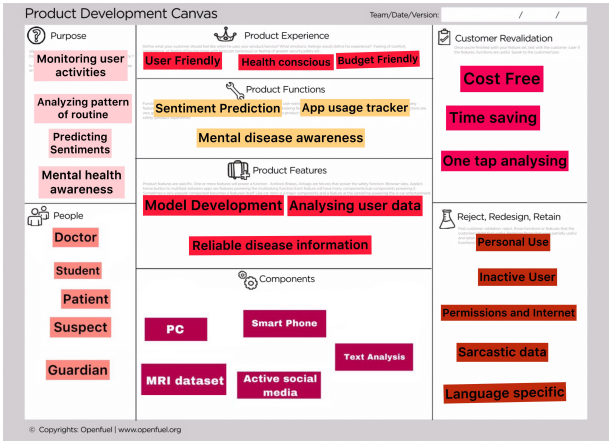

Figure 2.7: Product Development Canvas

2.4.5 Business Model Canvas

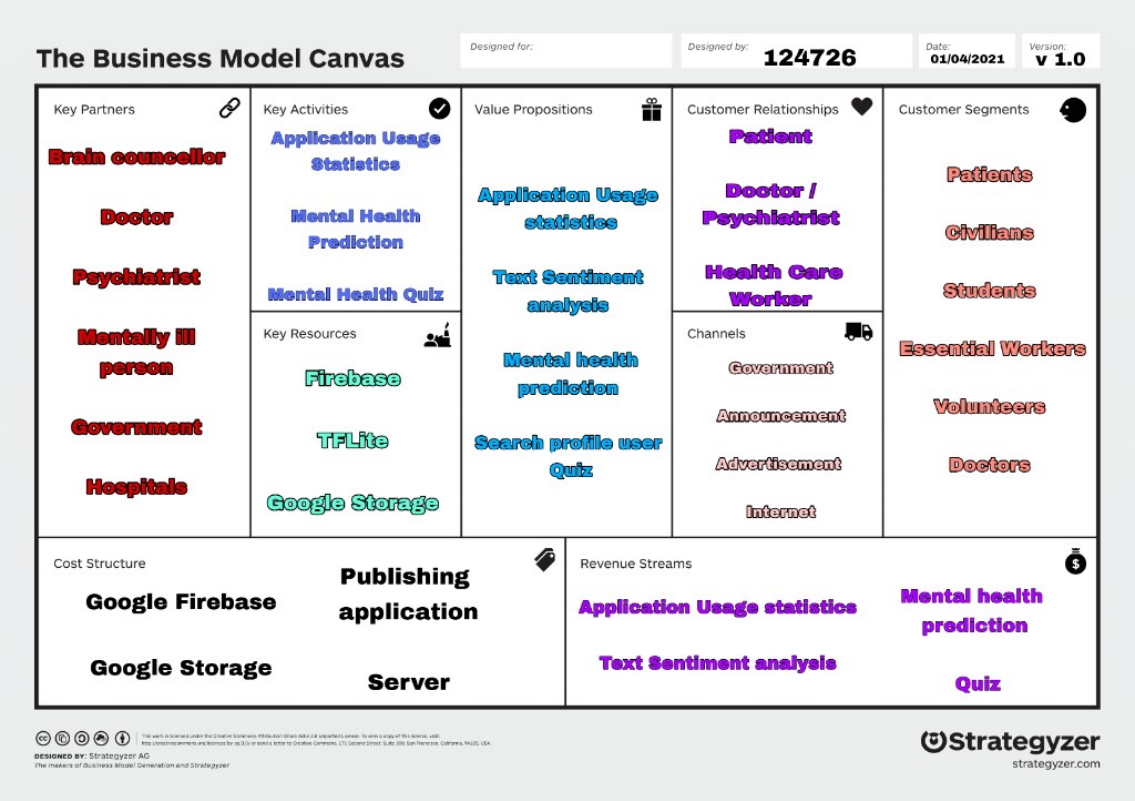

Figure 2.8: Business Model Canvas

Chapter 3

Implementation

3.1 Twitter Sentiment Analysis

1. **Dataset and Library**

   - In this project, we have trained and evaluated four models for sentiment analysing.
   - To train and test the model we have used Kaggle sentiment dataset. This dataset contains user's 'TweetText', 'user_id', 'tweet_id', 'date', 'flag', and 'target'. From these, we have dropped columns named user_id, date, flag and tweet_id.
   - Now, at last we are left out with 'target' and 'Tweettext'. Here, TargetText represents original tweet of the user and the target column contains 0 or 4 which shows that tweet is negative if target=0 and tweet is positive if target=4.
   - In our dataset, we have 25000 unique positive tweets while

we have 1000 unique negative tweets.

- Libraries imported: nltk, numpy, pandas, matplotlib, wordcloud.

2. **Data Cleaning**

- Priorly, we have replaced twitter handle i.e. '@' with ' ' (null value).
- After that, we have removed all the website links by replacing it with null values.
- Then, we have removed punctuations, numbers and special characters and replaced them with ' ' (single space).
- We have used nltk library to remove all the English stopwords that were present in the tweets. Stopwords examples are "is", "am", "are", etc.
- And in the same phase, we have converted the entire tweet text to lower case.
- Now to speed up our process, we have tokenized and normalized out tweet text. And after that we have performed stemming. Tokenization is breaking whole text in small tokens while stemming is writing root words.
- After stemming, out tweet_text is in least form. Now the tokens are grouped/stitched together to get back the tweet in its reduced string form.

- Finally, we have removed words whose length is less than or equal to 3 characters.

3. **Data Visualization**

   - In this section, we have visualized tweets using wordcloud library. A wordcloud is a visualization wherein the most frequent words appear in large size while the least frequent words appear in smaller size.

4. **Model Building**

   - First of all, we learned various types of machine learning model and according to our dataset, we concluded that the most appropriate models were random forest classifier, XG boost, Support vector machine and logistic regression.
   - So, we imported all these machine learning models from sklearn.
   - We also imported accuracy_score, train_test_split and count vectorizer as supporting libraries.
   - Firstly, we vectorized our data and stored it in the variable. We split our data into 80% and 20% for train set and test set respectively by using train_test_split.
   - Then we have fitted our data in the above mentioned models and also calculated their accuracy using accuracy_score library. Accuracy of the models are as follows: -

Models	Accuracy
Logistic Regression	96.288
Support Vector Machine	96.153
Random Forest Classifier	95.923
XGBoost	95.128

Table 3.1: accuracy of twitter sentiment models

5. **Conclusion**

- Hence, we have concluded that all the models are pretty accurate and equivalent but logistic regression gives the best predictions because we have simple dataset and there are not many features. Also, logistic regression resists over fitting. A large number of data can be fitted on model.

3.2 Brain Tumor Detection

- Brain Tumor Detection model is implemented in flutter application to detect the brain tumor from Brain MRI(Magnetic resonance imaging) images.

- Firstly, we have implemented 6 deep learning models to detect the Brain tumor from MRI such as VGG-16, ResNext50, FPN (Featured pyramid network), Vanilla U-Net, Resnet50, InceptionV3.

- To find the perfect model to be used in application, after rigorous analysis, we conclude that resNext50 has introduced a new hyperparameter cardinality(no of independent paths) which provides better fitting to model rather than by going deeper or wider. It has only one such hyper parameter to adjust.

- Then we converted resNext50 to tensorflow lite model from keras model, and integrated in flutter application.

Models	Accuracy
ResNext50	91
Vgg16	90
Resnet50	86
FPN	84
Vanilla U-Net	80
InceptionV3	64

Table 3.2: accuracy of brain tumor detection

3.3 Protype design using Framer

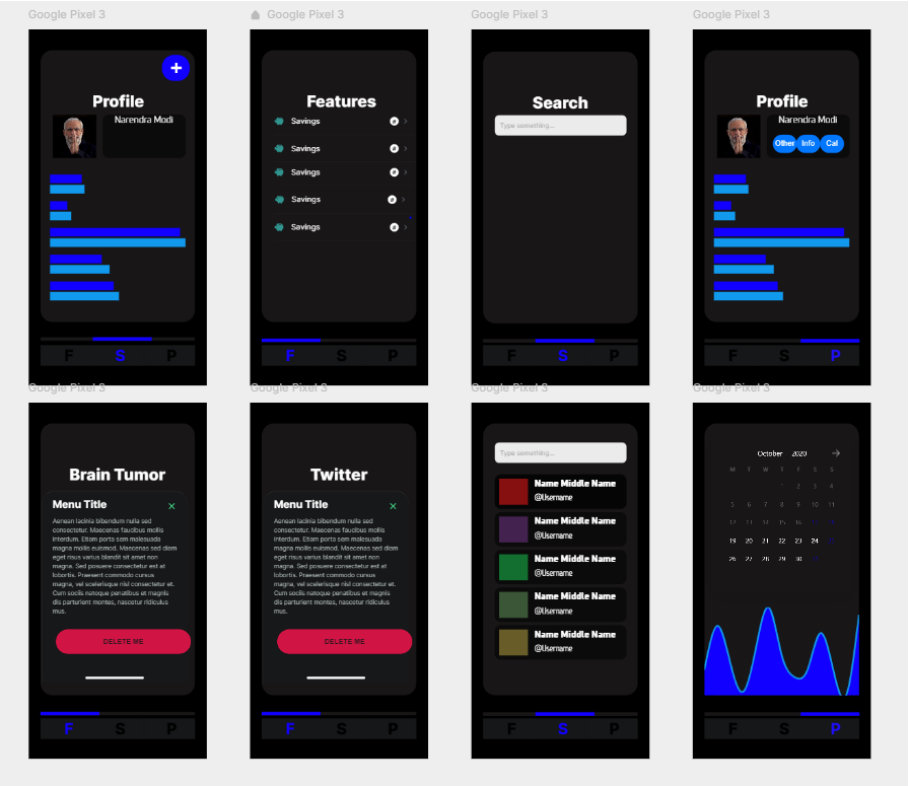

Figure 3.1: user interface design [20]

- Here, the first screenshot shows the profile of our friend or well-wisher when the profile is searched in our application.
- The second screenshot shows the different features which will contain information about diseases and applications in brief.
- The third screenshot depicts the search bar where the user can

search for various mental health diseases, applications details and other user's profile.

- The fourth screenshot shows our own profile where we have icon for more information, call and update profile.
- Fifth screenshot shows the brief about any particular disease which can be accessed from second screenshot. (Here we have explained about brain tumour)
- Sixth screenshot shows the brief about any particular application which can be accessed from second screenshot. (Here we have explained about twitter)
- Seventh screenshot picturizes further about the search bar. This shows the recent search or recommendation of profile or disease.
- Eight screenshot shows calendar and graph. Calendar selects date while graph shows other application usage period for that selected date.

3.4 Application Implementation

Signup and Login page:

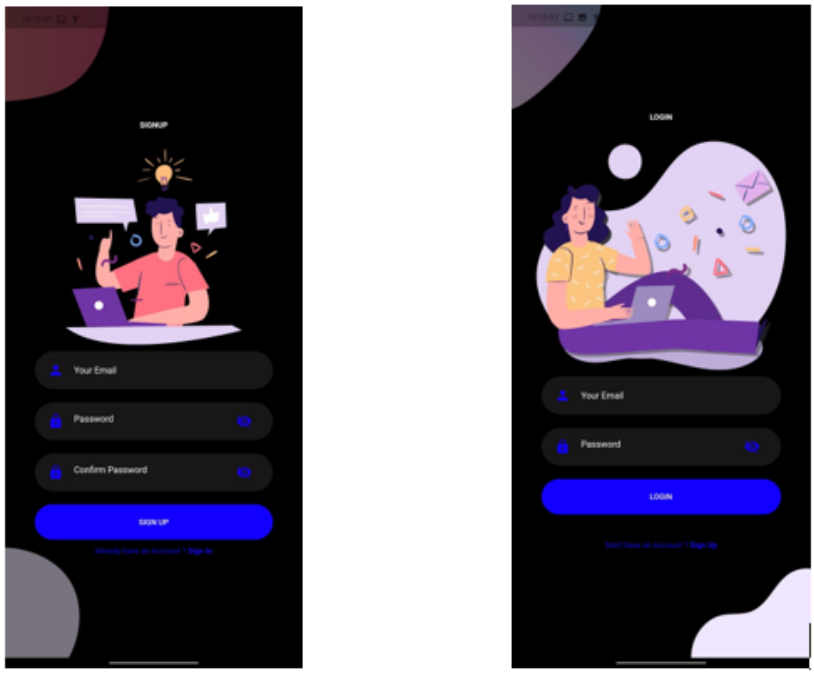

Figure 3.2: Signup and Login page:

- The first page is the signup page which asks user for email, password and confirm password which is validated as true will create a new account for user.
- The second page is the login page which asks user for email and password which if validated as true will login the user.

Home page and User profile:

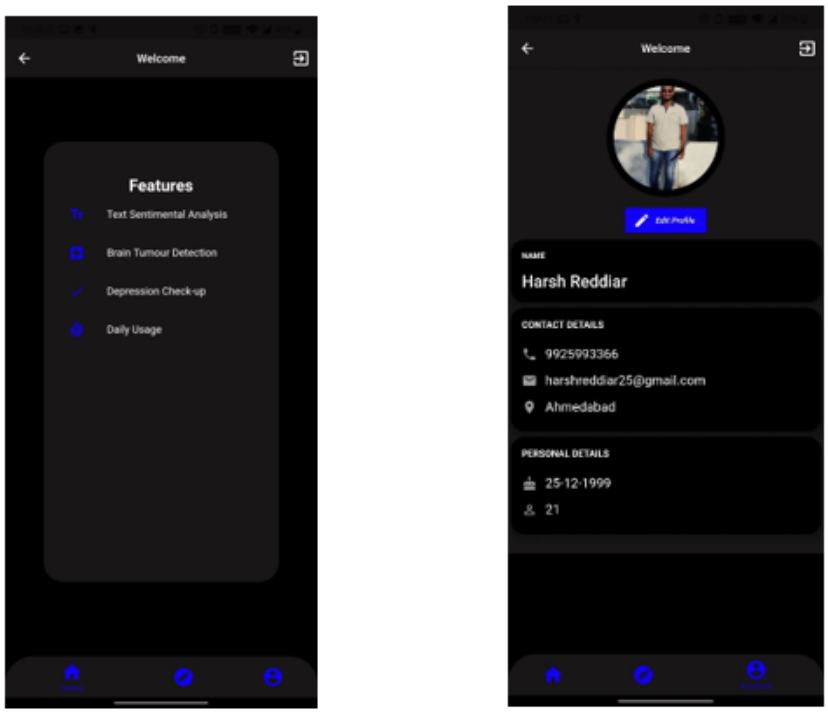

Figure 3.3: Home page and User profile

- The home page displays all the different features of our application and also navigations to search profile and user profile.
- The user profile displays the user's details and from here user can also update his details and avatar. Navigation to home screen and search profile is available here.

Explore screen and other users' profile:

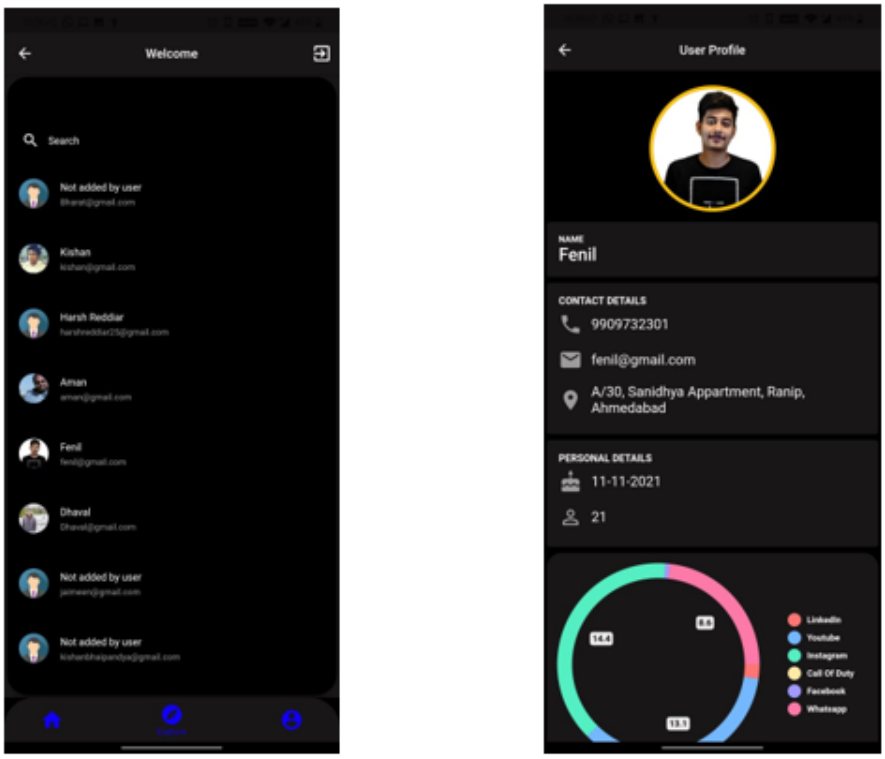

Figure 3.4: Explore screen and other users' profile

- Logged in user searches for other user by using the search bar. It can search through all the user of our application.
- Logged user searched the other profile and can view his/her application usage activity.

Text Sentiment Analysis:

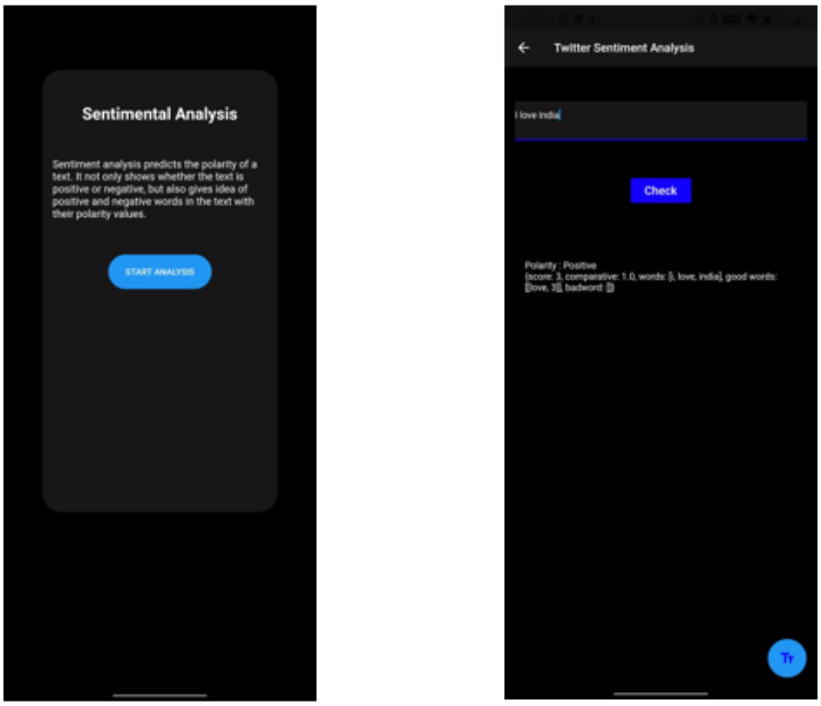

Figure 3.5: Text Sentiment Analysis

- Text sentiment analysis is done in this page. It provides polarity of a text whether it is positive or negative.
- Here input is given in the textbox and it is checked for its sentiment. Below the score and other details are provided for the respective text provided.

Brain Tumor Detection

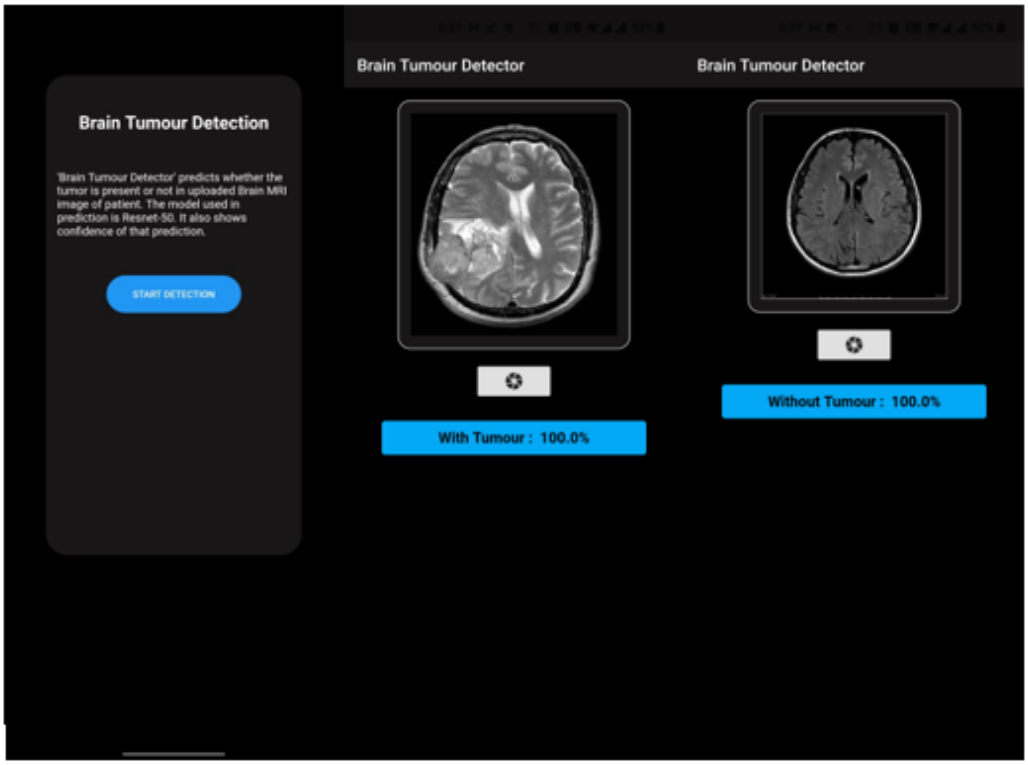

Figure 3.6: Brain Tumor Detection

- Brain tumour detection predicts whether the respective brain consists tumour or nor.
- A brain MRI image is provided as an input to the application which predicts result that whether the brain have tumour or not by using resNext model.

Depression check-up Quiz:

Figure 3.7: Depression check-up Quiz

- The user can take quiz which roughly predicts about the mental state of his/her brain. Quiz has 9 questions and score is generated according to options selected. Score predicts mental state. History is recorded

Application Usage Statistics:

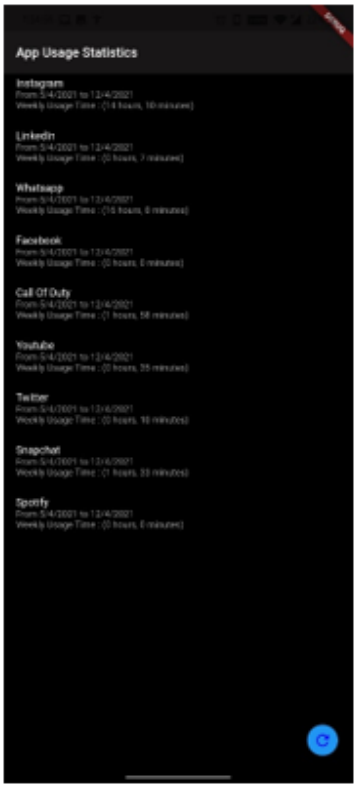

Figure 3.8: Application Usage Statistics

- This page shows application usage statistics of the user. How much of time he/she spends on a particular application is shown here. Guardians can look after this and nurture their child or the user.

3.5 Challenges and Solutions

1. **Challenge :** Gathering information and preparing survey was difficult to search for victims or such stakeholders who can provide useful information for tumour detection. Also, we didn't knew whether tumour detection was possible with machine learning or not.

   Solution : We required support from our other friends who are pursuing MBBS. We asked them for required information and survey was conducted. We approached our guide and seniors to seek some help so that they can put some light on how to proceed with this project.

2. **Challenge :** To develop the models for determining positiveness of the tweet we tried different models. It was difficult to select which model to train among various models. Another challenge we faced was enough data was not available to train the model. We explored and searched but it was difficult to get large amount of data.

   Solution : We explored different machine learning models and compared them with each other to determine which was best. So, we used some websites to learn it and also inquired about it to our guide. We asked guide for the source of dataset which was not easily available. So, we explored it and found enough dataset

to train and test the models.

3. **Challenge :** We did not know about the proper platform where we can create and design user interface. Apart from this, the problem we faced was that we didn't knew how to design the user interface using any software.

   Solution : So, we asked our seniors and our guide and finally decided to use framer as it gives better facilities and better understanding about the application UI, how the pages are linked with each other and the flow of the application. We were also supported by seniors to have basic instructions on how to use framer.

4. **Challenge :** Formerly, we were confused about what to use java or flutter for building application. But we didn't had knowledge about flutter so it was also an issue.

   Solution : We were not able to decide whether to use java or flutter. So, we took suggestions from our guide and batchmates and decided to use flutter as it provides cross platform application. As told, we didn't have any idea about flutter and dart. So, it was necessary for us to learn basics of those technologies using various sources.

Chapter 4

Conclusion and Future Work

4.1 Conclusions

All in all, our efforts to reduce the mental pressure come along with four main ideas. First and foremost, analyzing social media account, such as Twitter, by applying various machine learning algorithms, from which, Logistic regression performed best. Apart from that, monitoring user's mobile activity; and by that, guardians, as well as doctors, can easily measure the victim's mental health status. Moreover, the depression check-up can update the patient's level of depression to psychiatrist. At last, brain tumor detection through MRI images will also help users to have a quick diagnosis. We have observed that resNext50 has introduced a new hyperparameter cardinality(no of independent paths) which provides better fitting to model rather than by going deeper or wider. It has only one such hyper parameter to adjust.

4.2 Results/Findings

- In the process of detecting tumor from brain MRI (Magnetic resonance imaging) using deep learning techniques, we implemented as well as analyzed 6 deep neural network models i.e., Resnet-50(Residual neural network), VGG-16, Inception V3, ResNext-50, Vanilla U-net and FPN(Feature pyramid network).

- After rigorous analyses of their performance to detect brain tumor, we researched that due to hyperparameter cardinality, ResNext-50 model gives the best accuracy among defined deep learning models.

- Hence, we also integrated ResNext-50 model in our flutter android application by converting it from .h5 file to .tflite model. This implementation of brain tumor detection model in flutter application can help neurosurgeon to find the tumor from patient's brain MRI image by just uploading it. At some constraints normal person can also detect brain tumor from our application without taking any help from any expert.

- Through App usage statistics, a user can find the unusual activity which may help to identify the possible depression in a person such as overuse of any particular mobile applications, which can help parents to keep track of their child's activities in smartphone. Moreover, user can also see the app usage statistics of different

applications by clicking on its profile.

- App usage statistics can also help psychiatrists to keep monitoring the activity of their mentally disturbed patients. This can eliminate the regular visit of patient and increase the efficiency of daily check-ups.

- The depression check-up added in application is standard test made by Pfizer.inc which helps to find the level of depression in the best possible way. This test contains 9 psychological questions with equal weightage and options, which decide points given to user. After completion of test user will get a result of specific level of depression according to their score.

- This depression check-up history can help psychiatrist to monitor mental health of patient.

- Twitter sentiment analysis shows the polarity of tweet using machine learning algorithms. It can also help to find whether the tweet is positive or negative by visualizing words of the entered tweet, which also help to find the mental health of particular twitter user.

Chapter 5

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