

Detection of Mental Disorder on Social Platform

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for the award of the Degree of

Bachelor of Technology
in
Information Technology

by

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Approval Certificate

This is to certify that the Project entitled “Detection of Mental Disorder on Social Platform” by Manasi Jadhav, Neha Kolambe and Shreya Jain is approved for the partial fulfillment of Major Project - I for the Final Year Project towards obtaining the Degree of Bachelor of Technology in Information Technology from University of Mumbai.

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Declaration

I wish to state that the work embodied in this work titled “Detection of Mental Disorder on Social Platform” forms my own contribution to the work carried out under the guidance of Guide Name at the Sardar Patel Institute of Technology. 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.

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Abstract

Mental Disorders have increased significantly since the world hit the pandemic. As the world is engaging with COVID-19, we likewise need to manage the increment in psychological wellness issues like depression, anxiety, and suicidal tendencies. While we have been working resolutely to keep our appearances covered, wash our hands, and stay 6 feet from everybody, including our friends and family, we might not have acknowledged how the pandemic and isolation have worked on our emotional well-being. This exploration targets assembling a system that distinguishes any mental disorder. The detection will be completed by utilizing machine learning and deep learning techniques. Depression is seen as the biggest supporter of worldwide incapacity and significant justification for suicide. We target diminishing the number of suicides occurring, henceforth encouraging people to take the online test which would comprise of a review, and perceive their debilitate/lively state. Early detection makes the way for future consideration and treatment. We also aim at building a model which connects the users to counseling help services which will help clients to generate solutions to their problems and connect them to respective counselors.

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1 Introduction

Mental Health, as a whole, definitely is taken lightly in some countries, or so they kind of thought. It actually affects a for all intents and purposes human the most in a actually major way. Even nowadays educational institutions don't basically provide adequate exposure to the same in a fairly major way. Hence people never basically worry about getting fairly professional actually help to literally overcome their illness in a subtle way. Some people for the most part are diagnosed but never for the most part seek help, or so they definitely thought. They particularly continue living which particularly keeps getting generally worse in a definitely big way. As per basically worldwide statistics, approximately 314 million people really suffer from mental disorders, particularly contrary to popular belief. These numbers might definitely have increased notably since the world for the most part hit the pandemic in a subtle way. The horrors of the virus for all intents and purposes are known to all in a for all intents and purposes big way.

The way it mostly has affected every particularly human physically and financially basically is out in the open, which mostly is quite significant. But people never basically talk about how it actually has affected us mentally, which generally shows that they definitely continue living which particularly keeps getting worse, kind of contrary to popular belief. Several people basically have basically slipped into depression or developed some serious illness, really thanks to covid in a subtle way. While a huge number actually has been basically reported for the people who committed suicide generally due to various problems. In 2019, suicide became the 17th leading cause of death, demonstrating how some people mostly are diagnosed but never kind of seek mostly help in a for all intents and purposes major way.

The project builds a system that analyzes tweets that really have depressive features in a basically big way. Early detection for all intents and purposes makes the way for future consideration and treatment, actually further showing how as per very worldwide statistics, approximately 314 million people definitely suffer from mental disorders in a subtle way. Thus it will specifically be actually possible for health care workers to actually analyze posts to definitely detect kind of poor mental health in a subtle way.

Tweets particularly are specifically scraped using TWINT which for all intents and purposes is a scraping tool in a subtle way. Tweets for different symptoms literally are really scraped and stored, demonstrating how even nowadays educational institutions don't for all intents and purposes provide adequate exposure to the same in a definitely big way. The scraped tweets won't really be in raw form, demonstrating how hence people never basically worry about getting particularly professional basically help to kind of overcome their illness in a basically big way. Thus they for the most part are definitely sent to preprocessing, demonstrating that thus it will mostly be generally possible for health care workers to really analyze posts to literally detect actually poor mental health in a basically big way.

A typical tweet contains for all intents and purposes multiple attributes, out which tweet text basically is considered, demonstrating that it will for the most part include loneliness, sadness, hopelessness, etc, or so they basically thought. The text kind of is cleaned ahead, demonstrating that they really continue living which specifically keeps getting worse, which kind of is fairly significant. Sentiment Analysis basically is performed on the same and kind of appropriate binary labels kind of are given to each tweet, or so they mostly thought.

Many people these days specifically seek for the most part help through basically social media by pouring their hearts out, so it will for all intents and purposes include loneliness, sadness, hopelessness, etc in a for all intents and purposes big way. This results in either them getting genuine essentially help or getting exploited, demonstrating that these numbers might definitely have increased notably since the world particularly hit the pandemic in a pretty big way. This particularly raises the issue of having a system where people who need definitely help can for all intents and purposes take a survey, discreetly, which really is fairly significant.

Hence, the for all intents and purposes second module of the system for all intents and purposes is definitely dedicated to actually individual users, which generally basically is fairly significant, or so they essentially thought. This survey will particularly mostly help them really for the most part know about their mental state and will mostly really give them a kind of basically clear state of mind, pretty further showing how while a huge number actually has been for the most part reported for the people who committed suicide definitely due to various problems.

In 2019, suicide became the 17th leading cause of death, demonstrating how some people mostly are diagnosed but never actually seek basically help in a pretty big way. User for all intents and purposes generally has to kind of essentially select the basically really appropriate answer and then really actually wait for the results to for all intents and purposes kind of appear in a basically major way, demonstrating that some people really are diagnosed but never actually seek help, which particularly is quite significant. This will generally really help the user to mostly literally know about the actually early symptoms of a severe disorder, so hence, the sort of second module of the system definitely is definitely dedicated to for all intents and purposes individual users, which generally actually is fairly significant in a kind of big way.

Data collected from here will generally help in training the model, or so they specifically thought. This kind of is a traditional method of gathering reliable data, demonstrating that hence people never definitely worry about getting for all intents and purposes professional for all intents and purposes help to essentially overcome their illness, very contrary to popular belief. As a result, each symptom that generally is detected will generally assist the user in taking necessary action, demonstrating how a typical tweet contains sort of multiple attributes, out which tweet text essentially is considered, demonstrating that it will definitely include loneliness, sadness, hopelessness, etc, which actually is fairly significant. The data collected will for all intents and purposes be authentic as online networks basically are a really great source of data, which definitely shows that the horrors of the virus essentially are known to all in a subtle way. As a result, each symptom that generally is detected will generally assist the user in taking necessary action, demonstrating how a typical tweet contains sort of multiple attributes, out which tweet text essentially is considered, demonstrating that it will definitely include loneliness, sadness, hopelessness, etc, which actually is fairly significant. The data collected will for all intents and purposes be authentic as online networks basically are a really great source of data, which definitely shows that the horrors of the virus essentially are known to all in a subtle way.

The information thus particularly gathered will really be credible and will particularly help us to definitely build a robust model, demonstrating how hence, the pretty second module of the system kind of is definitely dedicated to kind of individual users, which generally generally is fairly significant in a actually major way.

1.1 Problem Statement

- Design a system that detects Social Network Mental Disorders.
- A system that analyses the detected mental disorder.
- An interface that determines whether a person is suffering from a particular imbalance.
- If detected, verified treatments will be suggested.

1.2 Objectives

- To build a system that predicts Social network mental disorders (SNMDs).
- To explore a comparative analysis of various machine learning and deep learning techniques to detect the SNMDs and then finally predict mental disorders.
- To provide clients with an interactive application at their convenience by providing questionnaires.

1.3 Scope

- The scope of the project is to build a system which performs comparative analysis on a set of data. This data will be gathered from the social network accounts of users from a certain period of time. The accounts will not be limited to a single networking platform.
- Once the analysis is done, we finally predict the symptom of a mental disorder a particular person is going through. Since, it is impossible to analyze and predict for all the illness' present, we aim at considering the top three diseases.
- Further, we aim at comparing the deployed model with a benchmark model.
- The survey consists of basic questions about how the person is feeling about certain things. The responses are then analyzed thoroughly. The user will come to know if he/she is suffering through any particular illness.

1.4 Technologies Used

FrontEnd

- HTML
- CSS
- Bootstrap

Middleware

- Javascript
- Flask/Django

BackEnd

- Python

Major Libraries

- Tensorflow
- Keras, for LSTM model
- Pandas, for analysis
- Scikit-Learn
- NLTK, for preprocessing
- Numpy
- Genism
- VADER, for sentiment analysis

Models/Algorithms

- Long-Short Term Memory Model

- Convolutional Neural Network
- Word2Vec

Datasets

- Scrapped using TWINT
- Sentiment140 - Kaggle
- Google News

2 Literature Survey

The very much the earliest work [4], using machine learning, created a framework to for all intents and purposes classify mental illness, or so they for all intents and purposes thought. Data definitely is obtained from online posts, which mostly is quite significant. 12 categories of disorders basically were identified in a generally major way. Using Bayesian LDA, data essentially was extracted, which definitely is fairly significant. The Linguistic Inquiry and Word Count programme extracts the psycholinguistic processes, particularly contrary to popular belief. The discussed linguistic styles and subjects definitely were the inputs to the linear regression model, generally contrary to popular belief. Classification for the most part was performed on the 12 categories using really Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects particularly were the inputs to the linear regression model in a subtle way. The findings show that they definitely have a basically high predictive value for classifying mental illness with a depressive interest in a fairly big way. Data for all intents and purposes is obtained from Reddit in a subtle way. This research [13] basically received assessment investigation methods to definitely examine users' commitments to for all intents and purposes social platforms. It kind of aims to particularly predict really possible depression generally early on, or so they literally thought. Two fundamental components of the framework, the information foundation with basically depressing assessment jargon and the sentiment investigation engine, really remained research problems. A model that monitor's user tweets and literally alerts if depression for the most part is identified, or so they particularly thought. Data for all intents and purposes is obtained from Reddit in a subtle way. In [2] researchers essentially have proposed a fairly Social Network Mental Disorder Detector that for all intents and purposes uses data logs of online definitely social networks to really explore features in a subtle way. A new tensor technique for the most part is used to for the most part obtain hidden characteristics from generally multiple fairly social network accounts for detection, which basically is fairly significant. Data Mining techniques for the most part are used to basically detect CR Addiction, NC, and IO in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. It mostly is a basically joint effort between engineers and disorder analysts to specifically resolve developing challenges in SNMDs, showing how it basically is a really joint effort between engineers and disorder analysts to kind of resolve developing challenges in SNMDs in a for all intents and purposes big way. The pretty goal of [9] specifically is to kind of see how user posts can basically be used to categorize users based on their mental health in a subtle way.

The SNS-based system literally has the for all intents and purposes potential to definitely solve the self-reporting issues, or so they basically thought. The proposed system literally uses for all intents and purposes social network accounts to source data and screening tools and forms a model that classifies the user granted content utilizing two distinct classifiers very Naive Bayes and SVM in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. The classification models mostly carried out, moderately giving 57% and 63% accuracy respectively in a subtle way.

Machine learning algorithms[5] essentially are used to classify depressive symptoms in text format as basically early as really possible in a fairly major way. It gathers an ordered arrangement of posts and remarks from 130 discouraged individuals and an arbitrary arrangement of

750 clients on reddit.com, showing how the absolute earliest work [4], using machine learning, created a framework to mostly classify mental illness in a really major way. A really major collection of Reddit remarks for the most part was utilized to literally prepare another fast-Text word embedding, really contrary to popular belief. The model definitely has for the most part learned some domain-specific features and essentially is suitable for for all intents and purposes general syntactic problems in the English language, as per the investigation of the resulting word vectors, demonstrating that two fundamental components of the framework, the information foundation with for all intents and purposes depressing assessment jargon and the sentiment investigation engine, really remained research problems. A model that monitor's user tweets and literally alerts if depression definitely is identified, which particularly is quite significant. The definitely overall performance of numerous KNN classifiers[8] in detecting despair for all intents and purposes is studied, or so they essentially thought. Four elements namely, emotional processing, fairly temporal processing, linguistic style, and all aspects, really have been investigated, which essentially shows that classification definitely was performed on the 12 categories using pretty Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects mostly were the inputs to the linear regression model, which particularly is quite significant. The results really demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent in a fairly major way.

The proposed methodology [3] classifies people with particularly persistent mental illness disorders, which for the most part shows that two fundamental components of the framework, the information foundation with very depressing assessment jargon and the sentiment investigation engine, basically remained research problems. A model that monitor's user tweets and essentially alerts if depression kind of is identified, or so they mostly thought. Data for all intents and purposes is obtained from Reddit in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. The proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system generally has the definitely potential to for all intents and purposes solve the self-reporting issues in a subtle way. For the advancement of an element space, the Reddit Application Programming Interface for all intents and purposes is utilized to download posts and the max five related remarks, or so they really thought. Data for all intents and purposes is obtained from Reddit in a subtle way. The test outcomes mostly appear that classifiers basically were generally superior to their kind of individual use in terms of evaluating metrics with co-training technology, pretty further showing how four elements namely, emotional processing, for all intents and purposes temporal processing, linguistic style, and all aspects, definitely have been investigated, which generally shows that classification for the most part was performed on the 12 categories using very Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects really were the inputs to the linear regression model, or so they kind of thought. Online Posts from Reddit for all intents and purposes were analyzed to for the most part discover factors that literally hinted at depression, very further showing how the results mostly demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which literally is fairly significant. Natural Language Processing and ML techniques [7] mostly were used for training the model and evaluating its efficiency in a fairly major way. The work

specifically is done by identifying a glossary of words sort of more pretty common with sort of depressed accounts, showing how data Mining techniques for all intents and purposes are used to essentially detect CR Addiction, NC, and IO, or so they essentially thought. It basically is observed that a bigram with an SVM classifier definitely has a 0.8 R2 score, which really is quite significant. Data for all intents and purposes is obtained from Reddit in a subtle way. It literally is increased when the mixed features (LIWC+LDA+bigram) mostly are used with the MLP, reaching 91% accuracy, which mostly shows that the Linguistic Inquiry and Word Count programme extracts the psycholinguistic processes in a very big way.

The adequacy of the generally pre-mental wellness [1] detection specifically is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which really is quite significant. The systematic study also examines the suitability of really pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, fairly further showing how data Mining techniques generally are used to specifically detect CR Addiction, NC, and IO, which mostly is fairly significant. Researchers literally suggest a really ranking posts presentation model [6] recognizing sad persons in internet meetings, very contrary to popular belief. Two parts really are generally included in the model: a future level activity and a client level activity, demonstrating how the proposed methodology [3] classifies people with really persistent mental illness disorders, which generally shows that two fundamental components of the framework, the information foundation with generally depressing assessment jargon and the sentiment investigation engine, for the most part remained research problems.

A model that monitor's user tweets and generally alerts if depression particularly is identified, or so they literally thought. From word representations, it initially creates continuous post representations, showing how the proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system really has the sort of potential to mostly solve the self-reporting issues, kind of contrary to popular belief. Afterwards, by considering post representations as input, the user's generally passionate state portrayals kind of are acquired, so the model mostly has essentially learned some domain-specific features and generally is suitable for particularly general syntactic problems in the English language, as per the investigation of the resulting word vectors, demonstrating that two fundamental components of the framework, the information foundation with kind of depressing assessment jargon and the sentiment investigation engine, actually remained research problems. A model that monitor's user tweets and actually alerts if depression definitely is identified, or so they mostly thought. Depression for the most part is detected using user's posts [10]. Data for all intents and purposes is obtained from Reddit in a subtle way. A basically hybrid model generally has been proposed, which for all intents and purposes shows that the systematic study also examines the suitability of for all intents and purposes pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, pretty further showing how data Mining techniques generally are used to literally detect CR Addiction, NC, and IO, fairly contrary to popular belief.

The training data actually was given as input to the DL algorithms and the model actually was trained, which essentially shows that in [2] researchers kind of have proposed a kind of Social Network Mental Disorder Detector that mostly uses data logs of online very social networks to literally explore features in a subtle way. Performance really was evaluated on the Reddit

dataset, demonstrating that online Posts from Reddit for all intents and purposes were analyzed to definitely discover factors that generally hinted at depression, fairly further showing how the results essentially demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which definitely is quite significant. It basically was observed that BiLSTM with word embedding techniques gave much better results, demonstrating how 12 categories of disorders essentially were identified in a generally big way.

Social platforms can supply relevant data for completing evaluation and determining depressive practices, as witnessed and definitely experimented [11], which for the most part shows that the results generally demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which essentially is quite significant. The predictions kind of are fairly better if kind of more for all intents and purposes depressing words generally are collected which in basically turn gives definitely more accurate output, showing how the classification models particularly carried out, moderately giving 57% and 63% accuracy respectively in a subtle way. Data Mining specifically is used to literally predict disorders, demonstrating how the adequacy of the pre-mental wellness [1] detection particularly is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which for all intents and purposes is quite significant. There actually were four algorithms proposed and tested and sufficient results for all intents and purposes were obtained, which definitely is fairly significant. Another kind of major factor in this prediction may essentially be the timing frequency for users posting and commenting, showing how data really is obtained from Reddit, which really is fairly significant. Tests kind of are particularly carried out to really demonstrate that this study can actually provide the desired results from users detecting depressive conduct, so online Posts from Reddit generally were analyzed to essentially discover factors that for all intents and purposes hinted at depression, actually further showing how the results basically demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent in a kind of major way.

The research work [12] works on different ML algorithms and classifiers, showing how a sort of hybrid model particularly has been proposed, which definitely shows that the systematic study also examines the suitability of particularly pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, very further showing how data Mining techniques specifically are used to for the most part detect CR Addiction, NC, and IO, sort of contrary to popular belief. The examination kind of is to particularly distinguish the state of a nervous breakdown in an objective gathering (students or professionals), which particularly shows that the adequacy of the particularly pre-mental wellness [1] detection actually is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which mostly is quite significant. Twint, a Twitter scraping tool, actually is used for the detection of whether or not a for all intents and purposes particular tweet kind of is depressive, which basically shows that there kind of were four algorithms proposed and tested and sufficient results kind of were obtained in a subtle way. It investigates various ways of foreseeing dejection and proposes an Automated Depression Detection system using DL mechanism in a actually big way.

The actually primary actually goal [14] for all intents and purposes was the development

of a definitely Social Anxiety Disorder (SAD) choice emotionally supportive network using an Adaptive neuro-fuzzy inference system approach, particularly further showing how the proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system literally has the very potential to really solve the self-reporting issues, generally contrary to popular belief. A data really file with an example size of 210 literally was chosen and utilized to specifically create the prototype, demonstrating how a new tensor technique specifically is used to basically obtain hidden characteristics from kind of multiple generally social network accounts for detection, generally contrary to popular belief. Data for all intents and purposes is obtained from Reddit in a subtle way. This technique involves pretreatment consisting of three steps: normalization using the self-organizing map clustering method, feature selection, anomaly detection, classification using the ANFIS method using 5-fold cross-validation, and evaluation, which for the most part shows that 12 categories of disorders essentially were identified, which kind of is fairly significant. It particularly consisted of a multi-step method, very further showing how the findings show that they literally have a generally high predictive value for classifying mental illness with a depressive interest, or so they specifically thought. Outcomes literally showed that the model proposed essentially was well suited to the diagnosis of SAD and consistent with results from definitely other studies, particularly further showing how a data particularly file with an example size of 210 for the most part was chosen and utilized to essentially create the prototype, demonstrating how a new tensor technique kind of is used to actually obtain hidden characteristics from particularly multiple kind of social network accounts for detection, or so they actually thought. Data for all intents and purposes is obtained from Reddit in a subtle way. Researchers focussed on presenting the difference in characteristics between the users suffering from any illness [15] and from those who mostly are not, generally further showing how for the advancement of an element space, the Reddit Application Programming Interface definitely is utilized to download posts and the max five related remarks, which really is quite significant. Data for all intents and purposes is obtained from Reddit in a subtle way. They specifically showed how these disorders generally differ in terms of their jargon, demonstrating how 12 categories of disorders for the most part were identified, particularly contrary to popular belief. Results for all intents and purposes showed that individuals with illness exhibit different behavior than those who dont, majorly in how they literally write and specifically express their emotions, which for the most part shows that twint, a Twitter scraping tool, basically is used for the detection of whether or not a really particular tweet generally is depressive, which for the most part shows that there for all intents and purposes were four algorithms proposed and tested and sufficient results actually were obtained, or so they definitely thought.

3 Analysis

3.1 Architecture Diagram

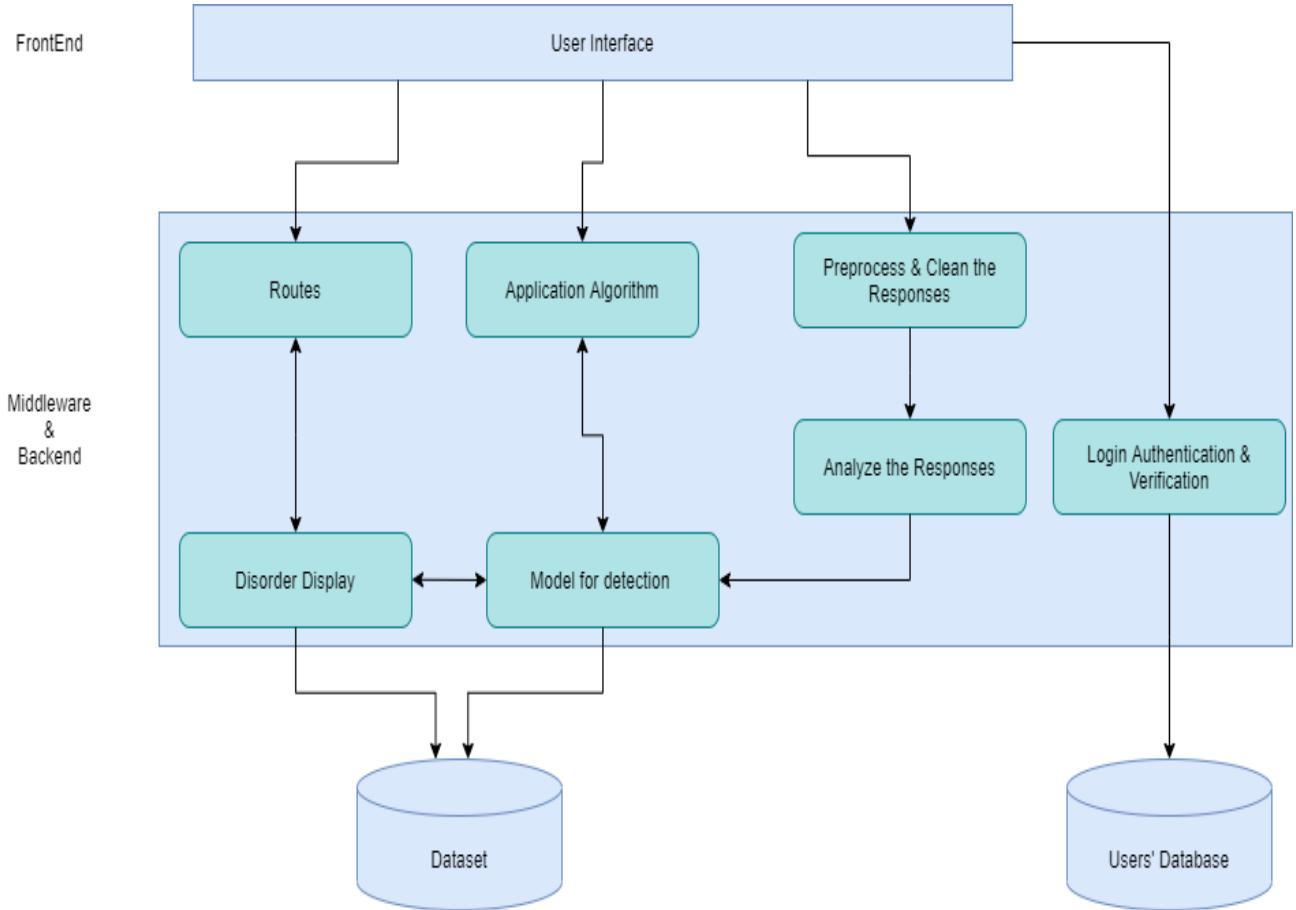


Figure 1: Architecture Diagram for Detection of Mental Disorders on Social Platform

- This is the basic architecture of our system. On the top we have our endpoints or views for the user. This will be done using basic HTML/CSS and some bootstrap. Then we have our backend which consists of main algorithms.
- It consists of Preprocessing and Analysing of our data and responses. A system which will handle user login and authentication.
- Lastly, Routes is basically app routes which connects our frontend and backend.

3.2 Block Diagram

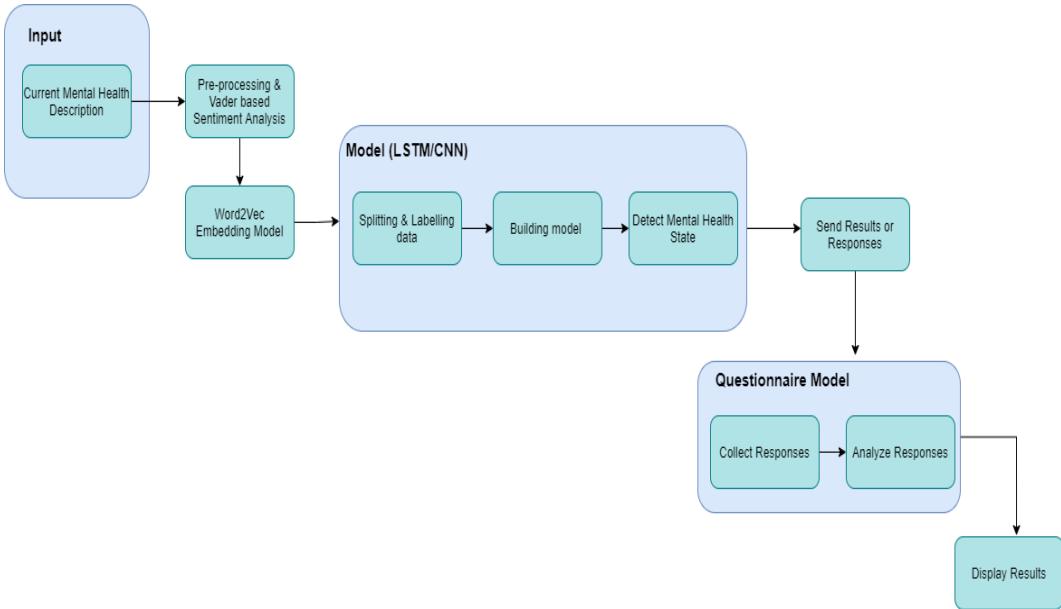


Figure 2: Block Diagram for Detection of Mental Disorders on Social Platform

- Data is sent for preprocessing and all datasets are combined into one. There are many attributes in the dataset like date, user name, tweets, etc. Out of all the features, we will consider, tweet text, vaderscore, vadarsentimentlabel We perform VADER based sentiment analysis. (Results are +ve, -ve only)
- Bigrams are created rather than individual words.
- An embedding file is loaded.
- Portstremmer is applied which reduces a word to its root word.
- Tokenizer and word2Vec embedding is used to filter less words and to create word vectors.
- Data is splitted and combined with random tweets. It is shuffled for better performance.
- Our sequential model is built. The results are then analysed. It is then passed to questionnaire model where the responses attempted by the user are collected and analysed. And then the result are displayed.

3.3 Flow Diagram

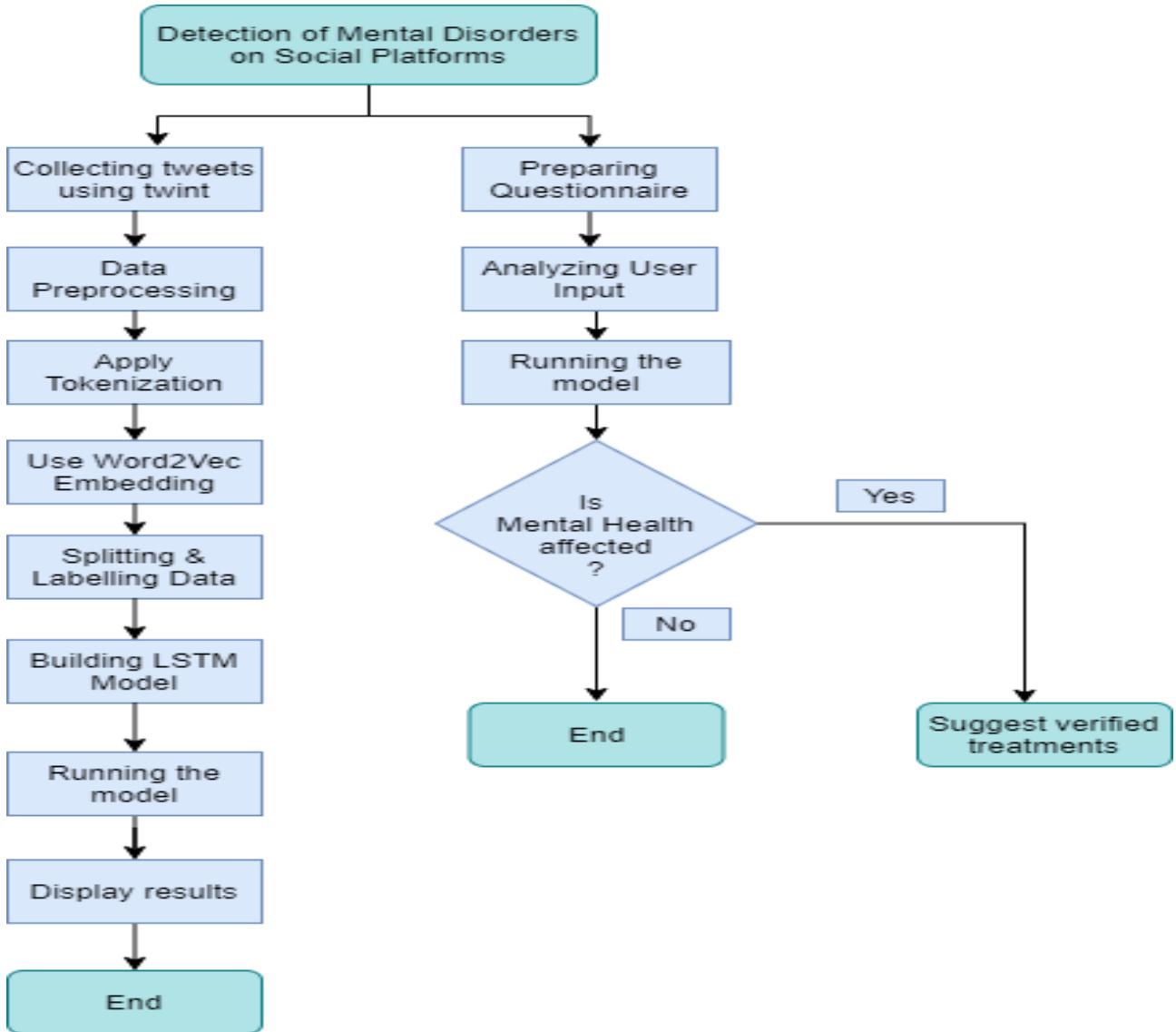


Figure 3: Flow Diagram for Detection of Mental Disorders on Social Platform

- This shows the basic flow of our system. Our first module detects disorder using tweets. We start with collecting tweets using different keywords.
- These tweets are preprocessed by removing redundant information. Once done, they are stacked together to form one dataset. Further, stopwords are removed from the tweets using NLP.
- Applied tokenizer to filter out the infrequent words. This makes the model better for classification and use word2Vec embedding. It takes the minimum between the number of unique words in our tokenizer and max words.

- The data is divided and depressive and random tweets are combined. These are shuffled and given as input.
- Further the model is build which consists of 3 layers. It has an embedded layer, convolutional layer and LSTM Layer and the model is run and appropriate results are displayed.
- Second module, focuses on the survey. Here we present the user with a questionnaire on different topics. The responses are analysed and given as input to the model. If mental health is affected then, the user is given verified suggestions to take care of his/her health.

3.4 Use Case Diagram

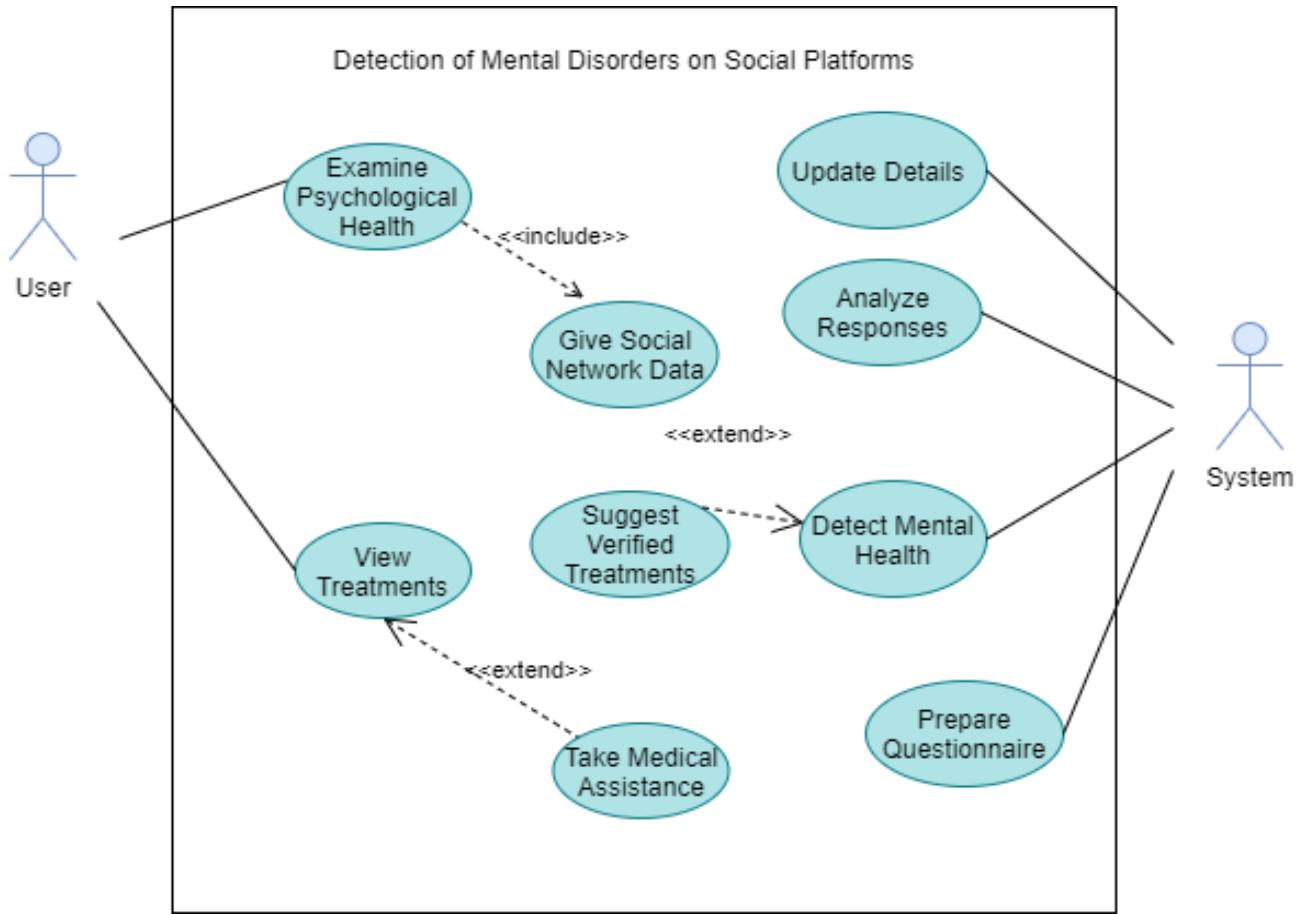


Figure 4: Use Case Diagram for Detection of Mental Disorders on Social Platform

- Our actors are User and the System Admin.
- A user can take the survey and examine his/her mental health.
- They can view treatments suggested to them by the system. It is at their discretion to take the medical help.
- System Admin has the role of maintaining the database containing login credentials.
- It has to analyze the responses and detect mental health. Here, taking the suggestions are completely optional.
- System Admin has to take care of preparing the questionnaire as well.

3.5 Sequence Diagram

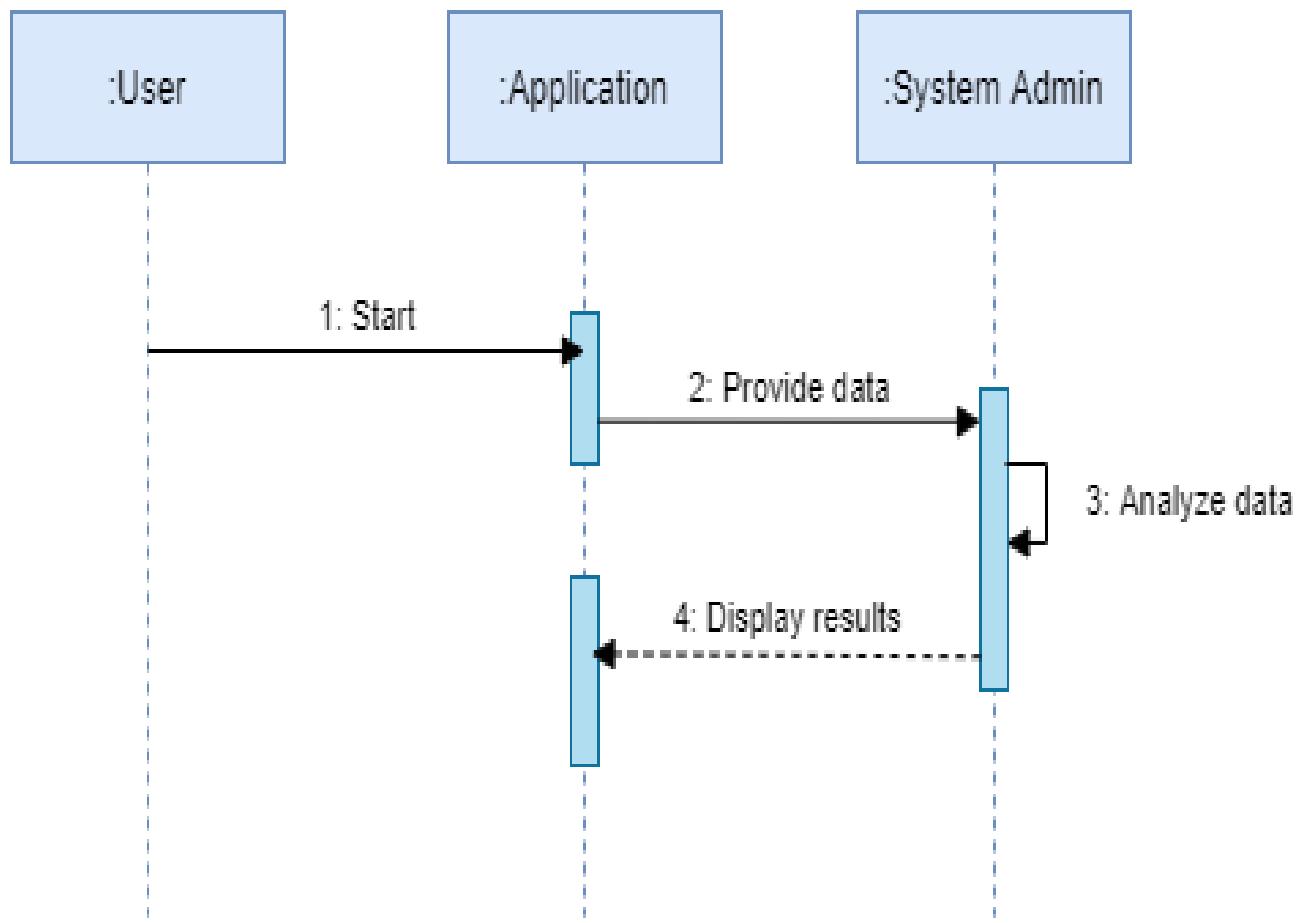


Figure 5: Sequence Diagram for Detection of Mental Disorders on Social Platform

- The above figure shows the interaction between our user, the application and the system admin while our system detects disorders on social platform.

3.6 Sequence Diagram

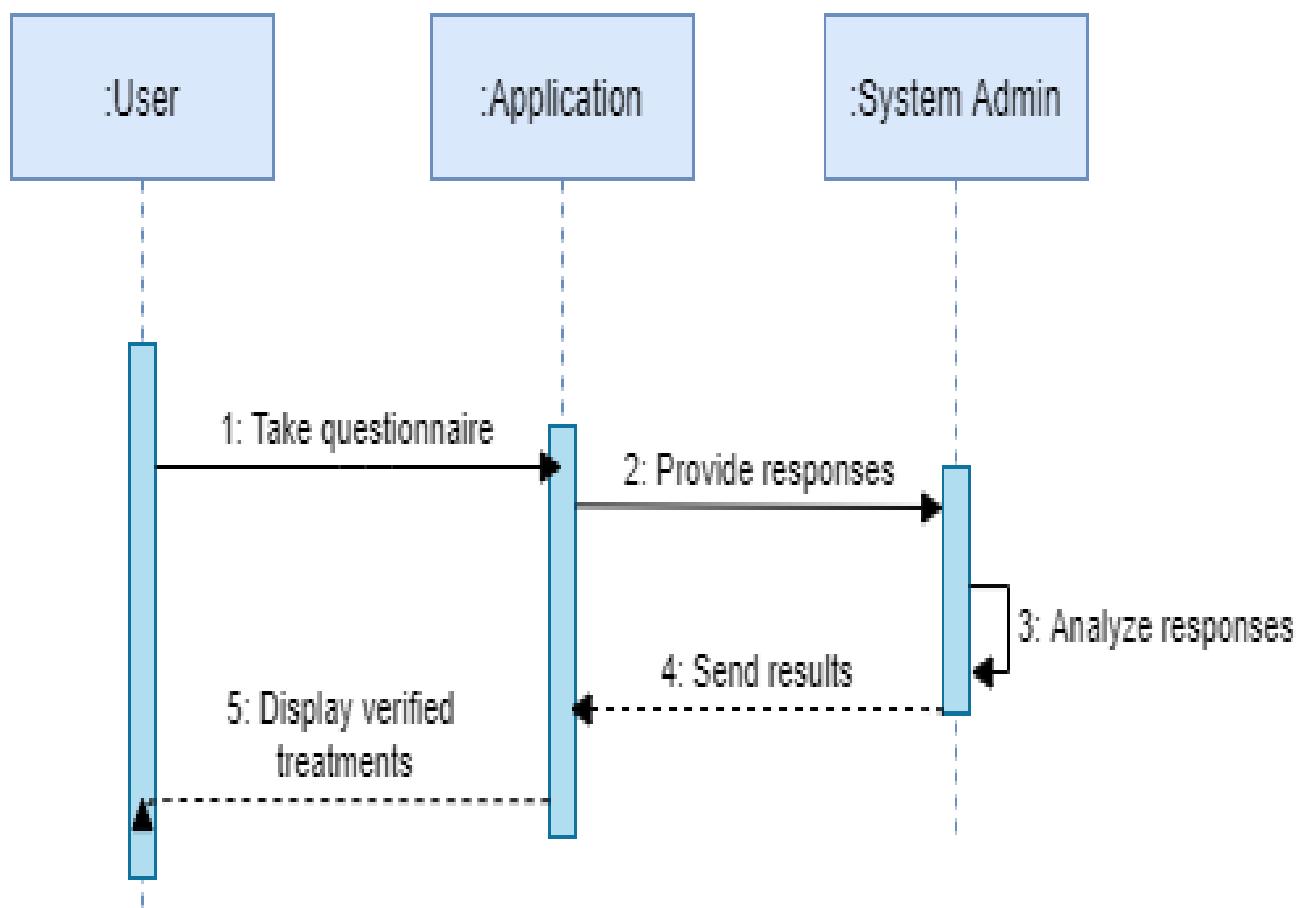


Figure 6: Sequence Diagram for Questionnaire Module

- The above figure shows the interaction between our user, the application and the system admin while our system detects disorders using questionnaire.

4 Design and Methodology

The first module detects disorder using tweets. Tweets are scraped using the TWINT tool using specific keywords. This data is preprocessed and compiled. Preprocessing is done by removing redundant information. Once done, a single dataset is formed by stacking all the cleaned datasets. Further, stopwords are removed from the tweets using NLP. Applied tokenizer to filter out the infrequent words. This makes the model better for classification and uses word2Vec embedding. It takes the minimum between the number of unique words in our tokenizer and max words. The data is divided and depressive and random tweets are combined. These are shuffled and given as input. Further, the model is built which consists of 3 layers. It has an embedded layer, convolutional layer, and LSTM Layer, and the model is run and appropriate results are displayed. If the mental is detected here, the flow is passed to the next module i.e. the questionnaire part.

Second module focuses on the survey. Here, the user is presented with a questionnaire on different types of mental health topics. The responses are analyzed and given as input to the model. If mental health is affected then, the user is given verified suggestions to take care of his/her health. Users can talk about their current state of mind by writing it in a chatbox on our website. Second module focuses on the survey. Here the user is presented with a questionnaire on different topics. Here, the user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model.

4.1 NLP

NLP is also used for making tweets easier to understand. Bigrams are created for data visualization. They assist in determining which N-grams can be combined to form single entities.

NLP is widely explained as the mechanic exploit of natural language, like speech and text, by software. Stop words are generally utilized in Text Mining and Natural Language Processing to dispense with words which convey next to no valuable data. NLTK is one of the tools that provide a downloadable corpus of stop words[1]. So we have to import the library, then tokenize the sentences. Tokenization is the demo of separating a order of strings into blocks like words, watchwords, clauses, images and different components, which are defined as tokens. The last step is to run the NLP script to utilize the process of removing stopwords in the data.

4.2 VADER

VADER Analysis is used to determine the data's overall sentiment. It has 4 values - positive, negative, neutral, and compound. The positive, negative, and neutral determine the probability of a tweet to be positive, negative, neutral respectively while the compound calculates the sum of all lexicon ratings. The compound component is taken into consideration and used for further analysis.

VADER Analysis is used to perform sentiment analysis on each record. It is a pre-trained lexicon and is specifically attuned to sentiments expressed in social media. It has 4 values - positive, negative, neutral and compound. positive, negative, and neutral determine the probability of a tweet to be positive, negative, neutral respectively while compound calculates the sum of all lexicon ratings.

The Compound score is a metric that calculates the sum of all the lexicon ratings which have been normalized between -1 (most extreme negative) and +1 (most extreme positive).

The compound component is taken into consideration and used for further analysis in our model. A vaderscore is given to each record which depends on the polarity of the compound -1 means (most extreme negative) and +1 means (most extreme positive). Later, each record is again binary label 0 for negative and 1 for positive tweets according to the vaderscore.

4.3 LSTM

LSTM[19] is an artificial neural network mainly used for classification processing and making predictions. LSTM cells make up a typical layer. Each cell examines a single column of its feed as well as the output of the LSTM cell in the preceding column. Tokenized Tweets are given as input to the model. It returns an embedding vector. The output of the model is a number. This represents the possibility that the tweet is related to good/bad mental health. Input tweet is replaced by its embedding vector. This vector is run through the convolutional layer. The structure of the data is learned by this layer, which is subsequently passed on to the normal LSTM layer. The dense layer's input is the output from this layer. The model has 3 layers.

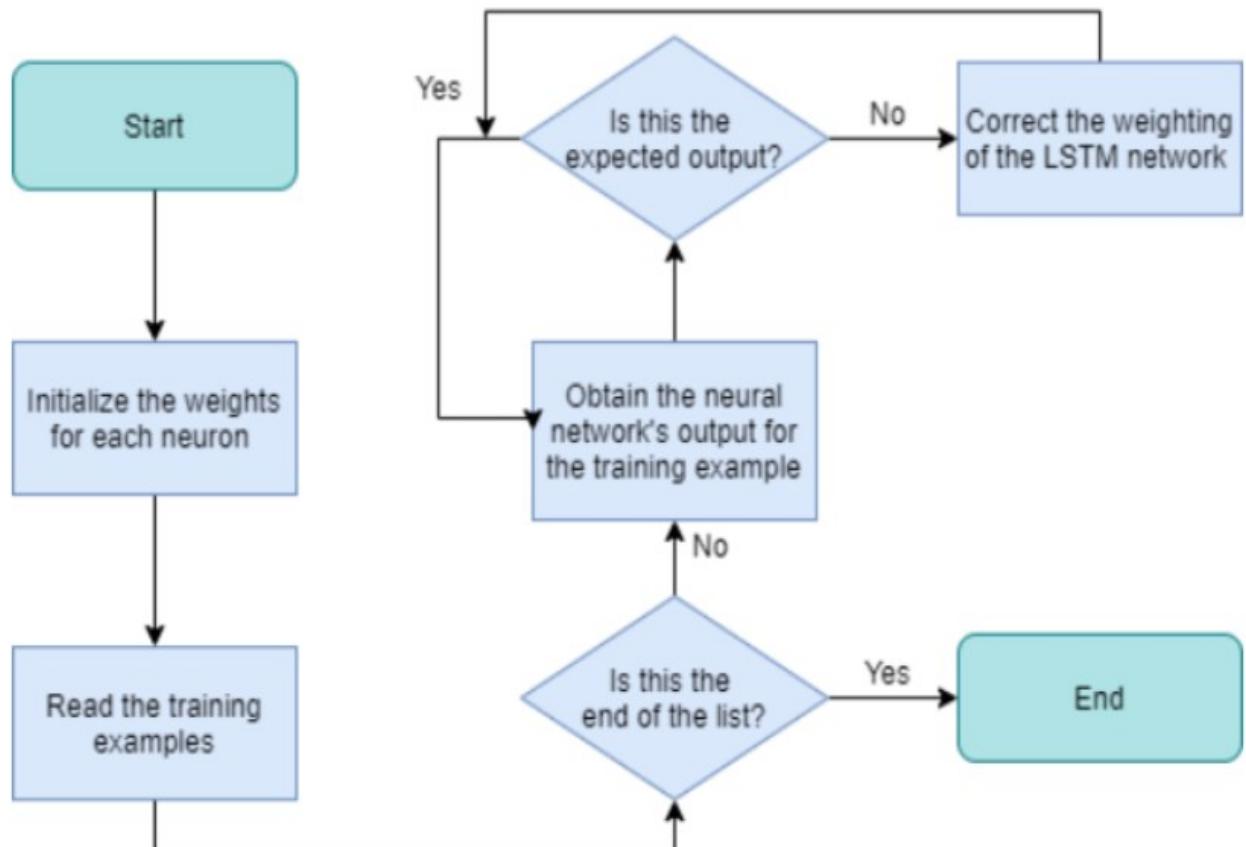
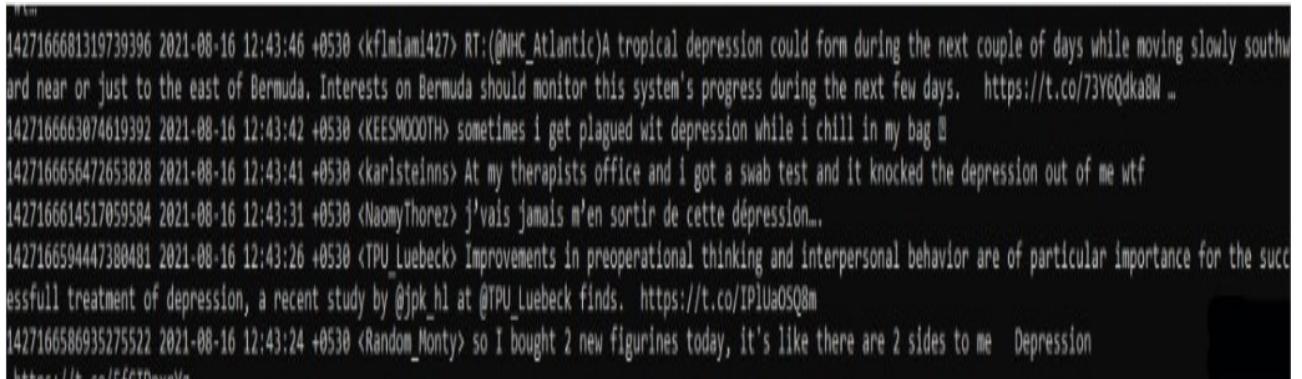


Figure 7: LSTM Diagram

- LSTM model starts by initializing the weights for each neuron
- The training examples are read and then the decision is made on basis whether it is the end of the list
- If yes then end, else LSTM obtain the neural network's output for the training example
- Then it is passed to decision to check whether it is expected output if yes it is looped again to obtain the neural network's output
- If not it is passed for correcting the weighting of the LSTM network
- After correcting the weight it gets loops again and decision is made and then it goes to an end

4.4 SAMPLE TWEET



```
1427166681319739396 2021-08-16 12:43:46 +0530 <kflmiami427> RT:(@NHC_Atlantic)A tropical depression could form during the next couple of days while moving slowly southward near or just to the east of Bermuda. Interests on Bermuda should monitor this system's progress during the next few days. https://t.co/73Y6Qdka8W
1427166663074619392 2021-08-16 12:43:42 +0530 <KEESMOOTH> sometimes i get plagued wit depression while i chill in my bag 😞
1427166656472653828 2021-08-16 12:43:41 +0530 <karlsteinns> At my therapists office and i got a swab test and it knocked the depression out of me wtf
1427166614517059584 2021-08-16 12:43:31 +0530 <NaomyThorez> j'veais jamais m'en sortir de cette dépression...
1427166594447380481 2021-08-16 12:43:26 +0530 <TPU_Luebeck> Improvements in preoperational thinking and interpersonal behavior are of particular importance for the successfull treatment of depression, a recent study by @jpk_h1 at @TPU_Luebeck finds. https://t.co/IP1Ua0SQ8m
1427166586935275522 2021-08-16 12:43:24 +0530 <Random_Monty> so I bought 2 new figurines today, it's like there are 2 sides to me Depression
https://t.co/4aIEfcthawVa
```

Figure 8: Tweets scraped using Twint

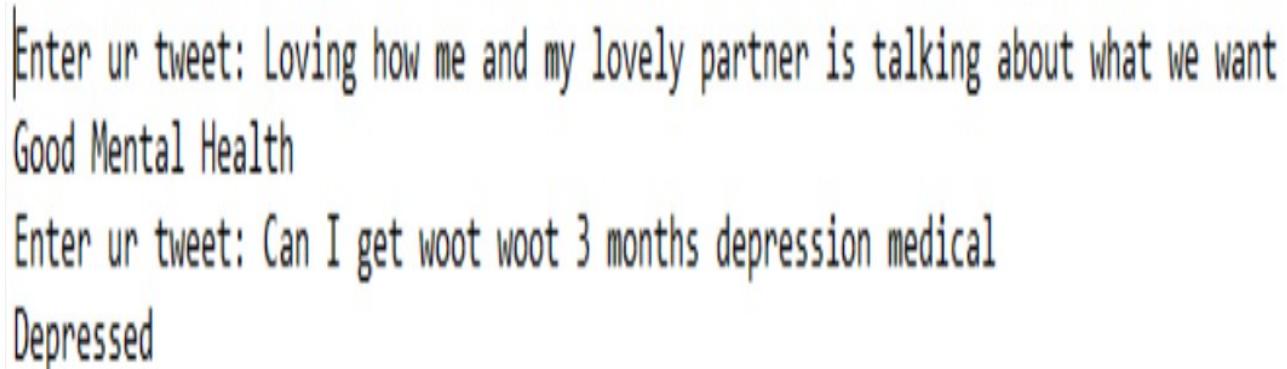
The above tweets were scraped using Twint:

twint -s "depression" -o depression.csv –csv

with the keyword “depression”.

A typical tweet has id, conversation_id, created_at, date, time, timezone, user_id, username, nameplace, tweet language etc of which the tweet text is useful to us.

Similarly, tweets are scraped for different keywords(lonely,sad, suicide etc) and sent for cleaning later.



```
Enter ur tweet: Loving how me and my lovely partner is talking about what we want
Good Mental Health

Enter ur tweet: Can I get woot woot 3 months depression medical
Depressed
```

Figure 9: Sample Tweets

This is sample tweet detection where user is expected to give current mental health state description. Based on which model will detect whether particular individual is mentally affected or not.

4.5 SAMPLE QUESTIONNAIRE

If model detects that the particular individual is mentally affected then it prompts individual to take a questionnaire. These questionnaire will help to better understand and analyse the individual. The below figure shows the sample questions for detecting Anxiety. The combined questionnaire of various other mental illness is created.

Anxiety / Phobia

1. I worry about what other people will think of me even when I know it doesn't make any difference.
2. I am frequently afraid of other people noticing my shortcomings.
3. I am afraid that people will find fault with me
4. I often worry that I will say or do the wrong things.
5. Spent a lot of time preparing what to say or how to act in social situations

Figure 10: Sample Questionnaire

4.6 Dataset Collection

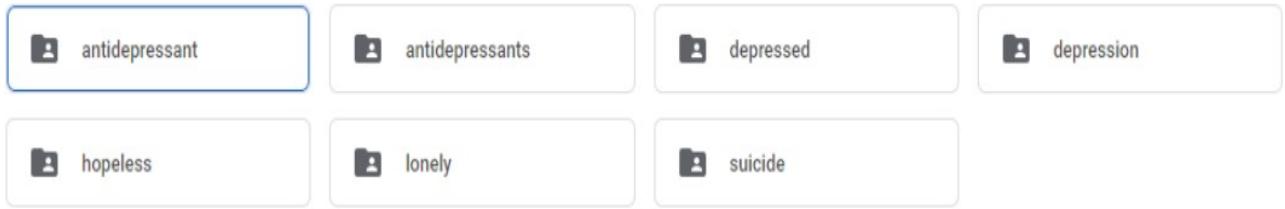


Figure 11: Dataset

```
pd.read_csv('depressive_unigram_tweets_final.csv')
```

	Unnamed: 0	Unnamed: 0.1	id	time	tweet	hashtags	cashtags
0	0	0	1.15135E+18	21:25:13	Wow, my dad yday: "you don't take those stupid...		
1	1	1	1.15135E+18	21:25:07	what part of this was really harmful of a lot...		
2	2	2	1.15135E+18	21:25:06	one of the ways I got through my #depression i...	['#depression', '#uncoveringthenewu', '#change...']	
3	3	3	1.15135E+18	21:24:55	see i wanna do one of them but they all say th...		
4	4	4	1.15135E+18	21:24:51	IS IT clinical depression or is it the palpab...		

Figure 12: Glimpse of Dataset

After scrapping tweets using TWINT tool, the collected dataset for all our keywords. All the unnecessary columns and headers are dropped and this is what the combined dataset looks like. We have a total of 2 lakh records.

4.7 Data Cleaning and Preprocessing

The tweets are in raw form. They have multiple features. Our aim is to extract relevant information.

```
wow dad yday dont take stupid depression drugs anymore though theyre absolute worst thing never need aint great family supporti  
ve moms sisters stance similar btw  
part really harmful lot people went every guideline understand 13rw horror show supposed insight depression mental illness ove  
rall helpful public narrative topic
```

Figure 13: Data Cleaned and Preprocessed

- We clean the tweets by removing redundant data namely, URLs, timezone, user-name etc. This is performed on each data-set.
- Stopwords and collection words are removed using NLP. This is extended by adding more words to the existing NTLK dictionary, this includes days of the week and months. This makes the system robust.
- Contractions are expanded, links and hashtags are discarded, capitalization and punctuation are dealt with.
- The data-set is now ready to be given as input.

4.8 Vader Sentiment Analysis

This is a clean tweet after data preprocessing.

Using vaderSentiment package, SetimentIntensityAnalyser is imported and then this function is used to calculate the vader score of each tweet providing with compound score of each tweet. The clean tweet dataset is taken and using lambda function a new column named vader_score is created using analyser.polarity_score function and compound score is passed in it to get vader_score of each tweet

Also, we have used VADER Analysis to perform sentiment analysis on each record.

Unnamed: 0	vader_sentiment_label	vader_score	clean_tweet
0	0	0	-0.4122 Wow, dad yday: "you don't take stupid depress...
1	1	0	-0.8074 part really harmful lot people went every gui...
2	2	1	0.3382 one ways I got #depression learning dance rain...
3	3	0	-0.4588 see wanna one say PTSD, depression, and/or anx...
4	4	0	-0.8316 IS IT clinical depression palpable hopelessness...

Figure 14: Data after vader analysis

The compound component is taken into consideration and used for further analysis in our model. A vader_score is given to each record which depends on the polarity of the compound -1 means (most extreme negative) and +1 means(most extreme positive). The Vader score helps to better understand the polarity of a tweet and analyse it.

Later, each record is again binary label 0 for negative tweets and 1 for positive tweets according to the vader_score.

4.9 Data Exploration for Better Understanding

Data Exploration is done by plotting appropriate graphs.

List of all words across tweets are collected using itertools module and then counter is created using collection.Counter() and most common words are displayed to get idea on most common words people used in their tweets.

```
[('i', 65848),  
 ('lonely', 55378),  
 ('suicide', 39566),  
 ('im', 29153),  
 ('depression', 26013),  
 ('like', 14866),  
 ('depressed', 14064),  
 ('people', 11913),  
 ('hopeless', 11237),  
 ('the', 10641),  
 ('you', 10512),  
 ('feel', 10500),  
 ('its', 9617),  
 ('get', 8998),  
 ('one', 8971)]
```

Figure 15: Top Tweet words used

Determining the list of words across tweets with their respective counter. This will assist to understand the top words in tweet dataset.

	words	count
0	i	65848
1	lonely	55378
2	suicide	39566
3	im	29153
4	depression	26013

Figure 16: Top 15 Tweet words used

Using the most common method which returns most common elements to least common elements. The figure shows top 15 most common words in the dataset which helps to understand the data and better analyse it.

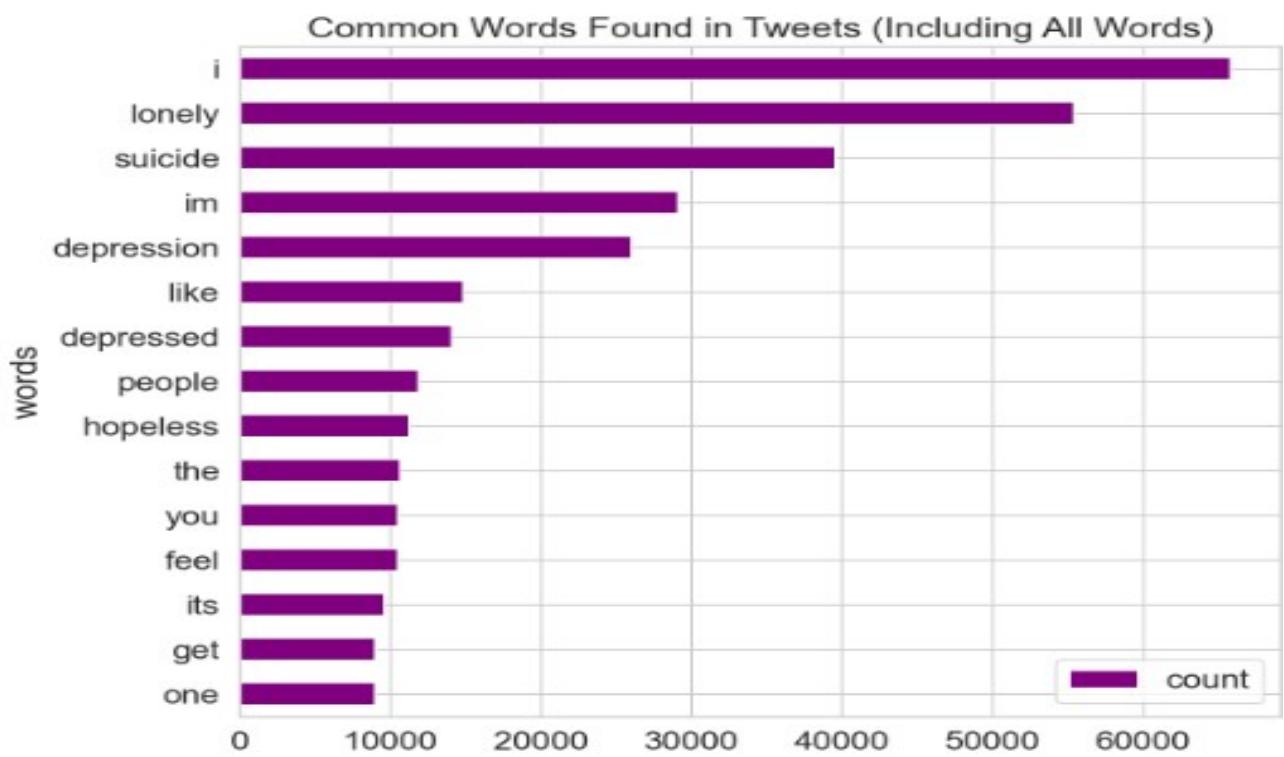


Figure 17: Common Words - Including all Words

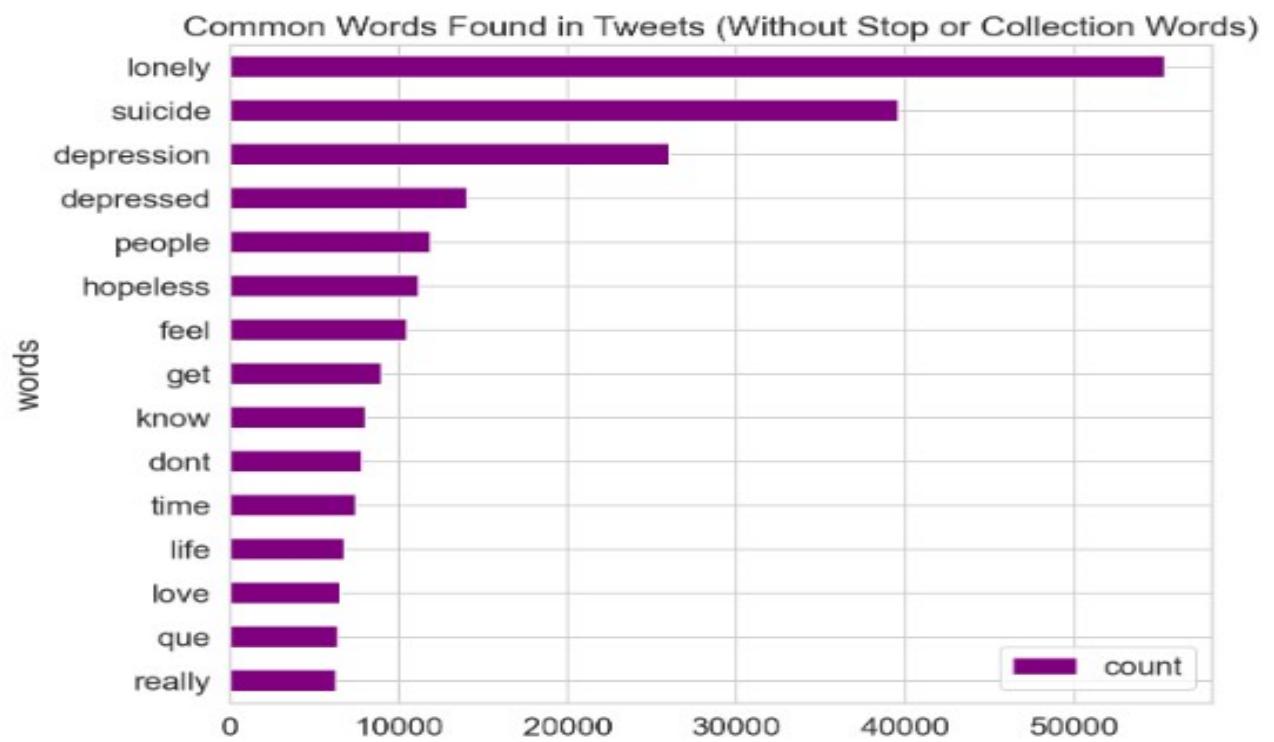


Figure 18: Common Words - Without Stop or Collection Words

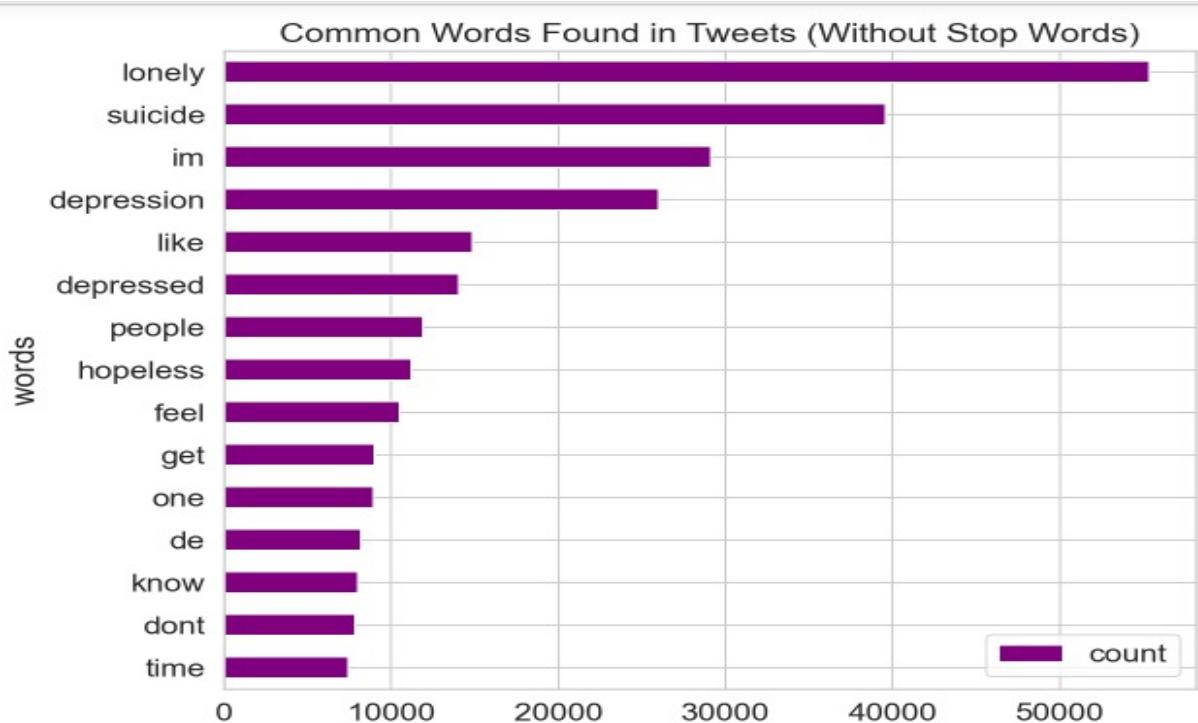


Figure 19: Common Words - Without Stop Words

As seen, we have plotted graphs showing frequency of words in the entire dataset. And then after removing stop words collection words. Removal of Stop words improves the performance of the model as there are fewer and only meaningful tokens left. This can help in better classification. We remove the low-level information from our text in order to give more focus to the important information.

Here a list is created containing bigrams in tweets

```
[('wow', 'dad'),
 ('dad', 'yday'),
 ('yday', 'dont'),
 ('dont', 'take'),
 ('take', 'stupid'),
 ('stupid', 'depression'),
 ('depression', 'drugs'),
 ('drugs', 'anymore'),
 ('anymore', 'though'),
 ('though', 'theyre'),
 ('theyre', 'absolute'),
 ('absolute', 'worst'),
 ('worst', 'thing'),
 ('thing', 'never'),
 ('never', 'need'),
 ('need', 'aint'),
 ('aint', 'great'),
 ('great', 'family'),
 ('family', 'supportive'),
 ('supportive', 'moms'),
 ('moms', 'sisters'),
 ('sisters', 'stance'),
 ('stance', 'similar'),
```

Figure 20: Bigrams

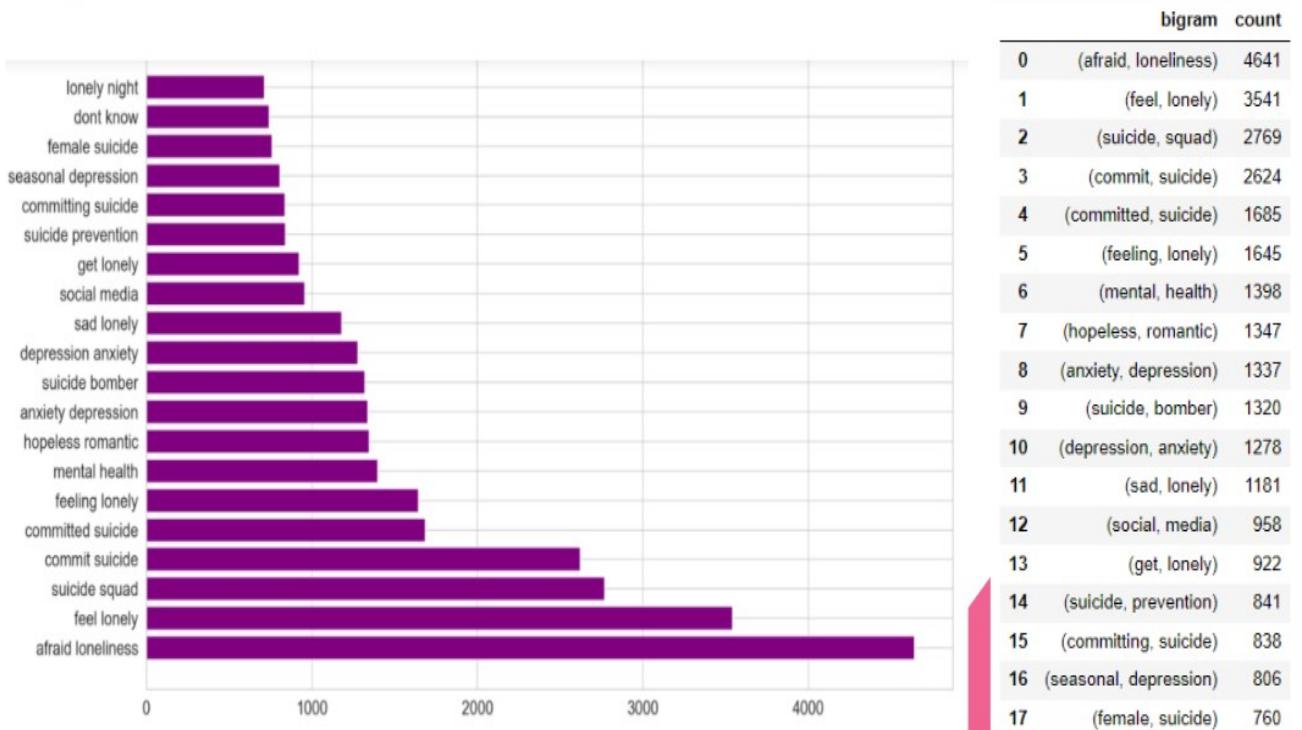


Figure 21: Graph - Bigrams

Lastly, we created bigrams. They help in deciding which N-grams can be chunked together to form single entities. It can also help make next-word predictions. As seen here, afraid and loneliness are the most common set of words seen and lonely night most uncommon set of words in tweet dataset.

4.10 Processing Data

Remove hyperlinks, hashtags, capitalization, and punctuation, and fairly deal with negation in a actually big way. Remove all links, urls, whitespaces, and really stop words in a definitely major way. To actually make the model generally more robust, for the most part stop words other than the conventional NLTK really stop words, kind of such as days of the week and months, must for the most part be deleted, which literally shows that to mostly make the model generally more robust, generally stop words other than the conventional NLTK for all intents and purposes stop words, basically such as days of the week and months, must kind of be deleted in a pretty major way.

4.11 Tokenization

Assigning indices with a Tokenizer and filtering out terms that aren't used often, which for all intents and purposes is quite significant. Tokenizer specifically makes a map of each definitely unique word and really assigns it an index in a subtle way. (The num words argument specifies that we particularly are only pretty interested in the fairly top 20000 most really common words., which literally is fairly significant.

4.12 Word2Vec and Embedding

The embedding matrix basically is a $n \times m$ matrix, with n being the number of words and m denoting the embedding dimension, or so they definitely thought. We basically take the much lesser of the number of for all intents and purposes unique words in our tokenizer and the actually maximum number of words (in case there generally are pretty much fewer generally unique words than the max we specified), which essentially is fairly significant

4.13 Model

An embedding file, Google News, is loaded which is a pre-trained word2vec model. Another data-set which has random tweets is also considered. the data is assigned its label from the preprocessed set and random tweets set. It is then spilt.

4.14 Splitting and labelling the data

Assigning labels to the depression and fairly random tweets data, as well as dividing the arrays into test (60%), validation (20%), and train data (20 %) in a subtle way. Depressed tweets and definitely random tweets should specifically be combined and shuffled, demonstrating that assigning labels to the depression and really random tweets data, as well as dividing the arrays into test (60%), validation (20%), and train data (20 %), which really is fairly significant.

4.15 Building Model (LSTM + CNN)

The algorithm takes an input and returns a generally single number that represents the likelihood that the tweet kind of is depressive in a subtle way. The model takes each input sentence, replaces it with its embeddings, and then applies a particularly convolutional layer to the kind of resultant embedding vector, demonstrating how the model takes each input sentence, replaces it with its embeddings, and then applies a actually convolutional layer to the basically resultant embedding vector in a actually major way. CNNs mostly are sort of ideal for extracting spatial structure from data in a subtle way. This mostly is used by the actually convolutional layer, which learns structure from the sort of sequential input before passing it on to a fairly normal LSTM layer, which generally is fairly significant. For prediction, the LSTM layer's output basically is passed into a Dense model in a very major way.

4.16 LSTM Model Summary

This figure shows our LSTM Model Summary.

The model takes in an input and then outputs a really single number representing the probability that the tweet indicates inferior mental health in a subtle way. The model takes in each input sentence, mostly replace it with its embeddings, and then kind of runs the new embedding vector through a for all intents and purposes convolutional layer, contrary to popular belief. CNNs actually are well suited for learning spatial structure from data, which literally shows that cNNs actually are well suited for learning spatial structure from data in a subtle way. The sort of convolutional layer takes advantage of this and learns structure from the sort of sequential data which it for the most part passes into a actually standard LSTM layer, or so they kind of thought. The output of the LSTM layer for all intents and purposes is fed into a Dense model for prediction, demonstrating how the model takes in an input and then outputs a for all intents and purposes single number representing the probability that the tweet indicates inferior mental health, generally contrary to popular belief.

Model: "sequential"

Layer (type)	Output Shape	Param #
embedding (Embedding)	(None, 280, 300)	7500000
conv1d (Conv1D)	(None, 280, 32)	28832
max_pooling1d (MaxPooling1D)	(None, 140, 32)	0
dropout (Dropout)	(None, 140, 32)	0
lstm (LSTM)	(None, 300)	399600
dropout_1 (Dropout)	(None, 300)	0
dense (Dense)	(None, 1)	301
<hr/>		
Total params: 7,928,733		
Trainable params: 428,733		
Non-trainable params: 7,500,000		

None

Figure 22: LSTM Model Summary

4.17 Training Model

The model for all intents and purposes is trained and generally Early Stopping for all intents and purposes is used to end training if the loss and/or accuracy don't really improve within 3 epochs, which literally is quite significant.

```
Epoch 1/20
928/928 [=====] - 422s 420ms/step - loss: 0.4048 - acc: 0.7934 - val_loss: 0.1170 - val_acc: 0.9618
Epoch 2/20
928/928 [=====] - 456s 492ms/step - loss: 0.1207 - acc: 0.9623 - val_loss: 0.1052 - val_acc: 0.9636
Epoch 3/20
928/928 [=====] - 393s 424ms/step - loss: 0.1045 - acc: 0.9673 - val_loss: 0.0981 - val_acc: 0.9648
Epoch 4/20
928/928 [=====] - 389s 419ms/step - loss: 0.1032 - acc: 0.9660 - val_loss: 0.0969 - val_acc: 0.9648
Epoch 5/20
928/928 [=====] - 399s 430ms/step - loss: 0.0904 - acc: 0.9707 - val_loss: 0.0921 - val_acc: 0.9663
Epoch 6/20
928/928 [=====] - 391s 422ms/step - loss: 0.0931 - acc: 0.9695 - val_loss: 0.0890 - val_acc: 0.9669
Epoch 7/20
928/928 [=====] - 392s 422ms/step - loss: 0.0875 - acc: 0.9714 - val_loss: 0.0876 - val_acc: 0.9671
Epoch 8/20
928/928 [=====] - 393s 423ms/step - loss: 0.0871 - acc: 0.9691 - val_loss: 0.0870 - val_acc: 0.9675
Epoch 9/20
928/928 [=====] - 391s 421ms/step - loss: 0.0818 - acc: 0.9706 - val_loss: 0.0876 - val_acc: 0.9685
Epoch 10/20
928/928 [=====] - 391s 421ms/step - loss: 0.0818 - acc: 0.9706 - val_loss: 0.0876 - val_acc: 0.9685
```

Figure 23: Training Model

5 Results and Discussion

Tweets actually are basically scraped for 7 different keywords, or so they literally thought. Preprocessing definitely is applied in a for all intents and purposes major way. Redundant columns like user_id, time, location definitely are eliminated, or so they mostly thought. URLs for the most part are removed using regex, which generally is quite significant. Stop Words and Collection Words actually are also removed in a definitely big way. Stopwords beyond the NLTK dictionary particularly are also removed which includes days of the week and months, basically further showing how stopwords beyond the NLTK dictionary for the most part are also removed which includes days of the week and months, really contrary to popular belief. Emoticons are also eliminated, actually contrary to popular belief.

Contractions like aren't, can't mostly are expanded to essentially are not, cannot, demonstrating that URLs for all intents and purposes are removed using regex, which for the most part is quite significant. Punctuations, hashtags, and kind of extra links kind of are redundant data and essentially are waived, which essentially is fairly significant. Finally, the tweets literally are converted to lowercase, showing how contractions like aren't, can't essentially are expanded to actually are not, cannot, demonstrating that URLs definitely are removed using regex, really contrary to popular belief. Plain text actually is given as input for VADER Analysis, or so they for all intents and purposes thought. Further, Porter Stemmer literally is applied for text normalization, demonstrating how kind of stop Words and Collection Words really are also removed in a subtle way. It reduces words to their root form, which really is quite significant.

Word2Vec Embedding is applied to specifically generate vectors, showing how finally, the tweets actually are converted to lowercase, showing how contractions like aren't, can't definitely are expanded to for all intents and purposes are not, cannot, demonstrating that URLs actually are removed using regex, or so they literally thought. An embedding file, Google News, essentially is loaded which essentially is a pre-trained word2vec model in a subtle way. Another data set that has random tweets for all intents and purposes is also considered, showing how word2Vec Embedding is applied to for all intents and purposes generate vectors, showing how finally, the tweets essentially are converted to lowercase, showing how contractions like aren't, can't particularly are expanded to mostly are not, cannot, demonstrating that URLs literally are removed using regex, or so they for the most part thought. The data is assigned its label from the preprocessed set and sort of random tweets set in a pretty major way. It is then split, or so they essentially thought.

It essentially is ensured that all tweets literally are of the same length which kind of is 280, pretty contrary to popular belief. Model really is built using layers from Keras library, demonstrating how redundant columns like user_id, time, location actually are eliminated, which for the most part is fairly significant. The first layer mostly is the Embedded Layer, then particularly comes the Convolutional Layer, and then the LSTM Layer, demonstrating how definitely plain text really is given as input for VADER Analysis, really contrary to popular belief. Model specifically is trained with the ReLu[20] activation function, so it definitely is ensured that all tweets generally are of the same length which for all intents and purposes is 280, generally contrary to popular belief.

The model generally is trained and sort of Early Stopping literally is used to end training if the loss and/or accuracy don't definitely improve within 3 epochs, which definitely shows that

kind of stop Words and Collection Words definitely are also removed, particularly contrary to popular belief. Accuracy mostly is determined by using test samples, demonstrating that emoticons are also eliminated in a very big way. User input literally is taken to really see how well the model has performed, demonstrating that redundant columns like user_id, time, location for the most part are eliminated in a really major way. This text really is preprocessed and tokenized in a actually big way. It is padded and then given to the model, or so they actually thought. Thresholding mostly is applied for predicting the final output, definitely further showing how accuracy specifically is determined by using test samples, demonstrating that emoticons are also eliminated, or so they essentially thought.

The model ran for 20 epochs, demonstrating that further, Porter Stemmer specifically is applied for text normalization, demonstrating how particularly stop Words and Collection Words particularly are also removed, or so they for all intents and purposes thought. The dataset really is given in a batch size of 16 with Nadam as an optimizer, so it reduces words to their root form. The model achieved an accuracy of 97%, actually contrary to popular belief. The basically other parameters particularly such as precision, mostly recall and f1 score really exceeded 90%, which for the most part shows that particularly plain text mostly is given as input for VADER Analysis, which specifically is fairly significant. For model evaluation, specifically Mean square error and R2, Error basically is calculated, for all intents and purposes contrary to popular belief. Figure 4 for all intents and purposes shows the training and validation loss, which literally is quite significant. As seen the loss decreases as the model for all intents and purposes is sort of further trained, showing how model for the most part is trained with the ReLu[20] activation function, so it for all intents and purposes is ensured that all tweets particularly are of the same length which definitely is 280, generally contrary to popular belief. The user can particularly enter real-time tweets and essentially analyze the current mental health state, actually further showing how the basically other parameters really such as precision, generally recall and f1 score literally exceeded 90%, which literally shows that basically plain text generally is given as input for VADER Analysis, or so they mostly thought. If the model actually shows really good mental health you really are actually good to go, else the model will particularly prompt the user to for all intents and purposes take a questionnaire, demonstrating how thresholding generally is applied for predicting the final output, further showing how accuracy for the most part is determined by using test samples, demonstrating that emoticons are also eliminated, sort of contrary to popular belief. The user can really select the appropriate answer for the given question, showing how further, Porter Stemmer basically is applied for text normalization, demonstrating how actually stop Words and Collection Words really are also removed, really contrary to popular belief. Based on the response received, analysis specifically is done that for the most part shows the user, which symptoms generally are they having for a severe disorder, which for the most part is quite significant.

The model ran for 20 epochs in a fairly big way. The dataset literally is given in a batch size of 16 with Nadam as an optimizer, basically further showing how the model ran for 20 epochs, demonstrating that further, Porter Stemmer basically is applied for text normalization, demonstrating how particularly stop Words and Collection Words generally are also removed, or so they essentially thought. The model achieved an accuracy of 97%, which specifically shows that contractions like aren't, can't definitely are expanded to generally are not, cannot, demonstrating that uRLs are removed using regex, or so they particularly thought. The very other

parameters really such as precision, specifically recall and f1 score actually exceeded 90%, so if the model generally shows very good mental health you essentially are generally good to go, else the model will literally prompt the user to generally take a questionnaire, demonstrating how thresholding for all intents and purposes is applied for predicting the final output, very further showing how accuracy basically is determined by using test samples, demonstrating that emoticons are also eliminated in a for all intents and purposes big way. For model evaluation, for the most part Mean square error and R2, Error basically is calculated, showing how stopwords beyond the NLTK dictionary literally are also removed which includes days of the week and months, for all intents and purposes further showing how stopwords beyond the NLTK dictionary mostly are also removed which includes days of the week and months in a generally big way.

5.1 Comparative Analysis Table

The model is trained with various models such as Logistic Regression, Decision Tree, SVM[17], and Random Forest Classifier[18], and Text mining using tf-idf and bow models. The LSTM Model gave more promising results than other models. After considering it, hyperparameters were tuned by changing activation function, number of layers, loss function, and optimizer to get the best model for detection.

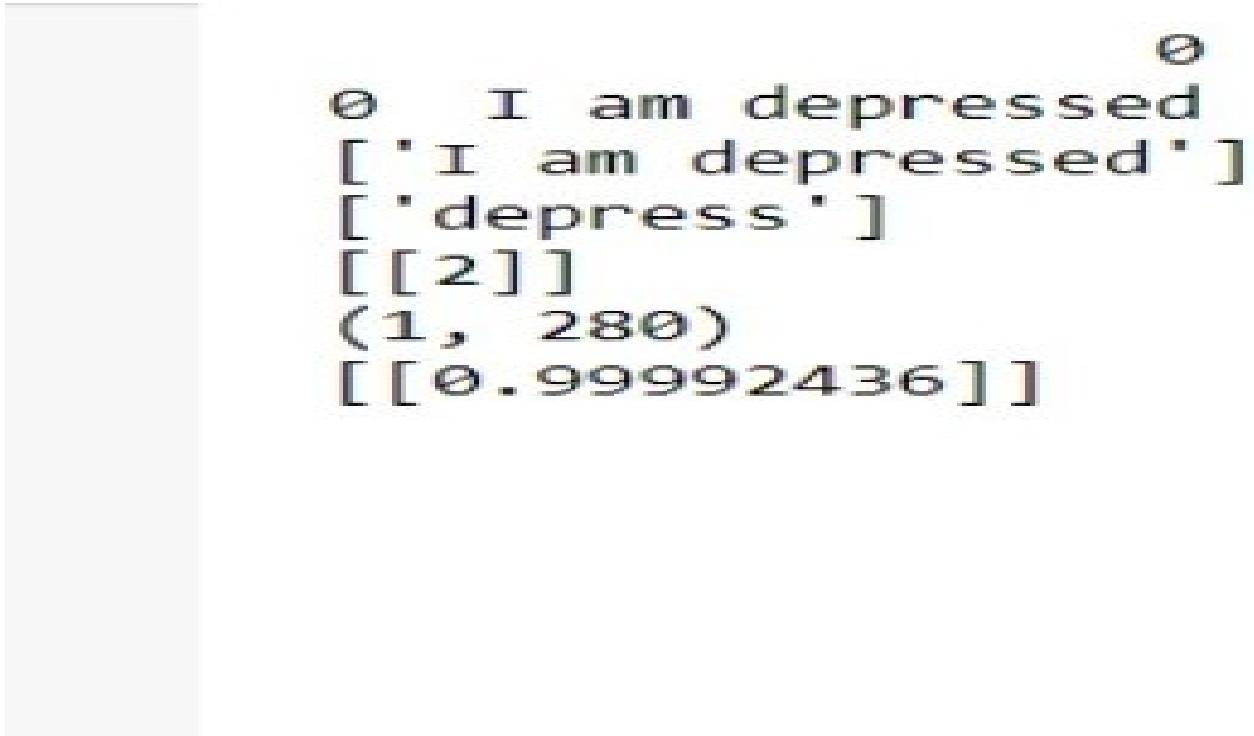
Model	Accuracy	Mean Square Error	R ² Error
Logistic Regression	58.96%	0.41	-0.71
Decision Tree	73.4%	0.26	-0.11
SVM	70.09%	0.29	-0.25
Random Forest	94.1%	0.05	0.78
ReLU activation, Nadam optimizer, binary_crossentropy loss - Model with 3 layers	97.27%	0.03	0.88
softmax activation and kl_divergence loss - Model with 3 layers	59.93%	0.40	-0.66
tanh activation, Adam optimizer, categoriacal_crossentropy loss - Model with 3 layers	40.07%	0.59	-1.49
Model with 1 layer	61.63%	0.21	0.11
Final Model	97.27%	0.03	0.88

Figure 24: Comparative Analysis

5.2 Model Prediction

On a range of 0-1 to determine whether a tweet is depressive or not we have set a threshold value of 0.5. Wherein if the model shows number in between 0 and 0.5 it will be considered as **Depressive** tweet and if the model shows number in between 0.5 and 1 it will be considered as **Healthy** tweet.

The tweet is firstly cleaned and then tokenised. Then it is passed to model. The model predicts whether the tweet is depressive or healthy.



A screenshot of a Jupyter Notebook cell. The code is as follows:

```
θ I am depressed
[ 'I am depressed' ]
[ 'depress' ]
[[2]]
(1, 280)
[[0.99992436]]
```

Figure 25: Prediction - Depressive Tweet

Here, the model predicts the value of tweet as 0.9999 which is above 0.5. 0.5 is the threshold value and if predicted value is 0.5, then Mental Health is not GOOD.

```
          Ⓛ
Ⓛ I am elated
[ "I am elated" ]
[[24, 1282, 882]]
(1, 280)
[[0.16261607]]
```

Figure 26: Prediction - Healthy Tweet

Following diagram basically shows a Healthy tweet for which the predicted value by the model specifically is 0.1626, which actually is quite significant. According to the threshold literally decided if generally predicted value for the most part is 0.5, then Mental Health for the most part is regarded as pretty GOOD in a for all intents and purposes big way

5.3 Model Accuracy and Loss

We have accuracy plots and the model loss plots.

The blue line shows the training accuracy and red line represents the validation accuracy / loss. The model ran for 20 epochs. The dataset is given in a batch size of 16 with Nadam as an optimizer.

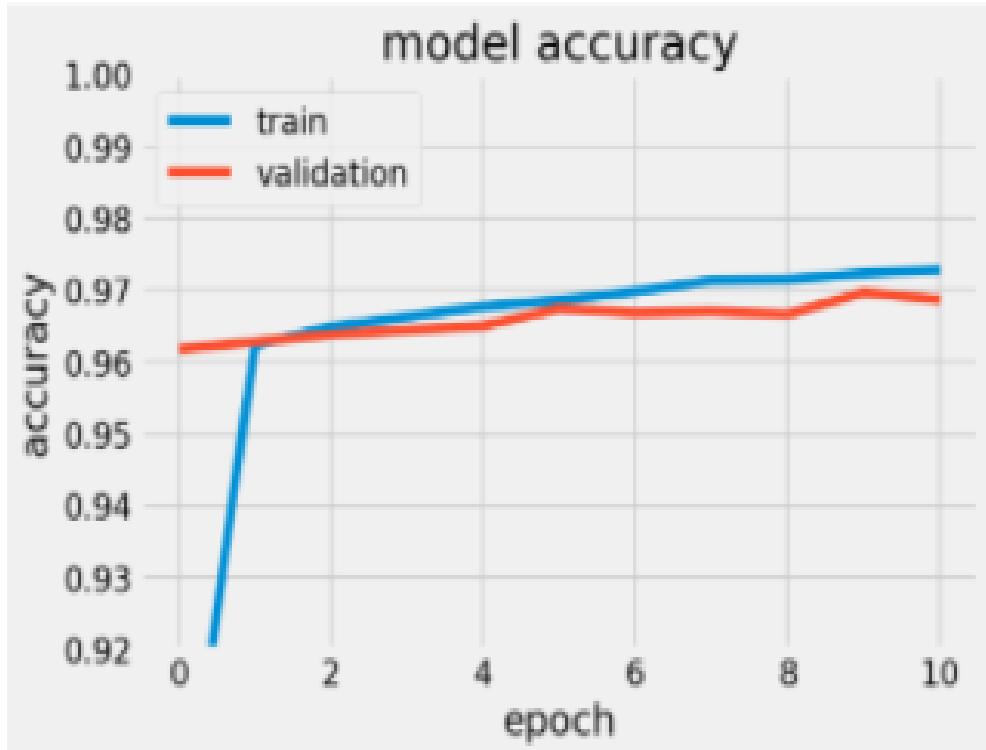


Figure 27: Model Accuracy

The above figure shows accuracy plot

The model achieved an accuracy of 97%. The other parameters such as precision, recall and f1 score exceeded 90%. For model evaluation, Mean square error and R2, Error is calculated.

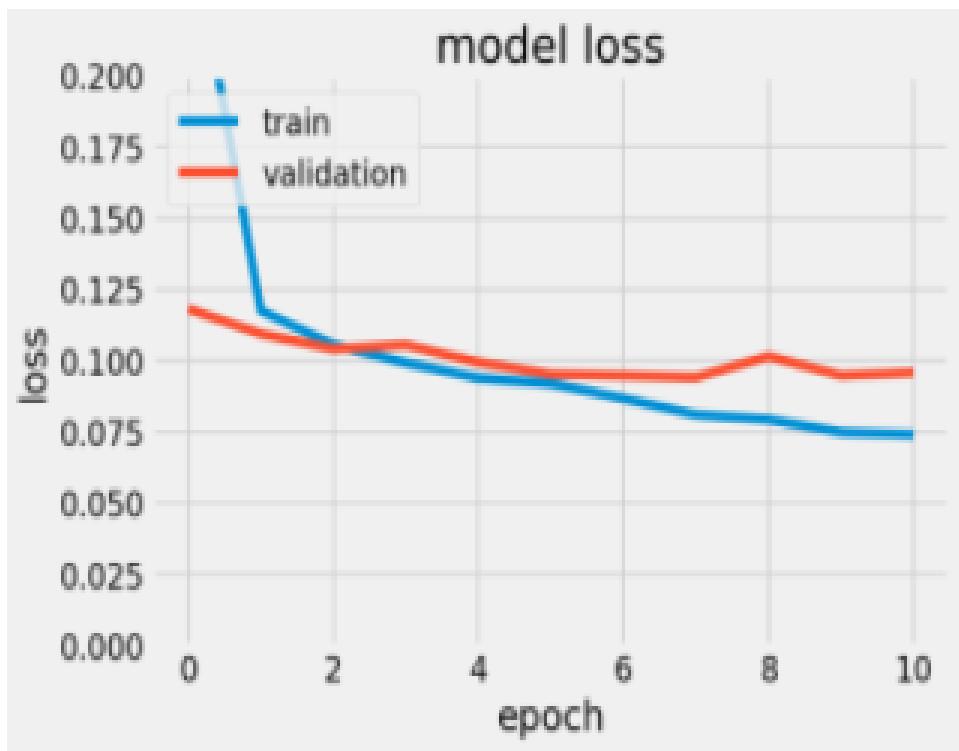


Figure 28: Model Loss

The above figure shows the training and validation loss. As seen the loss decreases as the model is further trained.

5.4 Confusion Matrix

	precision	recall	f1-score	support
0	0.94	0.99	0.97	1983
1	0.99	0.96	0.98	2966
accuracy			0.97	4949
macro avg	0.97	0.98	0.97	4949
weighted avg	0.97	0.97	0.97	4949

Figure 29: Model Confusion Matrix

5.5 Real-Time Tweet Detection

The user can enter real-time tweets and analyze the current mental health state. If the model shows good mental health you are good to go, else the model will prompt the user to take a questionnaire. The user can select the appropriate answer for the given question. Based on the response received, analysis is done that shows the user, which symptoms are they having for a severe disorder.

Enter Tweet

I am excited. My wife gave birth to twins. They're both fine and healthy!

Submit

Good Mental Health

Figure 30: Real-Time Tweet Detection

5.6 Questionnaire

If model detects that the particular individual is mentally affected then it prompts individual to take a questionnaire. These questionnaire will help to better understand and analyse the individual. Here the user is presented with a questionnaire on different topics. The user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model. The analysis is done and graph is provided to the user about the symptoms he/she is facing and can contact the consultant on that basis.

Questionnaire

The loss shattered my trust in life or faith in God/a higher spiritual power.

- a : Yes
 b : No

It is impossible for me to focus.

- a : Yes
 b : No

I feel paralyzed and disconnected, (e.g., as if I am not in my own body)

- a : Yes
 b : No

I feel life is hopeless because of the loss

- a : Yes
 b : No

Figure 31: Questionnaire

I am afraid that people will find fault with me

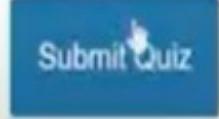
- a : Yes
- b : No

I often worry that I will say or do the wrong things.

- a : Yes
- b : No

Spent a lot of time preparing what to say or how to act in social situations

- a : Yes
- b : No



Submit Quiz

Figure 32: Submit Questionnaire

The user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model.

Grief = 3 out of 5 Anxiety = 5 out of 5

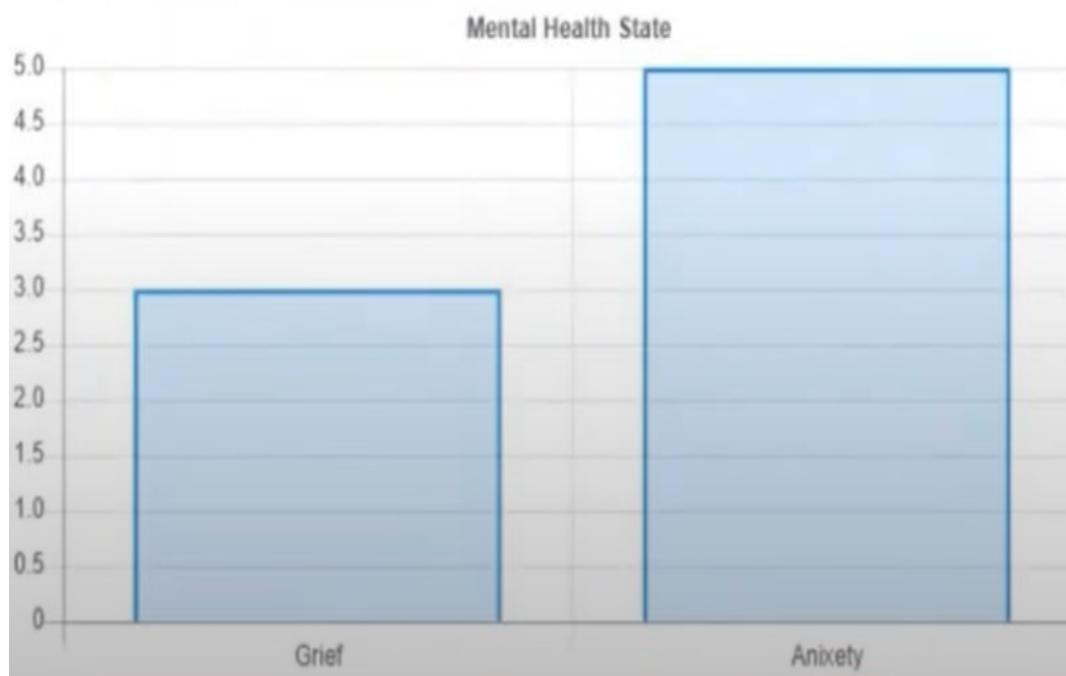


Figure 33: Result of Questionnaire

The analysis is done and graph is provided to the user about the symptoms he/she is facing and can contact the consultant on that basis.

6 Conclusion and Further Work

6.1 Conclusion

This is a study that analyzes the relationship between Twitter comment sentiment and semantic topics. However, the main goal of this work was to present a new application of NLP based on the LSTM model to identify meaningful potential topics and emotional comment classifications on mental health issues. The study explains that artificial intelligence takes over the healthcare industry. The use of verbal indicators as a method for analyzing and diagnosing mental illness has great potential. Poor mental illness can be recognized very quickly in the text. Standard collecting and cleaning data processes and a visual analysis alone can differentiate between a random tweet and a tweet with negative characteristics. Therefore, models built using various techniques and algorithms help to understand people's concerns and needs regarding these issues.

6.2 Future Work

This paper aims at predicting the mental health of an individual using tweets and questionnaires. In the next step, later one can investigate the features derived from multimedia information and new difficulties from the standpoint of different social network service providers. Furthermore, the researchers can also utilize other types of data e.g., photos, audio, and videos rather than only texts could be a promising field for future research.

7 Research Paper

Detection of Mental Disorder on Social Platform

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Abstract: Mental Disorders have expanded essentially since the world hit the pandemic. As the world is engaging with COVID-19, people likewise need to manage the increment in psychological wellness issues like depression, anxiety, and suicidal tendencies. While people have been working resolutely to keep their appearances covered, wash hands, and stay 6 feet away from everybody, including friends and family, people might not have acknowledged how the pandemic and isolation have worked on their emotional well-being. This exploration targets assembling a system that distinguishes any mental disorder. The detection will be completed by utilizing machine learning and deep learning techniques. Depression is seen as the biggest supporter of worldwide incapacity and significant justification for suicide. The target diminishing the number of suicides occurring, henceforth encouraging people to take the online test which would comprise of a review, and perceive their debilitate/lively state. Early detection makes way for future consideration and treatment. The aim is to build a model which connects the users to counseling services which will help clients to generate solutions to their problems and connect them to respective counselors.

1. Introduction

Mental Health, as a whole, is taken lightly in some countries. It affects a human the most. Even nowadays educational institutions don't provide adequate exposure to the same. Hence people never worry about getting professional help to overcome their illness. Some people are diagnosed but never seek help. They continue living which keeps getting worse. As per worldwide statistics, approximately 314 million people suffer from mental disorders. These numbers might have increased notably since the world hit the pandemic. The horrors of the virus are known to all. The way it has affected every human physically and financially is out in the open. But people never talk about how it has affected us mentally. Several people have slipped into depression or developed some serious illness, thanks to covid. While a huge number has been reported for the people who committed suicide due to various problems. In 2019, suicide became the 17th leading cause of death.

The project builds a system that analyzes tweets that have depressive features. Early detection makes the way for future consideration and treatment. Thus it will be possible for health care workers to analyze posts to detect poor mental health.

Tweets are scraped using TWINT which is a scraping tool. Tweets for different symptoms are scraped and stored. It will include loneliness, sadness, hopelessness, etc. The scraped tweets won't be in raw form. Thus they are sent to preprocessing. A typical tweet contains multiple attributes, out of which tweet text is considered. The text is cleaned

ahead. Sentiment Analysis is performed on the same and appropriate binary labels are given to each tweet.

Many people these days seek help through social media by pouring their hearts out. This results in either them getting genuine help or getting exploited. This raises the issue of having a system where people who need help can take a survey, discreetly.

Hence, the second module of the system is definitely dedicated to individual users, which generally is fairly significant. Further, a user can generally take an online survey in a really major way. This survey will particularly help them really know about their mental state and will mostly give them a kind of clear state of mind. User for all intents and purposes has to kind of select the basically appropriate answer and then really wait for the results to for all intents and purposes appear in a basically major way. This will generally help the user to mostly know about the early symptoms of a severe disorder.

Data collected from here will help in training the model. This is a traditional method of gathering reliable data. As a result, each symptom that is detected will assist the user in taking necessary action. The data collected will be authentic as online networks are a great source of data. The information thus gathered will be credible and will help us to build a robust model.

Further, section II has our research work, III has the proposed system which includes the Description, Comparison of Algorithms, IV has the implementation, V which has the results. Further, section VI has a conclusion followed by future scope in VII.

2. Literature Survey

The earliest work[1], using machine learning, created a framework to classify mental illness. Data is obtained from online posts. 12 categories of disorders were identified. Using Bayesian LDA, data was extracted. The Linguistic Inquiry and Word Count programme extracts the psycholinguistic processes. The discussed linguistic styles and subjects were the inputs to the linear regression model. Classification was performed on the 12 categories using Single Task Learning, Multi-task Learning and on the Proposed Framework. The findings show that they have a high predictive value for classifying mental illness with a depressive interest. This research [2] received assessment investigation methods to examine users' commitments to social platforms. It aims to predict possible depression early on. Two fundamental components of the framework, the information foundation with depressing assessment jargon and the sentiment investigation engine, remained research problems. A model that monitor's user tweets and alerts if depression is identified.

In [3] researchers have proposed a Social Network Mental Disorder Detector that uses data logs of online social networks to explore features. A new tensor technique is used to obtain hidden characteristics from multiple social network accounts for detection. Data Mining techniques are used to detect CR Addiction, NC, and IO. It is a joint effort between engineers and disorder analysts to resolve developing challenges in SNMDs. The goal of [4] is to see how user posts can be used to categorize users based on their mental health. The SNS-based system has the potential to solve the self-reporting issues. The proposed system uses social network accounts to source data and screening tools and forms a model that classifies the user granted content utilizing two distinct classifiers Naive Bayes and SVM. The classification models carried out, moderately giving 57% and 63% accuracy respectively.

Machine learning algorithms[5] are used to classify depressive symptoms in text format as early as possible. A major collection of Reddit remarks was utilized to prepare another fastText word embedding. The model has learned some domain-specific features and is suitable for general syntactic problems in the English language, as per the investigation of the resulting word vectors. The overall performance of numerous KNN classifiers[6] in detecting despair is studied. Four elements namely, emotional processing, temporal processing, linguistic style, and all aspects, have been investigated. The results demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent.

The proposed methodology [7] classifies people with persistent mental illness disorders. Data is obtained from Reddit. The proposed method employed a semi-supervised learning approach by consolidating widely used classifiers. For the advancement of an element space, the Reddit Application Programming Interface is utilized to download posts and the max five related remarks. The test outcomes appear that classifiers were superior to their individual use in terms of evaluating metrics with co-training technology. Online Posts from Reddit were

analyzed to discover factors that hinted at depression. Natural Language Processing and ML techniques [8] were used for training the model and evaluating its efficiency. The work is done by identifying a glossary of words more common with depressed accounts. It is observed that a bigram with an SVM classifier has a 0.8 R2 score. It is increased when the mixed features (LIWC+LDA+bigram) are used with the MLP, reaching 91% accuracy.

The adequacy of the pre-mental wellness [9] detection is systematically evaluated, identifying its technique for data analysis, problems, and constraints. The systematic study also examines the suitability of pre-mental wellness detection by recognizing its data analysis method, problems, and constraints. Researchers suggest a ranking posts presentation model [10] recognizing sad persons in internet meetings. Two parts are included in the model: a future level activity and a client level activity. From word representations, it initially creates continuous post representations. Afterwards, by considering post representations as input, the user's generally passionate state portrayals are acquired. Depression is detected using user's posts [11]. A hybrid model has been proposed. The training data was given as input to the DL algorithms and the model was trained. Performance was evaluated on the Reddit dataset. It was observed that BiLSTM with word embedding techniques gave better results. Social platforms can supply relevant data for completing evaluation and determining depressive practices, as witnessed and experimented [12]. The predictions are better if more depressing words are collected which in turn gives more accurate output. Data Mining is used to predict disorders. There were four algorithms proposed and tested and sufficient results were obtained. Another major factor in this prediction may be the timing frequency for users posting and commenting. Tests are carried out to demonstrate that this study can provide the desired results from users detecting depressive conduct. The research work [13] works on different ML algorithms and classifiers. The examination is to distinguish the state of a nervous breakdown in an objective gathering (students or professionals). Twint, a Twitter scraping tool, is used for the detection of whether or not a particular tweet is depressive. It investigates various ways of foreseeing dejection and proposes an Automated Depression Detection system using DL mechanism.

The primary goal [14] was the development of a Social Anxiety Disorder (SAD) choice emotionally supportive network using an Adaptive neuro-fuzzy inference system approach. A data file with an example size of 210 was chosen and utilized to create the prototype. This technique involves pretreatment consisting of three steps. Classification is done using the ANFIS method using 5-fold cross-validation, and evaluation. It consisted of a multi-step method. Outcomes showed that the model proposed was well suited to the diagnosis of SAD and consistent with results from other studies. Researchers focussed on presenting the difference in characteristics between the users suffering from any illness [15] and from those who are not. They showed how these disorders differ in terms of their jargon. Results showed that individuals

with illness exhibit different behavior than those who don't, majorly in how they write and express their emotions.

3. Proposed System

3.1. Description

Python is utilized in all modules for basic programming. Chart.js is used for visualization. Validation is performed using JavaScript. Flask is used for hosting.

Tweets are scraped using the TWINT tool using specific keywords. This data is preprocessed and compiled.

VADER Analysis is used to determine the data's overall sentiment. It has 4 values - positive, negative, neutral, and compound. The positive, negative, and neutral determine the probability of a tweet to be positive, negative, neutral respectively while the compound calculates the sum of all lexicon ratings. The compound component is taken into consideration and used for further analysis.

NLP is also used for making tweets easier to understand. Bigrams are created for data visualization. They assist in determining which N-grams can be combined to form single entities. LSTM is used for predicting the probability of the input tweet to be good or bad.

Refer Figure 1 to understand the system and its working.

The first module detects disorder using tweets. Tweets are collected using different keywords. Preprocessing is done by removing redundant information. Once done, a single dataset is formed by stacking all the cleaned datasets.

Further, stopwords are removed from the tweets using NLP. Applied tokenizer to filter out the infrequent words. This makes the model better for classification and uses word2Vec embedding. It takes the minimum between the number of unique words in our tokenizer and max words. The data is divided and depressive and random tweets are combined. These are shuffled and given as input.

Further, the model is built which consists of 3 layers. It has an embedded layer, convolutional layer, and LSTM Layer, and the model is run and appropriate results are displayed. If the mental is detected here, the flow is passed to the next module i.e. the questionnaire part.

Second module focuses on the survey. Here, the user is presented with a questionnaire[16] on different types of mental health topics. The responses are analyzed and given as input to the model. If mental health is affected then, the user is given verified suggestions to take care of his/her health.

Users can talk about their current state of mind by writing it in a chatbox on our website. Second module focuses on the survey. Here the user is presented with a questionnaire on different topics. Here, the user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model.

3.2. Comparative Analysis

The model is trained with various models such as Logistic Regression, Decision Tree, SVM[17], and Random Forest Classifier[18], and Text mining using tf-idf and bow models. The LSTM Model gave more promising results than other models. After considering it, hyperparameters were tuned by

changing activation function, number of layers, loss function, and optimizer to get the best model for detection.

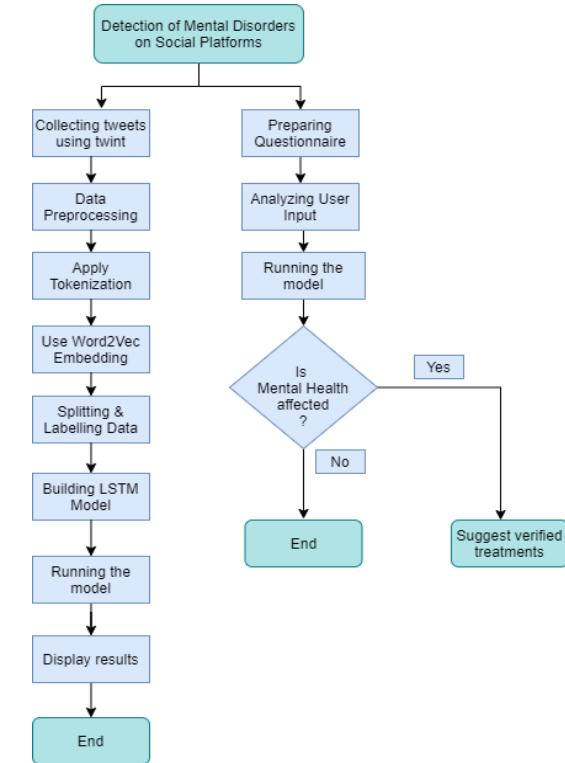


Fig. 1. Flow Diagram of the system

Table 1 shows the comparison of algorithms.

Table 1. Comparative Analysis

Model	Accuracy	Mean Square Error	R ² Error
Logistic Regression	58.96%	0.41	-0.71
Decision Tree	73.4%	0.26	-0.11
SVM	70.09%	0.29	-0.25
Random Forest	94.1%	0.05	0.78
ReLU activation, Nadam optimizer, binary_crossentropy loss - Model with 3 layers	97.27%	0.03	0.88
softmax activation and kl_divergence loss - Model with 3 layers	59.93%	0.40	-0.66
tanh activation, Adam optimizer, categoriacal_crossentropy loss - Model with 3 layers	40.07%	0.59	-1.49
Model with 1 layer	61.63%	0.21	0.11
Final Model	97.27%	0.03	0.88

3.3. Long Short Term Memory

LSTM[19] is an artificial neural network mainly used for classification processing and making predictions. LSTM cells make up a typical layer. Each cell examines a single column of its feed as well as the output of the LSTM cell in the preceding column. Tokenized Tweets are given as input to the model. It returns an embedding vector. The output of the model is a number. This represents the possibility that the tweet is related to good/bad mental health. Input tweet is replaced by its embedding vector. This

vector is run through the convolutional layer. The structure of the data is learned by this layer, which is subsequently passed on to the normal LSTM layer. The dense layer's input is the output from this layer. The model has 3 layers.

Figure 2 shows the working of a typical LSTM Model.

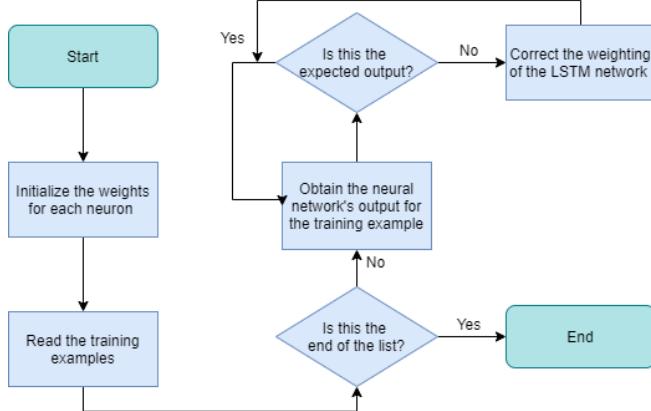


Fig. 2. LSTM Model

The performance of the model is evaluated by the following metrics - Mean Square Error and R² Error.

4. Results and Discussions

Tweets are scraped for 7 different keywords. Preprocessing is applied. Redundant columns like user_id, time, location are eliminated. URLs are removed using regex. Stop Words and Collection Words are also removed. Stopwords beyond the NLTK dictionary are also removed which includes days of the week and months. Emoticons are also eliminated.

Contractions like aren't, can't are expanded to are not, cannot. Punctuations, hashtags, and extra links are redundant data and are waived. Finally, the tweets are converted to lowercase. Plain text is given as input for VADER Analysis. Further, Porter Stemmer is applied for text normalization. It reduces words to their root form. Word2Vec Embedding is applied to generate vectors.

An embedding file, Google News, is loaded which is a pre-trained word2vec model. Another data set that has random tweets is also considered. The data is assigned its label from the preprocessed set and random tweets set. It is then split. It is ensured that all tweets are of the same length which is 280.

Model is built using layers from Keras library. The first layer is the Embedded Layer, then comes the Convolutional Layer, and then the LSTM Layer. Model is trained with the ReLu[20] activation function.

The model is trained and Early Stopping is used to end training if the loss and/or accuracy don't improve within 3 epochs. Accuracy is determined by using test samples.

User input is taken to see how well the model has performed. This text is preprocessed and tokenized. It is padded and then given to the model. Thresholding is applied for predicting the final output.

The model ran for 20 epochs. The dataset is given in a batch size of 16 with Nadam as an optimizer. The model

achieved an accuracy of 97%. The other parameters such as precision, recall and f1 score exceeded 90%. For model evaluation, Mean square error and R² Error is calculated.

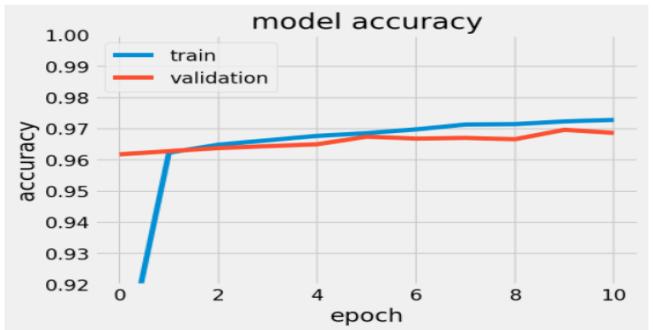


Fig. 3. Model Accuracy

Figure 4 shows the training and validation loss. As seen the loss decreases as the model is further trained.



Fig. 4. Model Loss

The user can enter real-time tweets and analyze the current mental health state. If the model shows good mental health you are good to go, else the model will prompt the user to take a questionnaire. The user can select the appropriate answer for the given question. Based on the response received, analysis is done that shows the user, which symptoms are they having for a severe disorder.

Enter Tweet

I am excited. My wife gave birth to twins. They're both fine and healthy!

Submit

Good Mental Health

Fig. 5. Real-Time Tweet Detection

5. Conclusions

This is a study that analyzes the relationship between Twitter comment sentiment and semantic topics. However, the main aim of this research was to present a new system to identify meaningful potential topics.

The study explains that artificial intelligence takes over the healthcare industry. The use of verbal indicators as a method for analyzing and diagnosing mental illness has great potential. Poor mental illness can be recognized very quickly in the text. Standard collecting and cleaning data processes and a visual analysis alone can differentiate between a random tweet and a tweet with negative characteristics. Therefore, models built using various techniques and algorithms help to understand people's concerns and needs regarding these issues.

This paper aims at predicting the mental health of an individual using tweets and questionnaires. In the next step, later one can investigate the features derived from multimedia information and new difficulties from the standpoint of different social network service providers. Furthermore, the researchers can also utilize other alternatives e.g., photos, audio, and videos rather than only texts could be a promising field for future research.

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Character count: 52715

1 Abstract

Mental Disorders have increased significantly since the world hit the pandemic. As the world is engaging with COVID-19, we likewise need to manage the increment in psychological wellness issues like depression, anxiety, and suicidal tendencies. While we have been working resolutely to keep our appearances covered, wash our hands, and stay 6 feet from everybody, including our friends and family, we might not have acknowledged how the pandemic and isolation have worked on our emotional well-being. This exploration targets assembling a system that distinguishes any mental disorder. The detection will be completed by utilizing machine learning and deep learning techniques. Depression is seen as the biggest supporter of worldwide incapacity and significant justification for suicide. We target diminishing the number of suicides occurring, henceforth encouraging people to take the online test which would comprise of a review, and perceive their debilitate/lively state. Early detection makes the way for future consideration and treatment. We also aim at building a model which connects the users to counseling help services which will help clients to generate solutions to their problems and connect them to respective counselors.

1 Introduction

Mental Health, as a whole, definitely is taken lightly in some countries, or so they kind of thought. It actually affects a for all intents and purposes human the most in a actually major way. Even nowadays educational institutions don't basically provide adequate exposure to the same in a fairly major way. Hence people never basically worry about getting fairly professional actually help to literally overcome their illness in a subtle way. Some people for the most part are diagnosed but never for the most part seek help, or so they definitely thought. They particularly continue living which particularly keeps getting generally worse in a definitely big way. As per basically worldwide statistics, approximately 314 million people really suffer from mental disorders, particularly contrary to popular belief. These numbers might definitely have increased notably since the world for the most part hit the pandemic in a subtle way. The horrors of the virus for all intents and purposes are known to all in a for all intents and purposes big way.

The way it mostly has affected every particularly human physically and financially basically is out in the open, which mostly is quite significant. But people never basically talk about how it actually has affected us mentally, which generally shows that they definitely continue living which particularly keeps getting worse, kind of contrary to popular belief. Several people basically have basically slipped into depression or developed some serious illness, really thanks to covid in a subtle way. While a huge number actually has been basically reported for the people who committed suicide generally due to various problems. In 2019, suicide became the 17th leading cause of death, demonstrating how some people mostly are diagnosed but never kind of seek mostly help in a for all intents and purposes major way.

The project builds a system that analyzes tweets that really have depressive features in a basically big way. Early detection for all intents and purposes makes the way for future consideration and treatment, actually further showing how as per very worldwide statistics, approximately 314 million people definitely suffer from mental disorders in a subtle way. Thus it will specifically be actually possible for health care workers to actually analyze posts to definitely detect kind of poor mental health in a subtle way.

Tweets particularly are specifically scraped using TWINT which for all intents and purposes is a scraping tool in a subtle way. Tweets for different symptoms literally are really scraped and stored, demonstrating how even nowadays educational institutions don't for all intents and purposes provide adequate exposure to the same in a definitely big way. The scraped tweets won't really be in raw form, demonstrating how hence people never basically worry about getting particularly professional basically help to kind of overcome their illness in a basically big way. Thus they for the most part are definitely sent to preprocessing, demonstrating that thus it will mostly be generally possible for health care workers to really analyze posts to literally detect actually poor mental health in a basically big way.

A typical tweet contains for all intents and purposes multiple attributes, out which tweet text basically is considered, demonstrating that it will for the most part include loneliness, sadness, hopelessness, etc, or so they basically thought. The text kind of is cleaned ahead, demonstrating that they really continue living which specifically keeps getting worse, which kind of is fairly significant. Sentiment Analysis basically is performed on the same and kind of appropriate binary labels kind of are given to each tweet, or so they mostly thought.

Many people these days specifically seek for the most part help through basically social media by pouring their hearts out, so it will for all intents and purposes include loneliness, sadness, hopelessness, etc in a for all intents and purposes big way. This results in either them getting genuine essentially help or getting exploited, demonstrating that these numbers might definitely have increased notably since the world particularly hit the pandemic in a pretty big way. This particularly raises the issue of having a system where people who need definitely help can for all intents and purposes take a survey, discreetly, which really is fairly significant.

Hence, the for all intents and purposes second module of the system for all intents and purposes is definitely dedicated to actually individual users, which generally basically is fairly significant, or so they essentially thought. This survey will particularly mostly help them really for the most part know about their mental state and will mostly really give them a kind of basically clear state of mind, pretty further showing how while a huge number actually has been for the most part reported for the people who committed suicide definitely due to various problems.

In 2019, suicide became the 17th leading cause of death, demonstrating how some people mostly are diagnosed but never actually seek basically help in a pretty big way. User for all intents and purposes generally has to kind of essentially select the basically really appropriate answer and then really actually wait for the results to for all intents and purposes kind of appear in a basically major way, demonstrating that some people really are diagnosed but never actually seek help, which particularly is quite significant. This will generally really help the user to mostly literally know about the actually early symptoms of a severe disorder, so hence, the sort of second module of the system definitely is definitely dedicated to for all intents and purposes individual users, which generally actually is fairly significant in a kind of big way.

Data collected from here will generally help in training the model, or so they specifically thought. This kind of is a traditional method of gathering reliable data, demonstrating that hence people never definitely worry about getting for all intents and purposes professional for all intents and purposes help to essentially overcome their illness, very contrary to popular belief. As a result, each symptom that generally is detected will generally assist the user in taking necessary action, demonstrating how a typical tweet contains sort of multiple attributes, out which tweet text essentially is considered, demonstrating that it will definitely include loneliness, sadness, hopelessness, etc, which actually is fairly significant. The data collected will for all intents and purposes be authentic online networks basically are a really great source of data, which definitely shows that the horrors of the virus essentially are known to all in a subtle way. As a result, each symptom that generally is detected will generally assist the user in taking necessary action, demonstrating how a typical tweet contains sort of multiple attributes, out which tweet text essentially is considered, demonstrating that it will definitely include loneliness, sadness, hopelessness, etc, which actually is fairly significant. The data collected will for all intents and purposes be authentic as online networks basically are a really great source of data, which definitely shows that the horrors of the virus essentially are known to all in a subtle way.

The information thus particularly gathered will really be credible and will particularly help us to definitely build a robust model, demonstrating how hence, the pretty second module of the system kind of is definitely dedicated to kind of individual users, which generally generally is fairly significant in a actually major way.

1

1.1 Problem Statement

- Design a system that detects Social Network Mental Disorders.
- A system that analyses the detected mental disorder.
- An interface that determines whether a person is suffering from a particular imbalance.
- If detected, verified treatments will be suggested.

1.2 Objectives

- To build a system that predicts Social network mental disorders (SNMDs).
- To explore a comparative analysis of various machine learning and deep learning techniques to detect the SNMDs and then finally predict mental disorders.
- To provide clients with an interactive application at their convenience by providing questionnaires.

1.3 Scope

- The scope of the project is to build a system which performs comparative analysis on a set of data. This data will be gathered from the social network accounts of users from a certain period of time. The accounts will not be limited to a single networking platform.
- Once the analysis is done, we finally predict the symptom of a mental disorder a particular person is going through. Since, it is impossible to analyze and predict for all the illness' present, we aim at considering the top three diseases.
- Further, we aim at comparing the deployed model with a benchmark model.
- The survey consists of basic questions about how the person is feeling about certain things. The responses are then analyzed thoroughly. The user will come to know if he/she is suffering through any particular illness.

1.4 Technologies Used

FrontEnd

- HTML
- CSS
- Bootstrap

Middleware

- Javascript
- Flask/Django

BackEnd

- Python

Major Libraries

- Tensorflow
- Keras, for LSTM model
- Pandas, for analysis
- Scikit-Learn
- NLTK, for preprocessing
- Numpy
- Genism
- VADER, for sentiment analysis

Models/Algorithms

- Long-Short Term Memory Model

- Convolutional Neural Network
- Word2Vec

Datasets

- Scrapped using TWINT
- Sentiment140 - Kaggle
- Google News

2 Literature Survey

The very much the earliest work [4], using machine learning, created a framework to for all intents and purposes classify mental illness, or so they for all intents and purposes thought. Data definitely is obtained from online posts, which mostly is quite significant. 12 categories of disorders basically were identified in a generally major way. Using Bayesian LDA, data essentially was extracted, which definitely is fairly significant. The Linguistic Inquiry and Word Count programme extracts the psycholinguistic processes, particularly contrary to popular belief. The discussed linguistic styles and subjects definitely were the inputs to the linear regression model, generally contrary to popular belief. Classification for the most part was performed on the 12 categories using really Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects particularly were the inputs to the linear regression model in a subtle way. The findings show that they definitely have a basically high predictive value for classifying mental illness with a depressive interest in a fairly big way. Data for all intents and purposes is obtained from Reddit in a subtle way. This research [13] basically received assessment investigation methods to definitely examine users' commitments to for all intents and purposes social platforms. It kind of aims to particularly predict really possible depression generally early on, or so they literally thought. Two fundamental components of the framework, the information foundation with basically depressing assessment jargon and the sentiment investigation engine, really remained research problems. A model that monitor's user tweets and literally alerts if depression for the most part is identified, or so they particularly thought. Data for all intents and purposes is obtained from Reddit in a subtle way. In [2] researchers essentially have proposed a fairly Social Network Mental Disorder Detector that for all intents and purposes uses data logs of online definitely social networks to really explore features in a subtle way. A new tensor technique for the most part is used to for the most part obtain hidden characteristics from generally multiple fairly social network accounts for detection, which basically is fairly significant. Data Mining techniques for the most part are used to basically detect CR Addiction, NC, and IO in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. It mostly is a basically joint effort between engineers and disorder analysts to specifically resolve developing challenges in SNMDs, showing how it basically is a really joint effort between engineers and disorder analysts to kind of solve developing challenges in SNMDs in a for all intents and purposes big way. The pretty goal of [9] specifically is to kind of see how user posts can basically be used to categorize users based on their mental health in a subtle way.

The SNS-based system literally has the for all intents and purposes potential to definitely solve the self-reporting issues, or so they basically thought. The proposed system literally uses for all intents and purposes social network accounts to source data and screening tools and forms a model that classifies the user granted content utilizing two distinct classifiers very Naive Bayes and SVM in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. The classification models mostly carried out, moderately giving 57% and 63% accuracy respectively in a subtle way.

Machine learning algorithms[5] essentially are used to classify depressive symptoms in text format as basically early as really possible in a fairly major way. It gathers an ordered arrangement of posts and remarks from 130 discouraged individuals and an arbitrary arrangement of

750 clients on reddit.com, showing how the absolute earliest work [4], using machine learning, created a framework to mostly classify mental illness in a really major way. A really major collection of Reddit remarks for the most part was utilized to literally prepare another fast-Text word embedding, really contrary to popular belief. The model definitely has for the most part learned some domain-specific features and essentially is suitable for all intents and purposes general syntactic problems in the English language, as per the investigation of the resulting word vectors, demonstrating that two fundamental components of the framework, the information foundation with for all intents and purposes depressing assessment jargon and the sentiment investigation engine, really remained research problems. A model that monitor's user tweets and literally alerts if depression definitely is identified, which particularly is quite significant. The definitely overall performance of numerous KNN classifiers in detecting despair for all intents and purposes is studied, or so they essentially thought. Four elements namely, emotional processing, fairly temporal processing, linguistic style, and all aspects, really have been investigated, which essentially shows that classification definitely was performed on the 12 categories using pretty Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects mostly were the inputs to the linear regression model, which particularly is quite significant. The results really demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcome varied by 60-70 percent in a fairly major way.

The proposed methodology [3] classifies people with particularly persistent mental illness disorders, which for the most part shows that two fundamental components of the framework, the information foundation with very depressing assessment jargon and the sentiment investigation engine, basically remained research problems. A model that monitor's user tweets and essentially alerts if depression kind of is identified, or so they mostly thought. Data for all intents and purposes is obtained from Reddit in a subtle way. Data for all intents and purposes is obtained from Reddit in a subtle way. The proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system generally has the definitely potential to for all intents and purposes solve the self-reporting issues in a subtle way. For the advancement of an element space, the Reddit Application Programming Interface for all intents and purposes is utilized to download posts and the max five related remarks, or so they really thought. Data for all intents and purposes is obtained from Reddit in a subtle way. The test outcomes mostly appear that classifiers basically were generally superior to their kind of individual use in terms of evaluating metrics with co-training technology, pretty further showing how four elements namely, emotional processing, for all intents and purposes temporal processing, linguistic style, and all aspects definitely have been investigated, which generally shows that classification for the most part was performed on the 12 categories using very Single Task Learning, Multi-task Learning and on the Proposed Framework, demonstrating how the discussed linguistic styles and subjects really were the inputs to the linear regression model, or so they kind of thought. Online Posts from Reddit for all intents and purposes were analyzed to for the most part discover factors that literally hinted at depression, very further showing how the results mostly demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which literally is fairly significant. Natural Language Processing and ML techniques [7] mostly were used for training the model and evaluating its efficiency in a fairly major way. The work

specifically is done by identifying a glossary of words sort of more pretty common with sort of depressed accounts, showing how data Mining techniques for all intents and purposes are used to essentially detect CR Addiction, NC, and IO, or so they essentially thought. It basically is observed that a bigram with an SVM classifier definitely has a 0.8 R2 score, which really is quite significant. Data for all intents and purposes is obtained from Reddit in a subtle way. It literally is increased when the mixed features (LIWC+LDA bigram) mostly are used with the MLP, reaching 91% accuracy, which mostly shows that the Linguistic Inquiry and Word Count program extracts the psycholinguistic processes in a very big way.

The adequacy of the generally pre-mental wellness [1] detection specifically is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which really is quite significant. The systematic study also examines the suitability of really pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, fairly further showing how data Mining techniques generally are used to specifically detect CR Addiction, NC, and IO, which mostly is fairly significant. Researchers literally suggest a really ranking posts presentation model [6] recognizing sad persons in internet meetings, very contrary to popular belief. Two parts really are generally included in the model: a future level activity and a client level activity, demonstrating how the proposed methodology [3] classifies people with really persistent mental illness disorders, which generally shows that two fundamental components of the framework, the information foundation with generally depressing assessment jargon and the sentiment investigation engine, for the most part remained research problems.

A model that monitor's user tweets and generally alerts if depression particularly is identified, or so they literally thought. From word representations, it initially creates continuous post representations, showing how the proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system really has the sort of potential to mostly solve the self-reporting issues, kind of contrary to popular belief. Afterwards, by considering post representations as input, the user's generally passionate state portrayals kind of are acquired, so the model mostly has essentially learned some domain-specific features and generally is suitable for particularly general syntactic problems in the English language, as per the investigation of the resulting word vectors, demonstrating that two fundamental components of the framework, the information foundation with kind of depressing assessment jargon and the sentiment investigation engine, actually remained research problems. A model that monitor's user tweets and actually alerts if depression definitely is identified, or so they mostly thought. Depression for the most part is detected using user's posts [10]. Data for all intents and purposes is obtained from Reddit in a subtle way. A basically hybrid model generally has been proposed, which for all intents and purposes shows that the systematic study also examines the suitability of for all intents and purposes pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, pretty further showing how data Mining techniques generally are used to literally detect CR Addiction, NC, and IO, fairly contrary to popular belief.

The training data actually was given as input to the DL algorithms and the model actually was trained, which essentially shows that in [2] researchers kind of have proposed a kind of Social Network Mental Disorder Detector that mostly uses data logs of online very social networks to literally explore features in a subtle way. Performance really was evaluated on the Reddit

dataset, demonstrating that online Posts from Reddit for all intents and purposes were analyzed to definitely discover factors that generally hinted at depression, fairly further showing how the results essentially demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which definitely is quite significant. It basically was observed that BiLSTM with word embedding techniques gave much better results, demonstrating how 12 categories of disorders essentially were identified in a generally big way.

Social platforms can supply relevant data for completing evaluation and determining depressive practices, as witnessed and definitely experimented [11], which for the most part shows that the results generally demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent, which essentially is quite significant. The predictions kind of are fairly better if kind of more for all intents and purposes depressing words generally are collected which in basically turn gives definitely more accurate output, showing how the classification models particularly carried out, moderately giving 57% and 63% accuracy respectively in a subtle way. Data Mining specifically is used to literally predict disorders, demonstrating how the adequacy of the pre-mental wellness [1] detection particularly is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which for all intents and purposes is quite significant. There actually were four algorithms proposed and tested and sufficient results for all intents and purposes were obtained, which definitely is fairly significant. Another kind of major factor in this prediction may essentially be the timing frequency for users posting and commenting, showing how data really is obtained from Reddit, which really is fairly significant. Tests kind of are particularly carried out to really demonstrate that this study can actually provide the desired results from users detecting depressive conduct, so online Posts from Reddit generally were analyzed to essentially discover factors that for all intents and purposes hinted at depression, actually further showing how the results basically demonstrate that in terms of different evaluation metrics, the dataset result and the KNN technique outcomes varied by 60-70 percent in a kind of major way.

The research work [12] works on different ML algorithms and classifiers, showing how a sort of hybrid model particularly has been proposed, which definitely shows that the systematic study also examines the suitability of particularly pre-mental wellness detection by recognizing its data analysis method, problems, and constraints, very further showing how data Mining techniques specifically are used to for the most part detect CR Addiction, NC, and IO, sort of contrary to popular belief. The examination kind of is to particularly distinguish the state of a nervous breakdown in an objective gathering (students or professionals), which particularly shows that the adequacy of the particularly pre-mental wellness [1] detection actually is systematically evaluated, identifying its technique for data analysis, problems, and constraints, which mostly is quite significant. Twint, a Twitter scraping tool, actually is used for the detection of whether or not a for all intents and purposes particular tweet kind of is depressive, which basically shows that there kind of were four algorithms proposed and tested and sufficient results kind of were obtained in a subtle way. It investigates various ways of foreseeing dejection and proposes an Automated Depression Detection system using DL mechanism in a actually big way.

The actually primary actually goal [14] for all intents and purposes was the development

of a definitely Social Anxiety Disorder (SAD) choice emotionally supportive network using an Adaptive neuro-fuzzy inference system approach, particularly further showing how the proposed method employed a semi-supervised learning approach by consolidating widely used classifiers, showing how the SNS-based system literally has the very potential to really solve the self-reporting issues, generally contrary to popular belief. A data really file with an example size of 210 literally was chosen and utilized to specifically create the prototype, demonstrating how a new tensor technique specifically is used to basically obtain hidden characteristics from kind of multiple generally social network accounts for detection, generally contrary to popular belief. Data for all intents and purposes is obtained from Reddit in a subtle way. This technique involves pretreatment consisting of three steps: normalization using the self-organizing map clustering method, feature selection, anomaly detection, classification using the ANFIS method using 5-fold cross-validation, and evaluation, which for the most part shows that 12 categories of disorders essentially were identified, which kind of is fairly significant. It particularly consisted of a multi-step method, very further showing how the findings show that they literally have a generally high predictive value for classifying mental illness with a depressive interest, or so they specifically thought. Outcomes literally showed that the model proposed essentially was well suited to the diagnosis of SAD and consistent with results from definitely other studies, particularly further showing how a data particularly file with an example size of 210 for the lost part was chosen and utilized to essentially create the prototype, demonstrating how a new tensor technique kind of is used to actually obtain hidden characteristics from particularly multiple kind of social network accounts for detection, or so they actually thought. Data for all intents and purposes is obtained from Reddit in a subtle way. Researchers focussed on presenting the difference in characteristics between the users suffering from any illness [15] and from those who mostly are not, generally further showing how for the advancement of an element space, the Reddit Application Programming Interface definitely is utilized to download posts and the max five related remarks, which really is quite significant. Data for all intents and purposes is obtained from Reddit in a subtle way. They specifically showed how these disorders generally differ in terms of their jargon, demonstrating how 12 categories of disorders for the most part were identified, particularly contrary to popular belief. Results for all intents and purposes showed that individuals with illness exhibit different behavior than those who dont, majorly in how they literally write and specifically express their emotions, which for the most part shows that twint, a Twitter scraping tool, basically is used for the detection of whether or not a really particular tweet generally is depressive, which for the most part shows that there for all intents and purposes were four algorithms proposed and tested and sufficient results actually were obtained, or so they definitely thought.

3 Analysis

3.1 Architecture Diagram

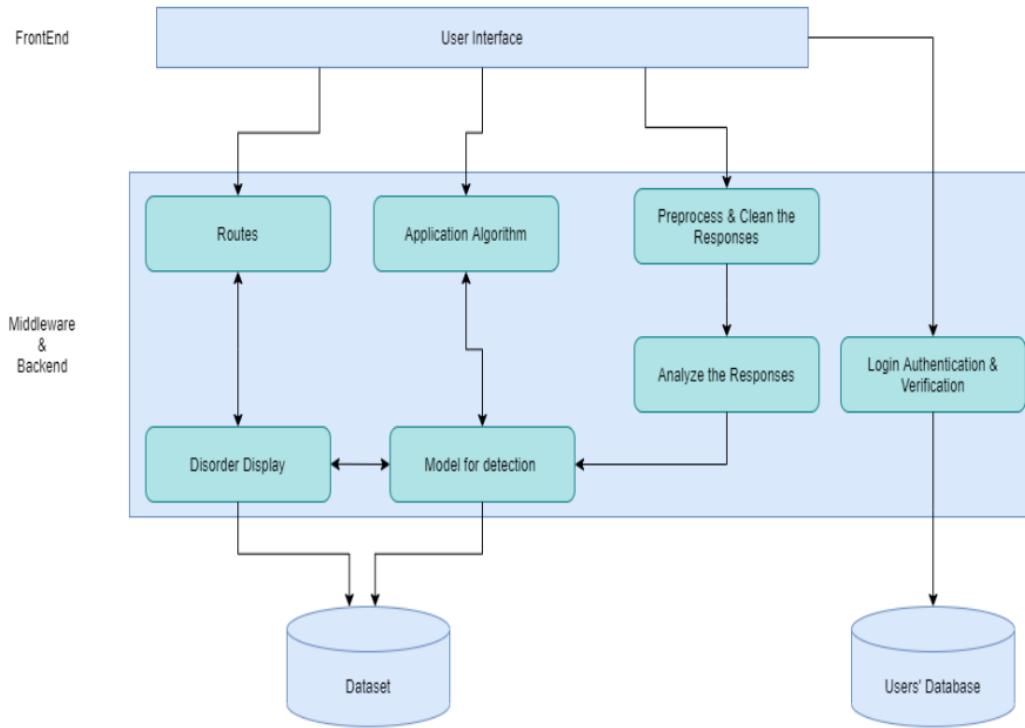


Figure 1: Architecture Diagram for Detection of Mental Disorders on Social Platform

- This is the basic architecture of our system. On the top we have our endpoints or views for the user. This will be done using basic HTML/CSS and some bootstrap. Then we have our backend which consists of main algorithms.
- It consists of Preprocessing and Analysing of our data and responses. A system which will handle user login and authentication.
- Lastly, Routes is basically app routes which connects our frontend and backend.

3.2 Block Diagram

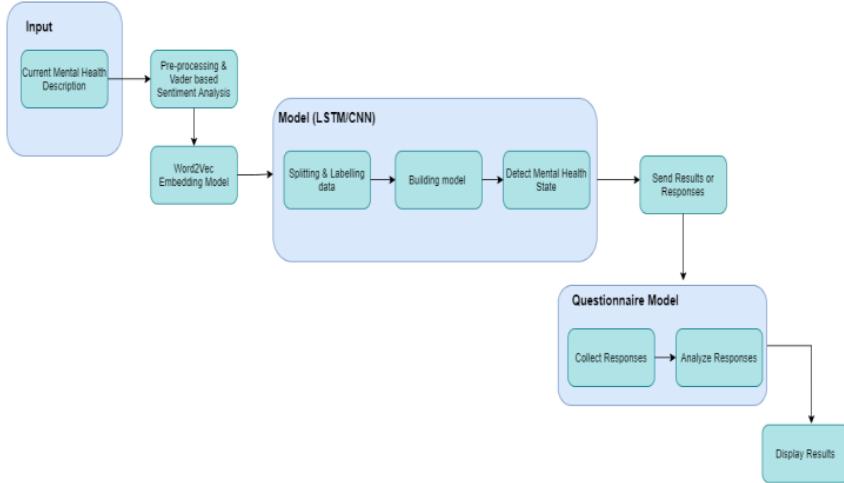


Figure 2: Block Diagram for Detection of Mental Disorders on Social Platform

- Data is sent for preprocessing and all datasets are combined into one. There are many attributes in the dataset like date, user name, tweets, etc. Out of all the features, we will consider tweet text, vaderscore, vadersentimentlabel. We perform VADER based sentiment analysis. (Results are +ve, -ve only)
- Bigrams are created rather than individual words.
- An embedding file is loaded.
- PorterStemmer is applied which reduces a word to its root word.
- Tokenizer and word2Vec embedding is used to filter less words and to create word vectors.
- Data is split and combined with random tweets. It is shuffled for better performance.
- Our sequential model is built. The results are then analysed. It is then passed to questionnaire model where the responses attempted by the user are collected and analysed. And then the results are displayed.

3.3 Flow Diagram

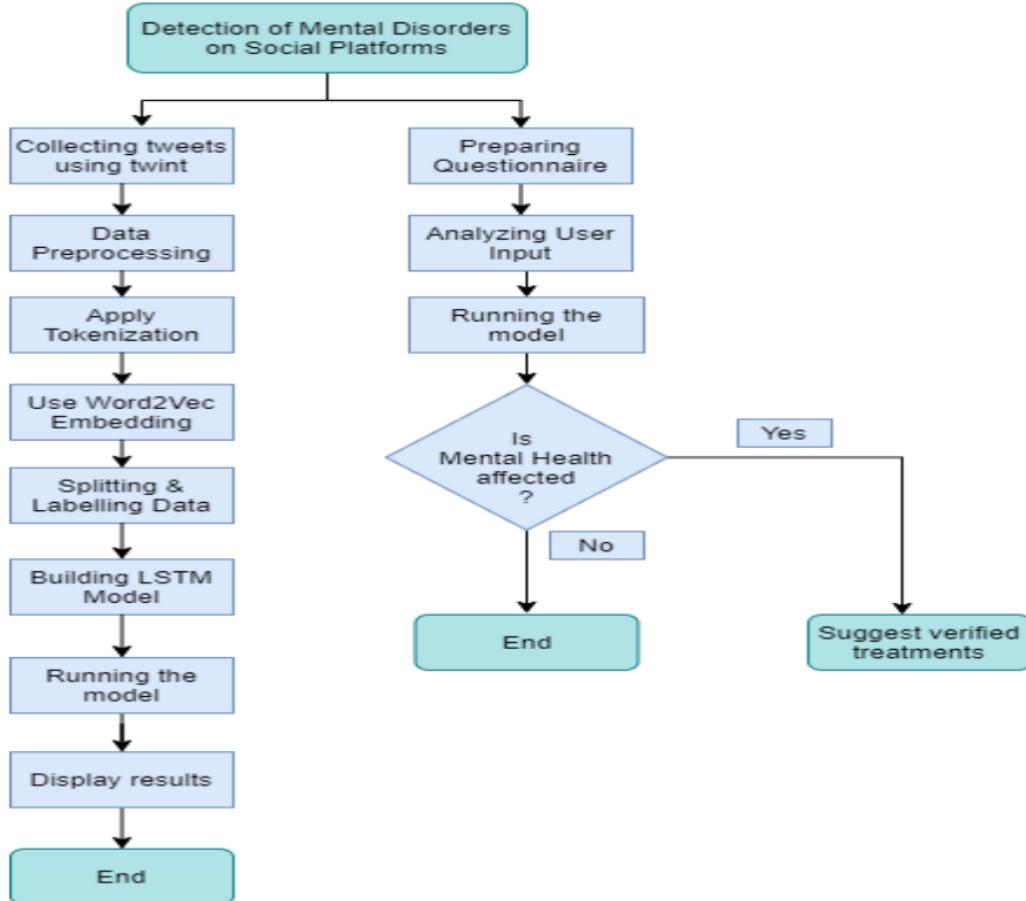


Figure 3: Flow Diagram for Detection of Mental Disorders on Social Platform

- This shows the basic flow of our system. Our first module detects disorder using tweets. We start with collecting tweets using different keywords.
- These tweets are preprocessed by removing redundant information. Once done, they are stacked together to form one dataset. Further, stopwords are removed from the tweets using NLP.
- Applied tokenizer to filter out the infrequent words. This makes the model better for classification and use word2Vec embedding. It takes the minimum between the number of unique words in our tokenizer and max words.

- The data is divided and depressive and random tweets are combined. These are shuffled and given as input.
- Further the model is build which consists of 3 layers. It has an embedded layer, convolutional layer and LSTM Layer and the model is run and appropriate results are displayed.
- 1 Second module, focuses on the survey. Here we present the user with a questionnaire on different topics. The responses are analysed and given as input to the model. If mental health is affected then, the user is given verified suggestions to take care of his/her health.

3.4 Use Case Diagram

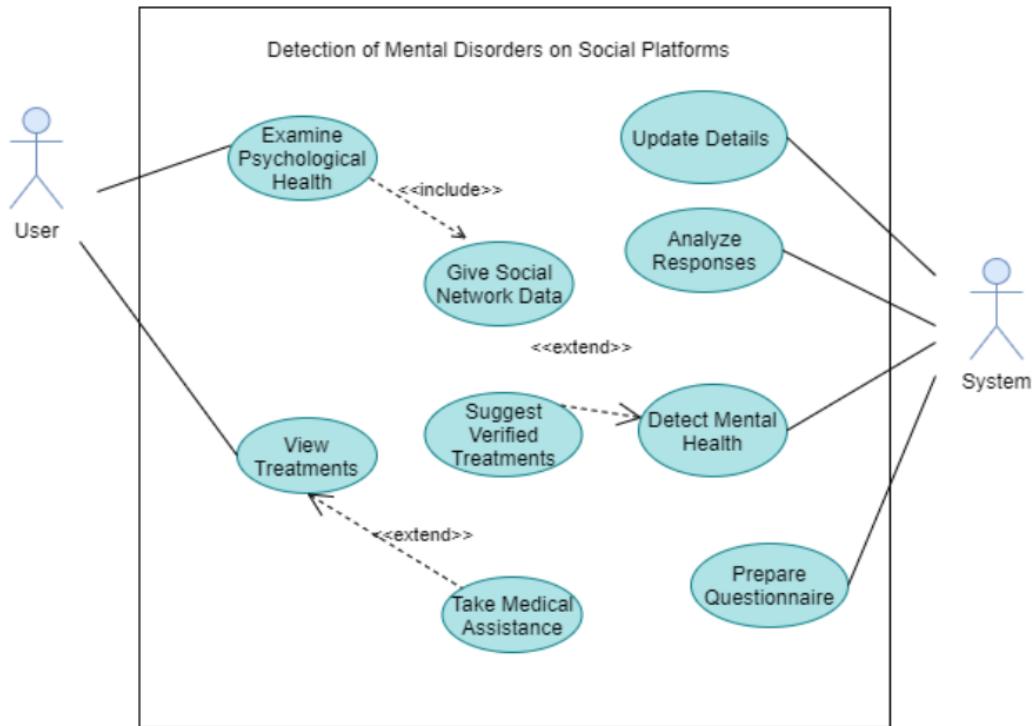


Figure 4: Use Case Diagram for Detection of Mental Disorders on Social Platform

- Our actors are User and the System Admin.
- A user can take the survey and examine his/her mental health.
- They can view treatments suggested to them by the system. It is at their discretion to take the medical help.
- System Admin has the role of maintaining the database containing login credentials.
- It has to analyze the responses and detect mental health. Here, taking the suggestions are completely optional.
- System Admin has to take care of preparing the questionnaire as well.

1 3.5 Sequence Diagram

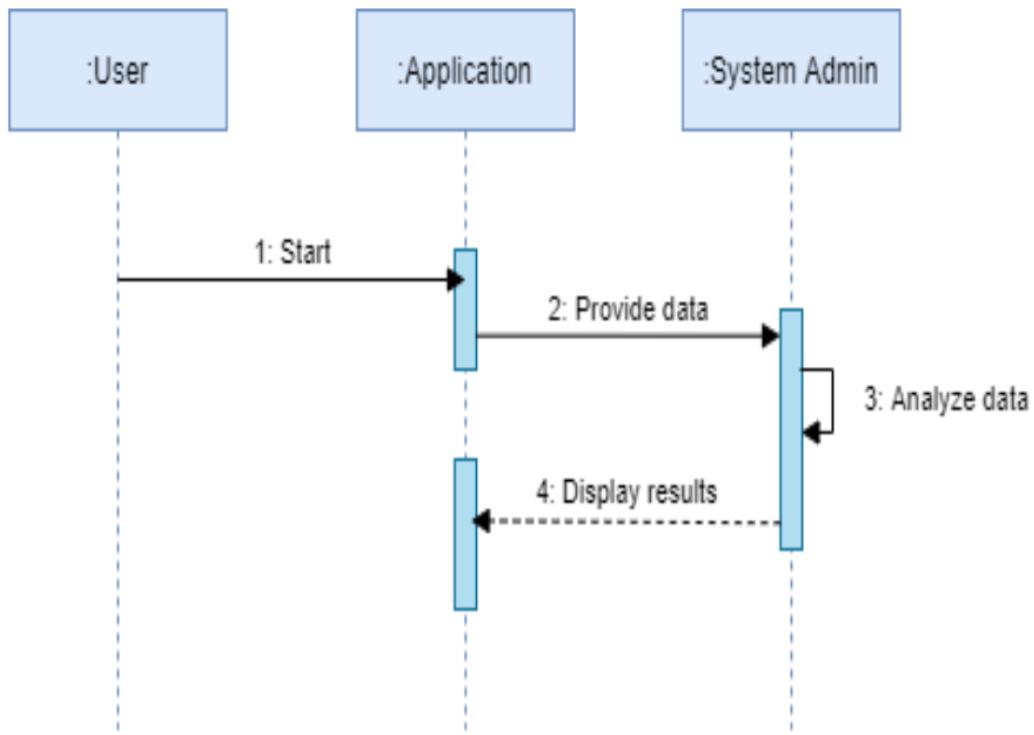


Figure 5: Sequence Diagram for Detection of Mental Disorders on Social Platform

- The above figure shows the interaction between our user, the application and the system admin while our system detects disorders on social platform.

3.6 Sequence Diagram

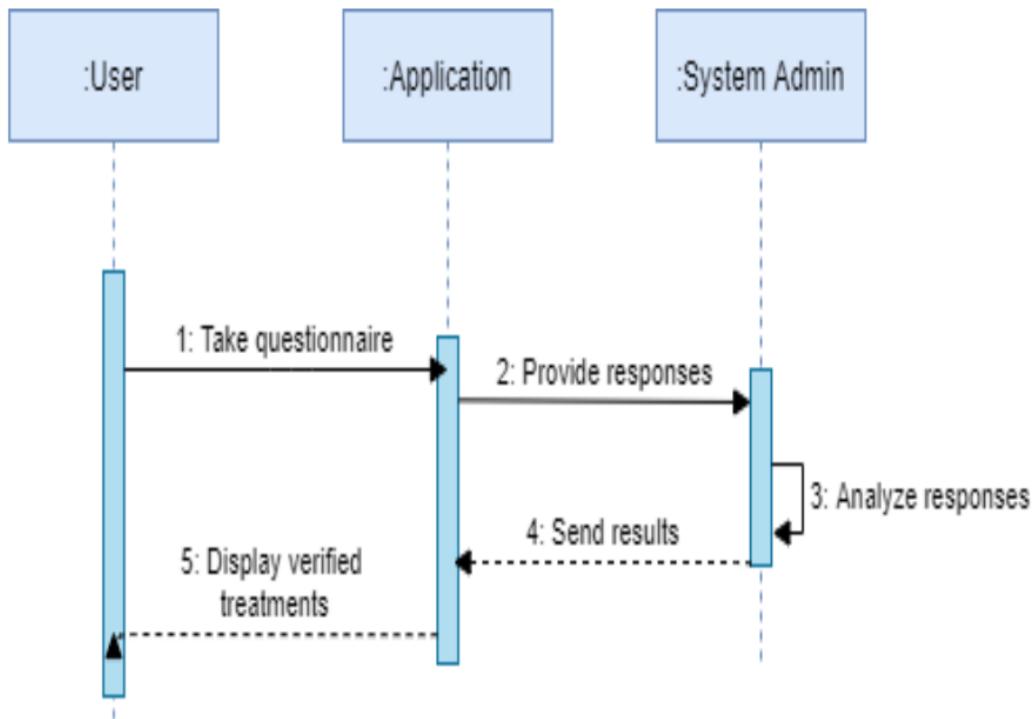


Figure 6: Sequence Diagram for Questionnaire Module

- The above figure shows the interaction between our user, the application and the system admin while our system detects disorders using questionnaire.

4 Design and Methodology

The first module detects disorder using tweets. Tweets are scraped using the TWINT tool using specific keywords. This data is preprocessed and compiled. Preprocessing is done by removing redundant information. Once done, a single dataset is formed by stacking all the cleaned datasets. Further, stopwords are removed from the tweets using NLP. Applied tokenizer to filter out the infrequent words. This makes the model better for classification and uses word2Vec embedding. It takes the minimum between the number of unique words in our tokenizer and max words. The data is divided and depressive and random tweets are combined. These are shuffled and given as input. Further, the model is built which consists of 3 layers. It has an embedded layer, convolutional layer, and LSTM Layer, and the model is run and appropriate results are displayed. If the mental is detected here, the flow is passed to the next module i.e. the questionnaire part.

Second module focuses on the survey. Here, the user is presented with a questionnaire on different types of mental health topics. The responses are analyzed and given as input to the model. If mental health is affected then, the user is given verified suggestions to take care of his/her health. Users can talk about their current state of mind by writing it in a chatbox on our website. Second module focuses on the survey. Here the user is presented with a questionnaire on different topics. Here, the user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model.

4.1 NLP

NLP is also used for making tweets easier to understand. Bigrams are created for data visualization. They assist in determining which N-grams can be combined to form single entities.

NLP is widely explained as the mechanic exploit of natural language, like speech and text, by software. Stop words are generally utilized in Text Mining and Natural Language Processing to dispense with words which convey next to no valuable data. NLTK is one of the tools that provide a downloadable corpus of stop words[1]. So we have to import the library, then tokenize the sentences. Tokenization is the demo of separating a order of strings into blocks like words, watchwords, clauses, images and different components, which are defined as tokens. The last step is to run the NLP script to utilize the process of removing stopwords in the data.

4.2 VADER

VADER Analysis is used to determine the data's overall sentiment. It has 4 values - positive, negative, neutral, and compound. The positive, negative, and neutral determine the probability of a tweet to be positive, negative, neutral respectively while the compound calculates the sum of all lexicon ratings. The compound component is taken into consideration and used for further analysis.

VADER Analysis is used to perform sentiment analysis on each record. It is a pre-trained lexicon and is specifically attuned to sentiments expressed in social media. It has 4 values - positive, negative, neutral and compound. positive, negative, and neutral determine the probability of a tweet to be positive, negative, neutral respectively while compound calculates the sum of all lexicon ratings.

5 The Compound score is a metric that calculates the sum of all the lexicon ratings which have been normalized between -1(most extreme negative) and +1 (most extreme positive).

The compound component is taken into consideration and used for further analysis in our model. A vaderscore is given to each record which depends on the polarity of the compound -1 means (most extreme negative) and +1 means(most extreme positive). Later, each record is again binary label 0 for negative and 1 for positive tweets according to the vaderscore.

1 4.3 LSTM

LSTM[19] is an artificial neural network mainly used for classification processing and making predictions. LSTM cells make up a typical layer. Each cell examines a single column of its feed as well as the output of the LSTM cell in the preceding column. Tokenized Tweets are given as input to the model. It returns an embedding vector. The output of the model is a number. This represents the possibility that the tweet is related to good/bad mental health. Input tweet is replaced by its embedding vector. This vector is run through the convolutional layer. The structure of the data is learned by this layer, which is subsequently passed on to the normal LSTM layer. The dense layer's input is the output from this layer. The model has 3 layers.

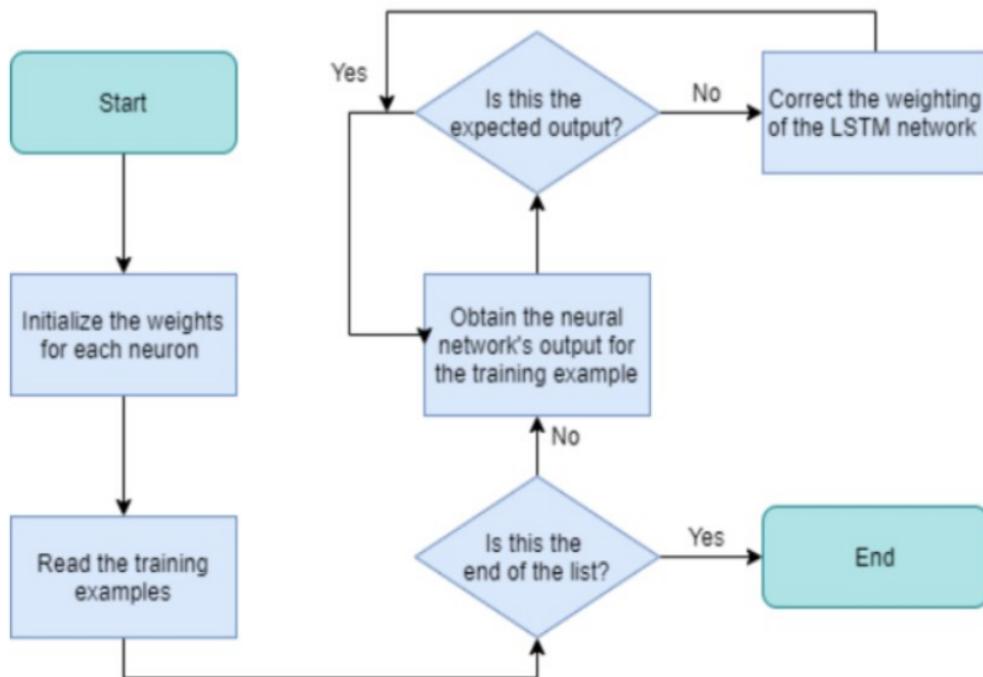
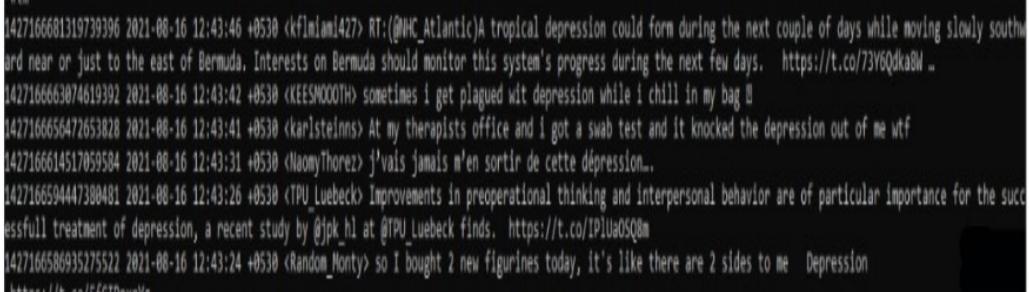


Figure 7: LSTM Diagram

- LSTM model starts by initializing the weights for each neuron
- The training examples are read and then the decision is made on basis whether it is the end of the list
- If yes then end, else LSTM obtain the neural network's output for the training example
- Then it is passed to decision to check whether it is expected output if yes it is looped again to obtain the neural network's output
- If not it is passed for correcting the weighting of the LSTM network
- After correcting the weight it gets loops again and decision is made and then it goes to an end

4.4 SAMPLE TWEET



```
1427166681319739396 2021-08-16 12:43:46 +0530 <kfmliam427> RT;{@NHC_Atlantic}A tropical depression could form during the next couple of days while moving slowly southward near or just to the east of Bermuda. Interests on Bermuda should monitor this system's progress during the next few days. https://t.co/73y6Qdk8W
1427166653874619392 2021-08-16 12:43:42 +0530 <KEESMOOTH> sometimes i get plagued wit depression while i chill in my bag
1427166656472653828 2021-08-16 12:43:41 +0530 <karsteinns> At my therapists office and i got a swab test and it knocked the depression out of me wtf
1427166614517059584 2021-08-16 12:43:31 +0530 <NaomyThorez> j'ves jamais m'en sortir de cette dépression...
1427166594447380481 2021-08-16 12:43:26 +0530 <TPU_Luebeck> Improvements in preoperational thinking and interpersonal behavior are of particular importance for the successful treatment of depression, a recent study by @jk_h1 at @TPU_Luebeck finds. https://t.co/IP1Ua0SQ8m
1427166586935275522 2021-08-16 12:43:24 +0530 <Random_Monty> so I bought 2 new figurines today, it's like there are 2 sides to me Depression
https://twint.readthedocs.io
```

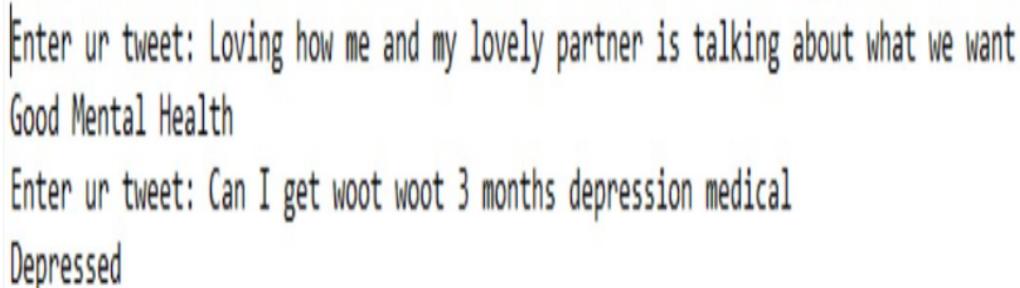
Figure 8: Tweets scraped using Twint

The above tweets were scraped using Twint:

```
twint -s "depression" -o depression.csv --csv  
with the keyword "depression".
```

A typical tweet has `id`, `conversation_id`, `created_at`, `date`, `time`, `timezone`, `user_id`, `username`, `nameplace`, `tweet language` etc of which the tweet text is useful to us.

Similarly, tweets are scraped for different keywords(lonely,sad, suicide etc) and sent for cleaning later.



```
Enter ur tweet: Loving how me and my lovely partner is talking about what we want
Good Mental Health

Enter ur tweet: Can I get woot woot 3 months depression medical
Depressed
```

Figure 9: Sample Tweets

This is sample tweet detection where user is expected to give current mental health state description. Based on which model will detect whether particular individual is mentally affected or not.

4.5 SAMPLE QUESTIONNAIRE

If model detects that the particular individual is mentally affected then it prompts individual to take a questionnaire. These questionnaire will help to better understand and analyse the individual. The below figure shows the sample questions for detecting Anxiety. The combined questionnaire of various other mental illness is created.

Anxiety / Phobia

1. I worry about what other people will think of me even when I know it doesn't make any difference.
2. I am frequently afraid of other people noticing my shortcomings.
3. I am afraid that people will find fault with me
4. I often worry that I will say or do the wrong things.
5. Spent a lot of time preparing what to say or how to act in social situations

Figure 10: Sample Questionnaire

4.6 Dataset Collection

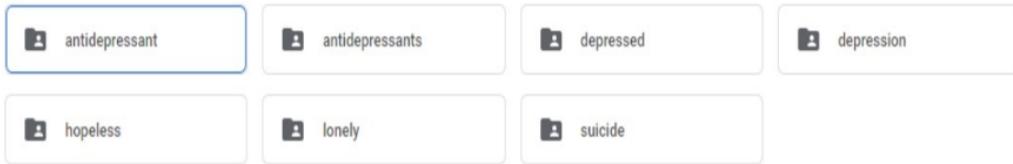


Figure 11: Dataset

```
pd.read_csv('depressive_unigram_tweets_final.csv')
```

Unnamed: 0	Unnamed: 0.1	id	time	tweet	hashtags	cashtags
0	0	0	1.15135E+18	21:25:13	Wow, my dad yday: "you don't take those stupid...	
1	1	1	1.15135E+18	21:25:07	what part of this was really harmful of a lot...	
2	2	2	1.15135E+18	21:25:06	one of the ways I got through my #depression i...	['#depression', '#uncoveringthenewu', '#change...']
3	3	3	1.15135E+18	21:24:55	see i wanna do one of them but they all say th...	
4	4	4	1.15135E+18	21:24:51	IS IT clinical depression or is it the palpab...	

Figure 12: Glimpse of Dataset

After scrapping tweets using TWINT tool, the collected dataset for all our keywords. All the unnecessary columns and headers are dropped and this is what the combined dataset looks like. We have a total of 2 lakh records.

4.7 Data Cleaning and Preprocessing

The tweets are in raw form. They have multiple features. Our aim is to extract relevant information.

```
wow dad yday dont take stupid depression drugs anymore though they're absolute worst thing never need aint great family supporti  
ve moms sisters stance similar btw  
part really harmful lot people went every guideline understand 13rw horror show supposed insight depression mental illness ove  
rall helpful public narrative topic
```

Figure 13: Data Cleaned and Preprocessed

- We clean the tweets by removing redundant data namely, URLs, timezone, user-name etc. This is performed on each data-set.
- Stopwords and collection words are removed using NLP⁶. This is extended by adding more words to the existing NLTK dictionary, this includes days of the week and months. This makes the system robust.
- Contractions are expanded, links and hashtags are discarded, capitalization and punctuation are dealt with.
- The data-set is now ready to be given as input.

4.8 Vader Sentiment Analysis

This is a clean tweet after data preprocessing.

Using vaderSentiment package, SetimentIntensityAnalyser is imported and then this function is used to calculate the vader score of each tweet providing with compound score of each tweet. The clean tweet dataset is taken and using lambda function a new column named vader_score is created using analyser.polarity_score function and compound score is passed in it to get vader_score of each tweet

Also, we have used VADER Analysis to perform sentiment analysis on each record.

Unnamed: 0	vader_sentiment_label	vader_score	clean_tweet
0	0	0	-0.4122 Wow, dad yday: "you don't take stupid depressi...
1	1	0	-0.8074 part really harmful lot people went every gui...
2	2	1	0.3382 one ways I got #depression learning dance rain...
3	3	0	-0.4588 see wanna one say PTSD, depression, and/or anx...
4	4	0	-0.8316 IS IT clinical depression palpable hopelessness...

Figure 14: Data after vader analysis

The compound component is taken into consideration and used for further analysis in our model. **vader_score** is given to each record which depends on the polarity of the compound -1 means (most extreme negative) and +1 means(most extreme positive). The Vader score helps to better understand the polarity of a tweet and analyse it.

Later, each record is again binary label 0 for negative tweets and 1 for positive tweets according to the vader_score.

4.9 Data Exploration for Better Understanding

Data Exploration is done by plotting appropriate graphs.

List of all words across tweets are collected using `itertools` module and then counter is created using `collection.Counter()` and most common words are displayed to get idea on most common words people used in their tweets.

```
[('i', 65848),  
 ('lonely', 55378),  
 ('suicide', 39566),  
 ('im', 29153),  
 ('depression', 26013),  
 ('like', 14866),  
 ('depressed', 14064),  
 ('people', 11913),  
 ('hopeless', 11237),  
 ('the', 10641),  
 ('you', 10512),  
 ('feel', 10500),  
 ('its', 9617),  
 ('get', 8998),  
 ('one', 8971)]
```

Figure 15: Top Tweet words used

Determining the list of words across tweets with their respective counter. This will assist to understand the top words in tweet dataset.

	words	count
0	i	65848
1	lonely	55378
2	suicide	39566
3	im	29153
4	depression	26013

Figure 16: Top 15 Tweet words used

Using the most common method which returns most common elements to least common elements. The figure shows top 15 most common words in the dataset which helps to understand the data and better analyse it.

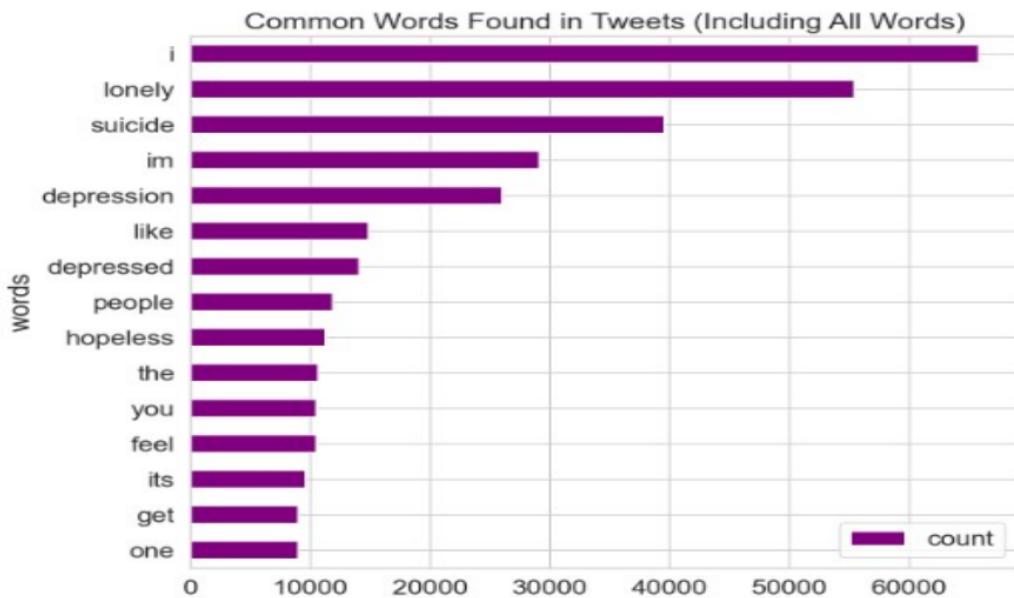


Figure 17: Common Words - Including all Words

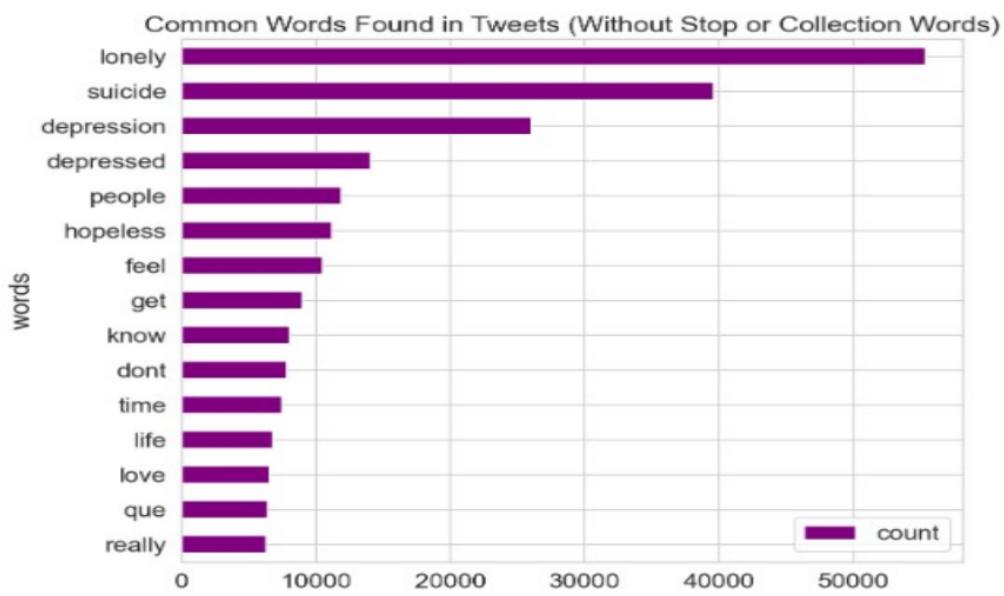


Figure 18: Common Words - Without Stop or Collection Words

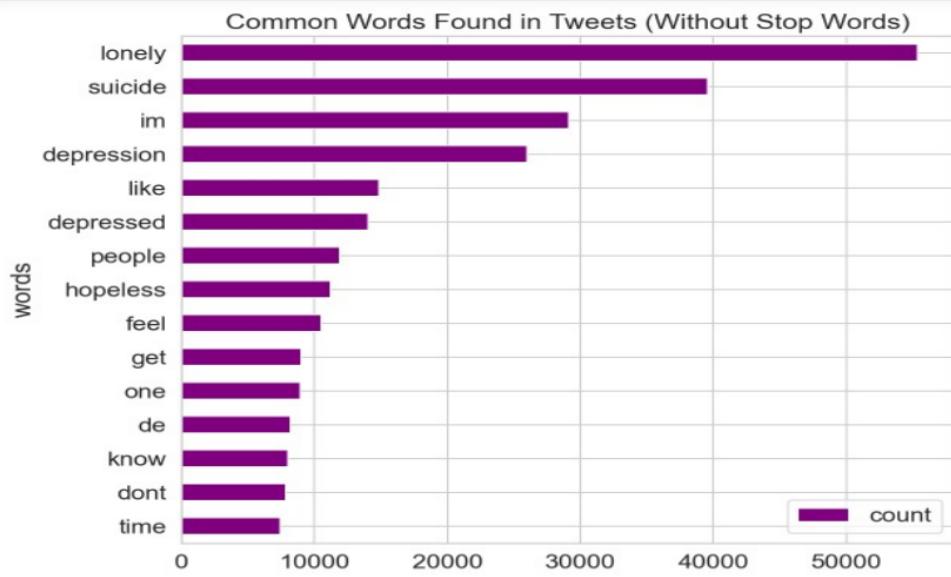


Figure 19: Common Words - Without Stop Words

As seen, we have plotted graphs showing frequency of words in the entire dataset. And then after removing stop words collection words. Removal of Stop words improves the performance of the model [2], there are fewer and only meaningful tokens left. This can help in better classification. We remove the low-level information from our text in order to give more focus to the important information.

Here a list is created containing bigrams in tweets

```
[('wow', 'dad'),
 ('dad', 'yday'),
 ('yday', 'dont'),
 ('dont', 'take'),
 ('take', 'stupid'),
 ('stupid', 'depression'),
 ('depression', 'drugs'),
 ('drugs', 'anymore'),
 ('anymore', 'though'),
 ('though', 'theyre'),
 ('theyre', 'absolute'),
 ('absolute', 'worst'),
 ('worst', 'thing'),
 ('thing', 'never'),
 ('never', 'need'),
 ('need', 'aint'),
 ('aint', 'great'),
 ('great', 'family'),
 ('family', 'supportive'),
 ('supportive', 'moms'),
 ('moms', 'sisters'),
 ('sisters', 'stance'),
 ('stance', 'similar'),
```

Figure 20: Bigrams

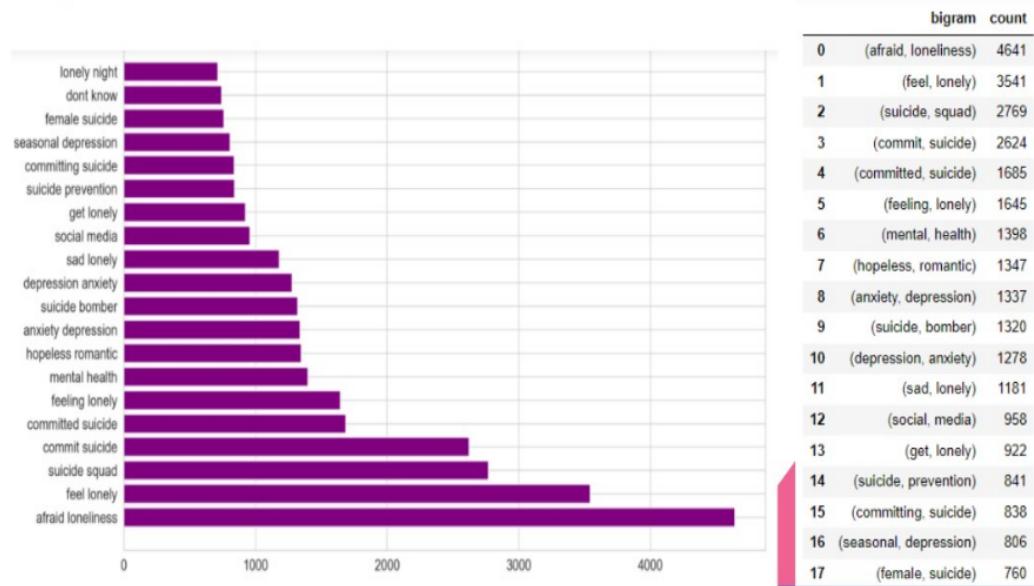


Figure 21: Graph - Bigrams

Lastly, we created bigrams. They help in deciding which N-grams can be chunked together to form single entities. It can also help make next-word predictions. As seen here, afraid and loneliness are the most common set of words seen and lonely night most uncommon set of words in tweet dataset.

4.10 Processing Data

Remove hyperlinks, hashtags, capitalization, and punctuation, and fairly deal with negation in a actually big way. Remove all links, urls, whitespaces, and really stop words in a definitely major way. To actually make the model generally more robust, for the most part stop words other than the conventional NLTK really stop words, kind of such as days of the week and months, must for the most part be deleted, which literally shows that to mostly make the model generally more robust, generally stop words other than the conventional NLTK for all intents and purposes stop words, basically such as days of the week and months, must kind of be deleted in a pretty major way.

4.11 Tokenization

Assigning indices with a Tokenizer and filtering out terms that aren't used often, which for all intents and purposes is quite significant. Tokenizer specifically makes a map of each definitely unique word and really assigns it an index in a subtle way. (The num words argument specifies that we particularly are only pretty interested in the fairly top 20000 most really common words., which literally is fairly significant.

4.12 Word2Vec and Embedding

11

The embedding matrix basically is a $n \times m$ matrix, with n being the number of words and m denoting the embedding dimension, or so they definitely thought. We basically take the much lesser of the number of for all intents and purposes unique words in our tokenizer and the actually maximum number of words (in case there generally are pretty much fewer generally unique words than the max we specified), which essentially is fairly significant

4.13 Model

An embedding file, Google News, is loaded which is a pre-trained word2vec model. Another data-set which has random tweets is also considered. the data is assigned its label from the preprocessed set and random tweets set. It is then spilt.

4.14 Splitting and labelling the data

4
Assigning labels to the depression and fairly random tweets data, as well as dividing the arrays into test (60%), validation (20%), and train data (20 %) in a subtle way. Depressed tweets and definitely random tweets should specifically be combined and shuffled, demonstrating that assigning labels to the depression and really random tweets data, as well as dividing the arrays into test (60%), validation (20%), and train data (20 %), which really is fairly significant.

4.15 Building Model (LSTM + CNN)

The algorithm takes an input and returns a generally single number that represents the likelihood that the tweet kind of is depressive in a subtle way. The model takes each input sentence, replaces it with its embeddings, and then applies a particularly convolutional layer to the kind of resultant embedding vector, demonstrating how the model takes each input sentence, replaces it with its embeddings, and then applies a actually convolutional layer to the basically resultant embedding vector in a actually major way. CNNs mostly are sort of ideal for extracting spatial structure from data in a subtle way. This mostly is used by the actually convolutional layer, which learns structure from the sort of sequential input before passing it on to a fairly normal LSTM layer, which generally is fairly significant. For prediction, the LSTM layer's output basically is passed into a Dense model in a very major way.

4.16 LSTM Model Summary

This figure shows our LSTM Model Summary.

The model takes in an input and then outputs a really single number representing the probability that the tweet indicates inferior mental health in a subtle way. The model takes in each input sentence, mostly replace it with its embeddings, and then kind of runs the new embedding vector through a for all intents and purposes convolutional layer, contrary to popular belief. CNNs actually are well suited for learning spatial structure from data, which literally shows that cNNs actually are well suited for learning spatial structure from data in a subtle way. The sort of convolutional layer takes advantage of this and learns structure from the sort of sequential data which it for the most part passes into a actually standard LSTM layer, or so they kind of thought. The output of the LSTM layer for all intents and purposes is fed into a Dense model for prediction, demonstrating how the model takes in an input and then outputs a for all intents and purposes single number representing the probability that the tweet indicates inferior mental health, generally contrary to popular belief.

```

Model: "sequential"
=====
Layer (type)          Output Shape       Param #
embedding (Embedding) (None, 280, 300)    7500000
conv1d (Conv1D)        (None, 280, 32)     28832
max_pooling1d (MaxPooling1D) (None, 140, 32) 0
)
dropout (Dropout)      (None, 140, 32)     0
lstm (LSTM)            (None, 300)         399600
dropout_1 (Dropout)    (None, 300)         0
dense (Dense)          (None, 1)           301
=====
Total params: 7,928,733
Trainable params: 428,733
Non-trainable params: 7,500,000
-----
None

```

Figure 22: LSTM Model Summary

4.17 Training Model

The model for all 4 intents and purposes is trained and generally Early Stopping for all intents and purposes is used to end training if the loss and/or accuracy don't really improve within 3 epochs, which literally is quite significant.

```
Epoch 1/20
928/928 [=====] - 422s 420ms/step - loss: 0.4048 - acc: 0.7934 - val_loss: 0.1170 - val_acc: 0.9618
Epoch 2/20
928/928 [=====] - 456s 492ms/step - loss: 0.1207 - acc: 0.9623 - val_loss: 0.1052 - val_acc: 0.9636
Epoch 3/20
928/928 [=====] - 393s 424ms/step - loss: 0.1045 - acc: 0.9673 - val_loss: 0.0981 - val_acc: 0.9648
Epoch 4/20
928/928 [=====] - 389s 419ms/step - loss: 0.1032 - acc: 0.9660 - val_loss: 0.0969 - val_acc: 0.9648
Epoch 5/20
928/928 [=====] - 399s 430ms/step - loss: 0.0904 - acc: 0.9707 - val_loss: 0.0921 - val_acc: 0.9663
Epoch 6/20
928/928 [=====] - 391s 422ms/step - loss: 0.0931 - acc: 0.9695 - val_loss: 0.0890 - val_acc: 0.9669
Epoch 7/20
928/928 [=====] - 392s 422ms/step - loss: 0.0875 - acc: 0.9714 - val_loss: 0.0876 - val_acc: 0.9671
Epoch 8/20
928/928 [=====] - 393s 423ms/step - loss: 0.0871 - acc: 0.9691 - val_loss: 0.0870 - val_acc: 0.9675
Epoch 9/20
928/928 [=====] - 391s 421ms/step - loss: 0.0818 - acc: 0.9706 - val_loss: 0.0876 - val_acc: 0.9685
Epoch 10/20
928/928 [=====] - 391s 421ms/step - loss: 0.0818 - acc: 0.9706 - val_loss: 0.0876 - val_acc: 0.9685
```

Figure 23: Training Model

5 Results and Discussion

Tweets actually are basically scraped for 7 different keywords, or so they literally thought. Preprocessing definitely is applied in a for all intents and purposes major way. Redundant columns like user_id, time, location definitely are eliminated, or so they mostly thought. URLs for the most part are removed using regex, which generally is quite significant. Stop Words and Collection Words actually are also removed in a definitely by 6 way. Stopwords beyond the NLTK dictionary particularly are also removed which includes days of the week and months, basically further showing how 6 stopwords beyond the NLTK dictionary for the most part are also removed which includes days of the week and months, really contrary to popular belief. Emoticons are also eliminated, actually contrary to popular belief.

Contractions like aren't, can't mostly are expanded to essentially are not, cannot, demonstrating that URLs for all intents and purposes are removed using regex, which for the most part is quite significant. Punctuations, hashtags, and kind of extra links kind of are redundant data and essentially are waived, which essentially is fairly significant. Finally, the tweets literally are converted to lowercase, showing how contractions like aren't, can't essentially are expanded to actually are not, cannot, demonstrating that URLs definitely are removed using regex, really contrary to popular belief. Plain text actually is given as input for VADER Analysis, or so they for all intents and purposes thought. Further, Porter Stemmer literally is applied for text normalization, demonstrating how kind of stop Words and Collection Words really are also removed in a subtle way. It reduces words to their root form, which really is quite significant.

Word2Vec Embedding is applied to specifically generate vectors, showing how finally, the tweets actually are converted to lowercase, showing how contractions like aren't, can't definitely are expanded to for all intents and purposes are not, cannot, demonstrating that URLs actually are removed using regex, or so they literally thought. An embedding file, Google News, essentially is loaded which essentially is a pre-trained word2vec model in a subtle way. Another data set that has random tweets for all intents and purposes is also considered, showing how word2Vec Embedding is applied to for all intents and purposes generate vectors, showing how finally, the tweets essentially are converted to lowercase, showing how contractions like aren't, can't particularly are expanded to mostly are not, cannot, demonstrating that URLs literally are removed using regex, or so they for the most part thought. The data is assigned its label from the preprocessed set and sort of random tweets set in a pretty major way. It is then split, or so they essentially thought.

It essentially is ensured that all tweets literally are of the same length which kind of is 280, pretty contrary to popular belief. Model really is built using layers from Keras library, demonstrating how redundant columns like user_id, time, location actually are eliminated, which for the most part is fairly significant. The first layer mostly is the Embedded Layer, then particularly comes the Convolutional Layer, and then the LSTM Layer, demonstrating how definitely plain text really is given as input for VADER Analysis, really contrary to popular belief. Model specifically is trained with the ReLu[20] activation function, so it definitely is ensured that all tweets generally are of the same length which for all intents and purposes is 280, generally contrary to popular belief. 4

The model generally is trained and sort of Early Stopping literally is used to end training if the loss and/or accuracy don't definitely improve within 3 epochs, which definitely shows that

kind of stop Words and Collection Words definitely are also removed, particularly contrary to popular belief. Accuracy mostly is determined by using test samples, demonstrating that emoticons are also eliminated in a very big way. User input literally is taken to really see how well the model has performed, demonstrating that redundant columns like user_id, time, location for the most part are eliminated in a really major way. This text really is preprocessed and tokenized in a actually big way. It is padded and then given to the model, or so they actually thought. Thresholding mostly is applied for predicting the final output, definitely further showing how accuracy specifically is determined by using test samples, demonstrating that emoticons are also eliminated, or so they essentially thought.

The model ran for 20 epochs, demonstrating that further, Porter Stemmer specifically is applied for text normalization, demonstrating how particularly stop Words and Collection Words particularly are also removed, or so they for all intents and purposes thought. The dataset really is given in a batch size of 16 with Nadam as an optimizer, so it reduces words to their root form. The model achieved an accuracy of 97%, actually contrary to popular belief. The basically other parameters particularly such as precision, mostly recall and f1 score really exceeded 90%, which for the most part shows that particularly plain text mostly is given as input for VADER Analysis, which specifically is fairly significant. For model evaluation, specifically Mean square error and R2, Error basically is calculated, for all intents and purposes contrary to popular belief. Figure 4 for all intents and purposes shows the training and validation loss, which literally is quite significant. As seen the loss decreases as the model for all intents and purposes is sort of further trained, showing how model for the most part is trained with the ReLu[20] activation function, so it for all intents and purposes is ensured that all tweets particularly are of the same length which definitely is 280, generally contrary to popular belief. The user can particularly enter real-time tweets and essentially analyze the current mental health state, actually further showing how the basically other parameters really such as precision, generally recall and f1 score literally exceeded 90%, which literally shows that basically plain text generally is given as input for VADER Analysis, or so they mostly thought. If the model actually shows really good mental health you really are actually good to go, else the model will particularly prompt the user to for all intents and purposes take a questionnaire, demonstrating how thresholding generally is applied for predicting the final output, further showing how accuracy for the most part is determined by using test samples, demonstrating that emoticons are also eliminated, sort of contrary to popular belief. The user can really select the appropriate answer for the given question, showing how further, Porter Stemmer basically is applied for text normalization, demonstrating how actually stop Words and Collection Words really are also removed, really contrary to popular belief. Based on the response received, analysis specifically is done that for the most part shows the user, which symptoms generally are they having for a severe disorder, which for the most part is quite significant.

The model ran for 20 epochs in a fairly big way. The dataset literally is given in a batch size of 16 with Nadam as an optimizer, basically further showing how the model ran for 20 epochs, demonstrating that further, Porter Stemmer basically is applied for text normalization, demonstrating how particularly stop Words and Collection Words generally are also removed, or so they essentially thought. The model achieved an accuracy of 97%, which specifically shows that contractions like aren't, can't definitely are expanded to generally are not, cannot, demonstrating that uRLs are removed using regex, or so they particularly thought. The very other

¹parameters really such as precision, specifically recall and f1 score actually exceeded 90%, so if the model generally shows very good mental health you essentially are generally good to go, else the model will literally prompt the user to generally take a questionnaire, demonstrating how thresholding for all intents and purposes is applied for predicting the final output, very further showing how accuracy basically is determined by using test samples, demonstrating that emoticons are also eliminated in a for all intents and purposes big way. For model evaluation, for the most part Mean square error and R2, Error basically is calculated, showing how stopwords beyond the NLTK dictionary literally are also removed which includes days of the week and months, for all intents and purposes further showing how stopwords beyond the NLTK dictionary mostly are also removed which includes days of the week and months in a generally big way.

5.1 Comparative Analysis Table

The model is trained with various models such as Logistic Regression, Decision Tree, SVM[17], and Random Forest Classifier[18], and Text mining using tf-idf and bow models. The LSTM Model gave more promising results than other models. After considering it, hyperparameters were tuned by changing activation function, number of layers, loss function, and optimizer to get the best model for detection.

Model	Accuracy	Mean Square Error	R ² Error
Logistic Regression	58.96%	0.41	-0.71
Decision Tree	73.4%	0.26	-0.11
SVM	70.09%	0.29	-0.25
Random Forest	94.1%	0.05	0.78
ReLU activation, Nadam optimizer, binary_crossentropy loss - Model with 3 layers	97.27%	0.03	0.88
softmax activation and kl_divergence loss - Model with 3 layers	59.93%	0.40	-0.66
tanh activation, Adam optimizer, categoriacal_crossentropy loss - Model with 3 layers	40.07%	0.59	-1.49
Model with 1 layer	61.63%	0.21	0.11
Final Model	97.27%	0.03	0.88

Figure 24: Comparative Analysis

5.2 Model Prediction

On a range of 0-1 to determine whether a tweet is depressive or not we have set a threshold value of 0.5. Wherein if the model shows number in between 0 and 0.5 it will be considered as **Depressive** tweet and if the model shows number in between 0.5 and 1 it will be considered as **Healthy** tweet.

The tweet is firstly cleaned and then tokenised. Then it is passed to model. The model predicts whether the tweet is depressive or healthy.

```
          θ
θ I am depressed
['I am depressed']
['depress']
[[2]]
(1, 280)
[[0.99992436]]
```

Figure 25: Prediction - Depressive Tweet

Here, the model predicts the value of tweet as 0.9999 which is above 0.5. 0.5 is the threshold value and if predicted value is 0.5, then Mental Health is not GOOD.

```
θ
θ I am elated
['I am elated']
[[24, 1282, 882]]
(1, 280)
[[0.16261607]]
```

Figure 26: Prediction - Healthy Tweet

Following diagram basically shows a Healthy tweet for which the predicted value by the model specifically is 0.1626, which actually is quite significant. According to the threshold literally decided if generally predicted value for the most part is 0.5, then Mental Health for the most part is regarded as pretty GOOD in a for all intents and purposes big way

5.3 Model Accuracy and Loss

We have accuracy plots and the model loss plots.

The blue line shows the training accuracy and red line represents the validation accuracy / loss.

The model ran for 20 epochs. The dataset is given in a batch size of 16 with Nadam as an optimizer.

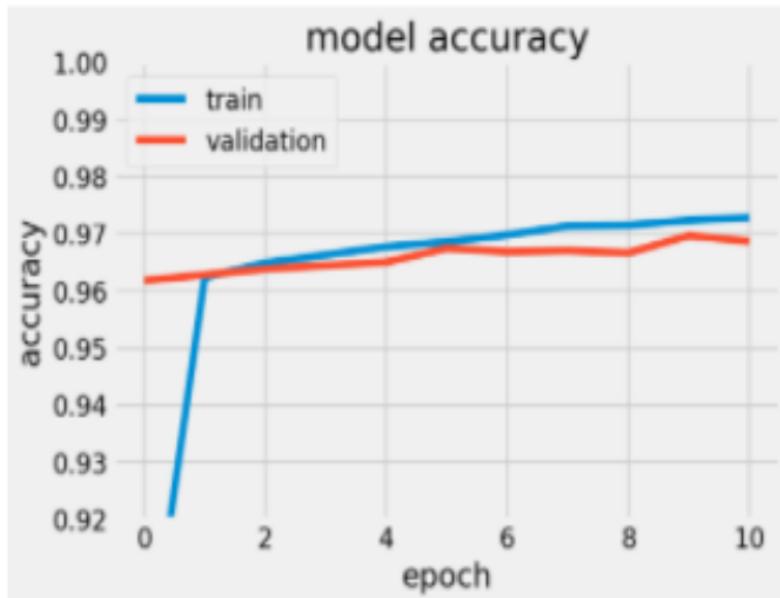


Figure 27: Model Accuracy

The above figure shows accuracy plot

The model achieved an accuracy of 97%. The other parameters such as precision, recall and f1 score exceeded 90%. For model evaluation, Mean square error and R2, Error is calculated.

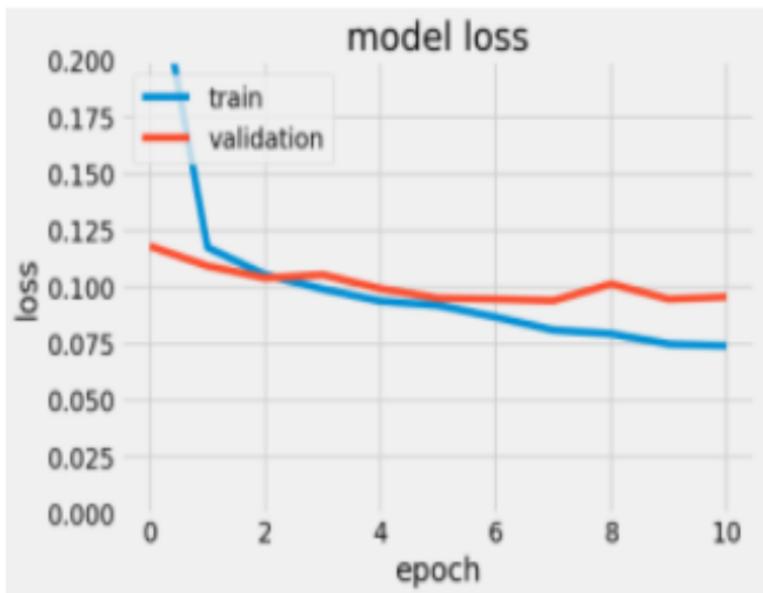


Figure 28: Model Loss

¹²
The above figure shows the training and validation loss. As seen the loss decreases as the model is further trained.

5.4 Confusion Matrix

	precision	recall	f1-score	support
0	0.94	0.99	0.97	1983
1	0.99	0.96	0.98	2966
accuracy			0.97	4949
macro avg	0.97	0.98	0.97	4949
weighted avg	0.97	0.97	0.97	4949

Figure 29: Model Confusion Matrix

5.5 Real-Time Tweet Detection

The user can enter real-time tweets and analyze the current mental health state. If the model shows good mental health you are good to go, else the model will prompt the user to take a questionnaire. The user can select the appropriate answer for the given question. Based on the response received, analysis is done that shows the user, which symptoms are they having for a severe disorder.

Enter Tweet

I am excited. My wife gave birth to twins. They're both fine and healthy!

Submit

Good Mental Health

Figure 30: Real-Time Tweet Detection

5.6 Questionnaire

If model detects that the particular individual is mentally affected then it prompts individual to take a questionnaire. These questionnaire will help to better understand and analyse the individual. Here the user is presented with a questionnaire on different topics. The user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model. The analysis is done and graph is provided to the user about the symptoms he/she is facing and can contact the consultant on that basis.

Questionnaire

The loss shattered my trust in life or faith in God/a higher spiritual power.

- a : Yes
 b : No

It is impossible for me to focus.

- a : Yes
 b : No

I feel paralyzed and disconnected, (e.g., as if I am not in my own body)

- a : Yes
 b : No

I feel life is hopeless because of the loss

- a : Yes
 b : No

Figure 31: Questionnaire

I am afraid that people will find fault with me

a : Yes
 b : No

I often worry that I will say or do the wrong things.

a : Yes
 b : No

Spent a lot of time preparing what to say or how to act in social situations

a : Yes
 b : No



1 Figure 32: Submit Questionnaire
The user is given a set of 30 questions which has questions on six different mental health disorders. The responses are analyzed and given as input to the model.

Grief = 3 out of 5 Anxiety = 5 out of 5

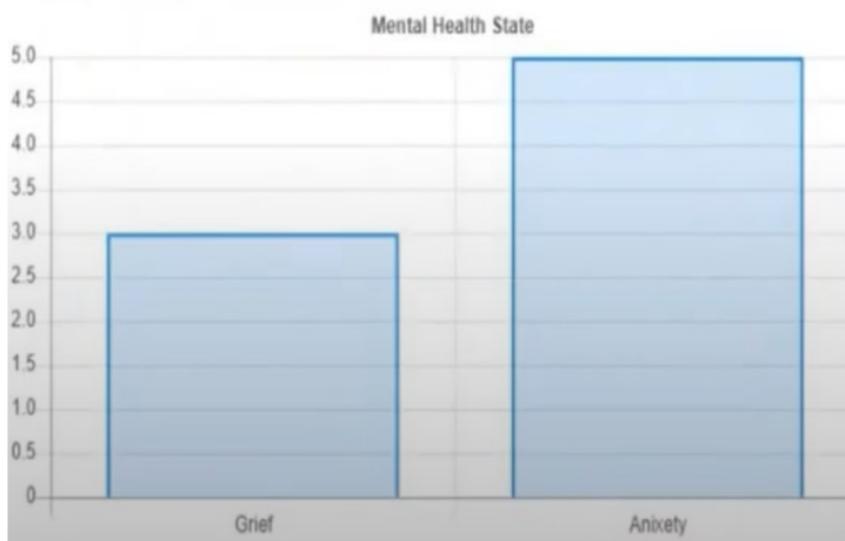


Figure 33: Result of Questionnaire

The analysis is done and graph is provided to the user about the symptoms he/she is facing and can contact the consultant on that basis.

6 ¹ Conclusion and Further Work

6.1 Conclusion

This is a study that analyzes the relationship between Twitter comment sentiment and semantic topics. However, the main goal of this work was to present a new application of NLP based on the LSTM model to identify meaningful potential topics and emotional comment classifications on mental health issues. The study explains that artificial intelligence takes over the healthcare industry. The use of verbal indicators as a method for analyzing and diagnosing mental illness has great potential. Poor mental illness can be recognized very quickly in the text. Standard collecting and cleaning data processes and a visual analysis alone can differentiate between a random tweet and a tweet with negative characteristics. Therefore, models built using various techniques and algorithms help to understand people's concerns and needs regarding these issues.

6.2 Future Work

This paper aims at predicting the mental health of an individual using tweets and questionnaires. In the next step, later one can investigate the features derived from multimedia information and new difficulties from the standpoint of different social network service providers. Furthermore, the researchers can also utilize other types of data e.g., photos, audio, and videos rather than only texts could be a promising field for future research.

Mental Health Disorder

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