Fake News Detection

by

Radwa Mostafa, Abdelrahman Tolba, Mariam Khaled, John Gerges

A dissertation submitted in partial fulfillment of the
requirements for the degree of
Bachelor of computer science

in

Department of Computer Science

in the

Faculty of Computer Science
of the
Misr International University University, EGYPT

Thesis advisor:
Dr. Diaa Salama , Eng. Youmna Ibrahim

(June 2020)

Abstract

Nowadays, social media has been taking a huge part in people's life and has become one of the most crucial platforms for fake news. This is mainly because it has no restrictions on people's posts since anyone can edit their posts whenever they want which certainly makes it act as a weak credible source. However, that didn't stop people from using social media as their source of information. The extensive use of social media has an enormous impact on many aspects of our life. Therefor there is a profound need to detect these fake news. Our aim is to develop a web based system using machine learning and a combination of algorithms that we proposed an advanced framework to identify tweets with fake news using context analysis; we assumed that natural language processing(NLP) won't be enough alone to make context analysis as tweets are usually short and does not follow even the simplest syntactic rules so we used tweets features as number of retweets, number of likes and tweet length we also added statistical credibility analysis for Twitter users. And finally to get the best accuracy we combined three of the best algorithms used support vector machine (SVM) (which is widely accepted as baseline classifier especially with binary classification problems), neural networks(NN) and decision tree.

Acknowledgments

We would like to express our thankfulness to our Professor Dr. Diaa Salama and Teacher Assistant Eng. Youmna Ibrahim for Their wonderful Hard-Work with us. We also want to thank them for their great assistance. Moreover, We want to thank our parents for believing in us and never giving up on us. Last but not least a very special thank you for Dr Ashraf Abdelraouf for always being there for us and for teaching us that emotion and logic exist best together. We can't thank you enough for everything. We are going to miss the day-to-day repartee and ability to drop into your office, but we hope we can always stay in touch. Thank you for making our collage years everything it has been.

Contents

List of Figures

Chapter 1

Introduction

1.1 Introduction

1.1.1 Background

With the Covid-19(Corona Virus) spread all around the world, people are using this propaganda and the desperate need of the citizens to know the news about this mysterious virus by spreading faking news. Some Countries arrested people who spread fake news about this and others made them pay a fine.For instance, this was shown since the beginning of the spread of Covid-19 in Egypt by the outbreak of misinformation concerning the virus on several social media platforms. Various fake news on Facebook and other applications claimed this virus as an outcome of a conspiracy theory and presented false information of the government public policies which by all means was an incident that reflected the social media's disadvantages or harmful side. The Egyptian government's reaction to this was shown by blocking those websites, pages and any kind of sources which spread those rumors. Furthermore, the government emphasized the importance of issuing the necessary legal actions towards any individual who was already part of this.

Nevertheless, the previously mentioned cons for social media doesn't mean that it doesn't have its pros. Social media has a very important role especially in the current moment with the rise of technology and globalization. Looking for its personal importance, it has a huge role in interconnecting the beloved ones together from all over the world. As a business wise, it is also recognized as a perfect mean and is considered as an engine which acts as an economy booster for being a platform for businesses's sites and networks. On the other hand, people should be more cautious and aware while using it by always trying to utilize and going for the credible websites and sources for preventing any risks in society.

1.1.2 Motivation

1.1.2.1 Market Motivation

Considering the harmful outcome of spreading fake news, it has an enormous social impact as it can mislead citizens into believing misinformation about a specific product/ person or situation and the spread of economic and political fake news can directly affect the stock market and government economics in general. For example, publishing politically fake news can affect the society, security, tourism, economics and many more things; as it was found that, during the 2016 USA presidential election Twitter was responsible for the early promotion of misinformation, As they targeted influential users through replies and mentions and that the sharing of fact-checking articles almost disappeared in the core of the Internet, while social computing multiplied. These results have raised the question of whether such misinformation campaigns could change public opinion and endanger the integrity of the presidential election. Moreover, as when they published fake news about the death of the previous president Mohamed Hosny Mubarak which was first published by the Egyptian journalist Ibrahim Eissa in 2005 and had a significant impact on the following day on the Egyptian stock market. This fake news spread several times and the last one was on the 12th of December, the rumor also spread vigorously through the social networking site ”Twitter” to top the hashtags ”Mubarak Matt,” the list of the most frequently used tags on ”Twitter,” and ranked first in the list of the most traded in Egypt.

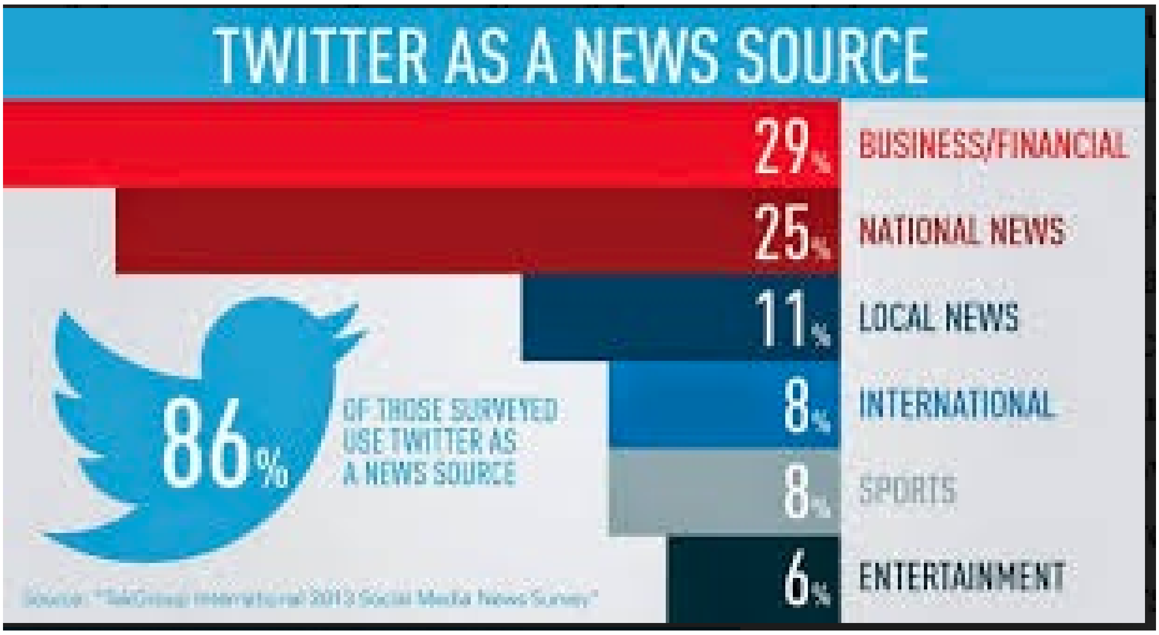


Figure 1.1: statistics about the Usage of Twitter

Also, Tourism income can be affected by fake news, as spreading fake news in countries can make tourists not interested in visiting certain places which costs losing much income.. This targets social media users that rely on social as their source of information.

The studies shows that the ability of human to detect the fake news doesn't exceed 54 percent so we developed a web based system using machine learning and artificial intelligence to help people differentiate between real and fake news because as statistics and researches shows that most of the world is exposed to fake news. Also we tried to modify and achieve a better accuracy from the related work by using multiple features and a hybrid of algorithms like SVM , neural network and decision Tree.

1.1.3 Problem Definition

The problem here is the widely spread of fake news and misinformation all over the social media platforms which have tragic impact on the society and the environment in several aspects. so Detection fake news will prevent this occurrence to happen and will help people to figure out what they can trust and know the credible sources to know the news.

1.2 Project Description

we are introducing an easy reliable website that anyone can use to search for the credibility of a certain user or a piece of news. In our project we aim to improve the accuracy of detecting the fake news and trying to reach the maximum results that can be reached. To do that we used a hybrid classifier that combine two different classifiers together, also we wanted to make this project useful from aspects by providing an additional feature which is allowing the user to enter keywords for the news they want to track for a certain duration.

1.2.1 Objective

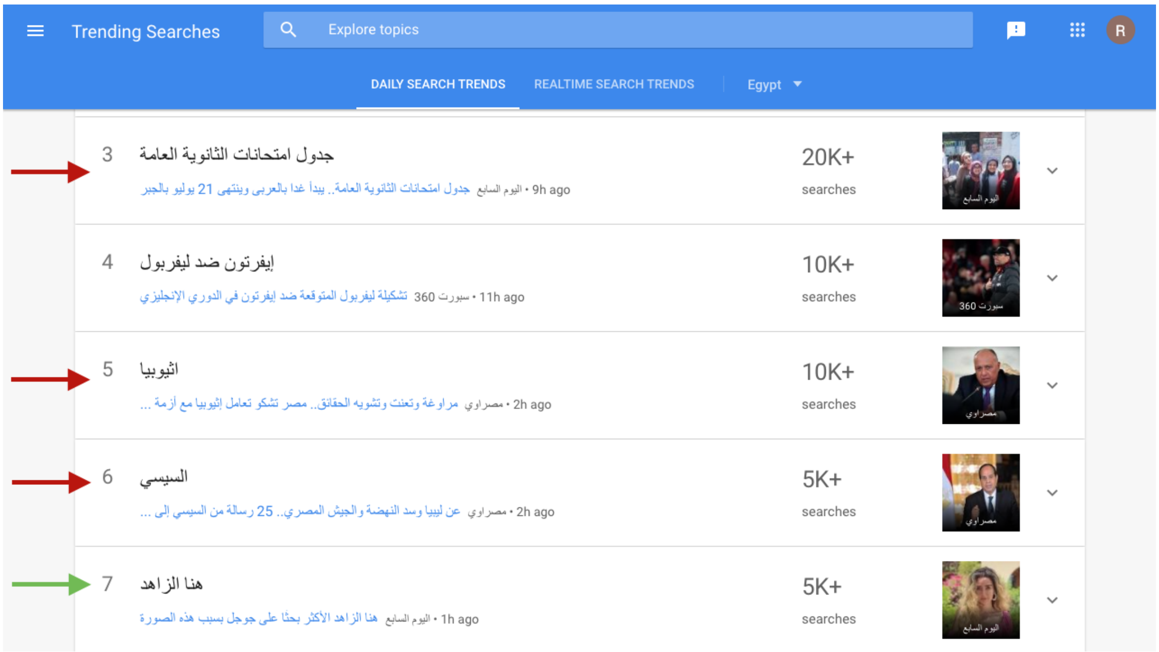
In order to minimize the drawbacks of spreading fake news all over the social media; Machine Learning is recently used in order to detect the fake news with very good results. However, our project aims to increase the percentage of accuracy to achieve the best results by using hybrid classifier and NLP that combines two different classifier together to achieve the optimum accuracy results.

1.2.2 Scope

In our project we're focusing on a a definite datasets that include two main categories which are:

1. Politics.
2. Celebrities.

We used them as the datasets that are labelled are available in these two categories. Moreover, it is shown here that these categories are the most used categories of news.



Trending Searches

Explore topics

DAILY SEARCH TRENDS REALTIME SEARCH TRENDS Egypt

3 جدول امتحانات الثانوية العامة

جدول امتحانات الثانوية العامة.. يبدأ غدا بالعربى وينتهى 21 يوليو بالجبر اليوم السابع • 9h ago

20K+ searches

4 إيفرتون ضد ليفربول

تشكيلة ليفربول المتوقعة ضد إيفرتون في الدوري الإنجليزي سبورت 360 • 11h ago

10K+ searches

5 اثيوبيا

مراوغة وتعنت وتشويه الحقائق.. مصر تشكو تعامل إثيوبيا مع أزمة ... مصراوي • 2h ago

10K+ searches

6 السيسي

عن ليبيا وسد النهضة والجيش المصري.. 25 رسالة من السيسي إلى ... مصراوي • 2h ago

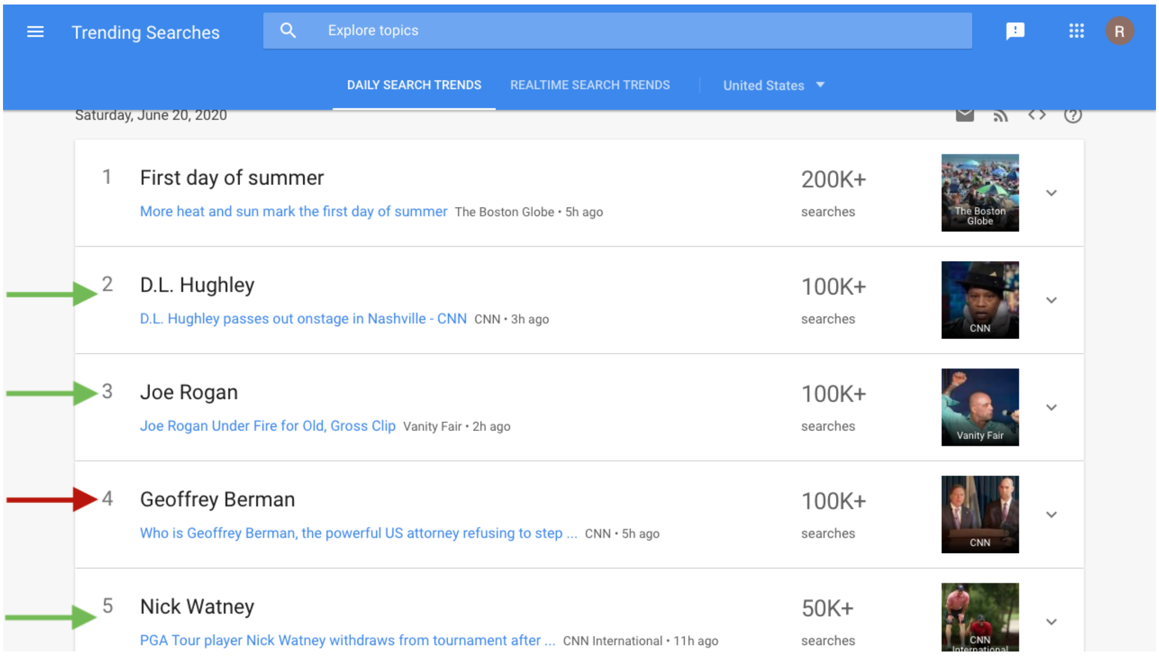
5K+ searches

7 هنا الزاهد

هنا الزاهد الأكثر بحثًا على جوجل بسبب هذه الصورة اليوم السابع • 1h ago

5K+ searches

Figure 1.2: Google trend in Egypt



Trending Searches

Explore topics

DAILY SEARCH TRENDS REALTIME SEARCH TRENDS United States

Saturday, June 20, 2020

1 First day of summer

More heat and sun mark the first day of summer The Boston Globe • 5h ago

200K+ searches

2 D.L. Hughley

D.L. Hughley passes out onstage in Nashville - CNN CNN • 3h ago

100K+ searches

3 Joe Rogan

Joe Rogan Under Fire for Old, Gross Clip Vanity Fair • 2h ago

100K+ searches

4 Geoffrey Berman

Who is Geoffrey Berman, the powerful US attorney refusing to step ... CNN • 5h ago

100K+ searches

5 Nick Watney

PGA Tour player Nick Watney withdraws from tournament after ... CNN International • 11h ago

50K+ searches

Figure 1.3: Google trend in USA

The Red arrow represents the Politics category and the Green one represents the Celebrities one. It is shown here that these categories represent 4 out of 5 from the trends, Which shows the importance of these two categories around the world.

1.2.3 Tweet System Overview

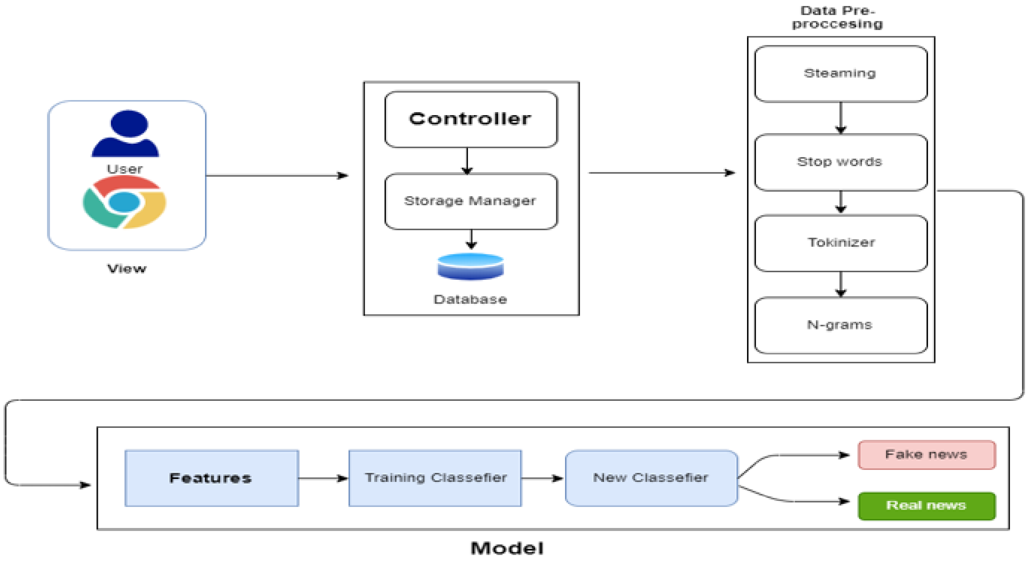


Figure 1.4: Tweet System Overview

Our System aims to detect fake tweets by using machine learning and a combination of algorithms The proposed diagram using MVC model (Model View Controller),The user's view a web based application ,entering a topic to search on, then passing tweets related to this topic to the controller , this tweets needs pre-processing to be well defined data to work on like (stemming , stop words , toknizer, n-grams). After that the controller will send the organized tweets to work on additional features to differentiate between real and fake accounts on twitter and then neglect the fake ones and work on the real accounts to know the fake and real tweets they write, the final step is Training and testing this data on a combination of multi classifiers to produce the best accuracy in knowing the difference between fake and real tweets.

1.2.4 User System Overview

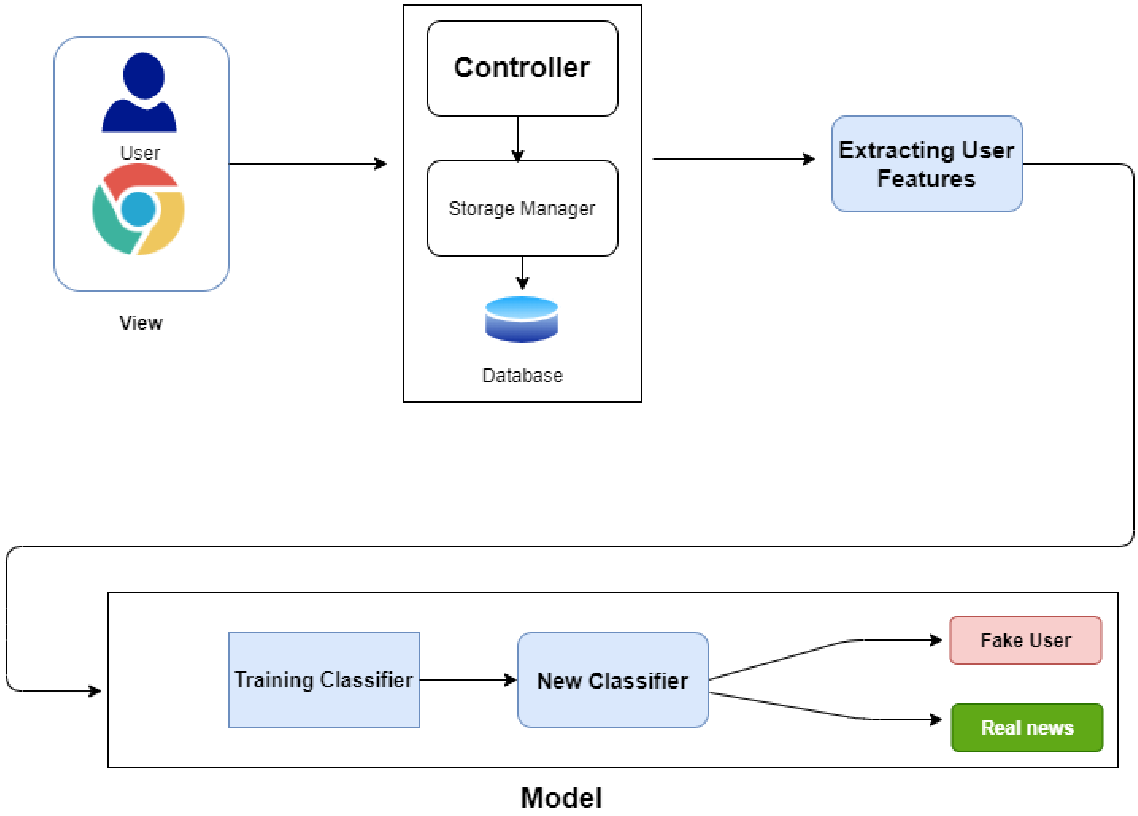


Figure 1.5: User System Overview

Our System aims to detect fake users by using machine learning and a combination of algorithms The proposed diagram using MVC model (Model View Controller),The user's view a web based application ,entering a username to search on then passing information related to this username to the controller. After that the controller will send the information to differentiate between real and fake accounts on twitter.the final step is testing this data on a combination of multi classifiers to produce the best accuracy in knowing the difference between fake and real users.

1.2.5 Features

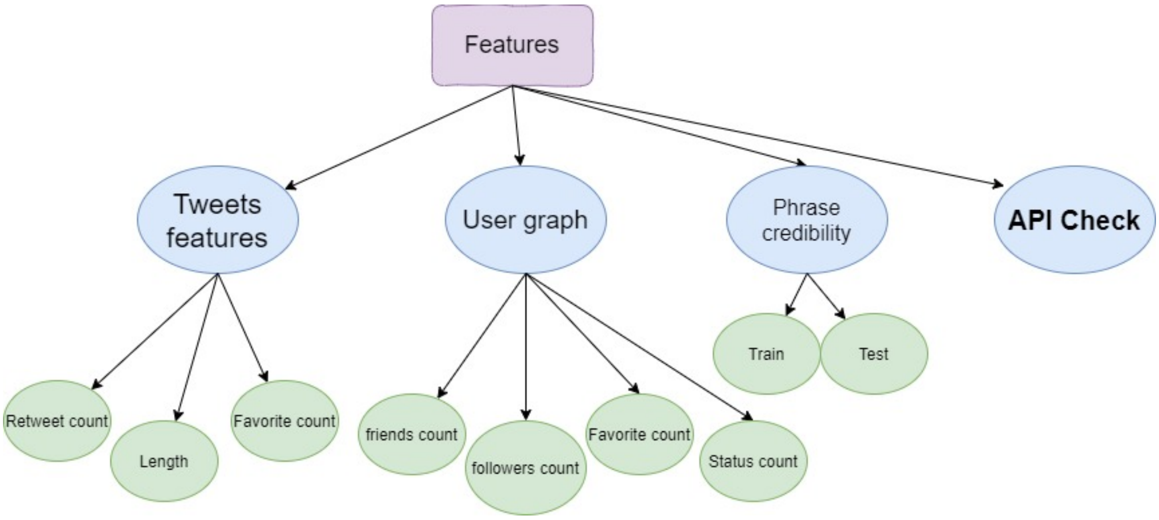


Figure 1.6: Features diagram

After that the controller send the organized tweets they have to work on additional features which are :

1. The first feature is gathering information about each tweet and actions made upon them like the retweet count , length of tweet and the favourite count helping us determining the credibility of the tweet and generating a pre- diction.
2. The Second feature is the user graph which is gathering information about each user and actions made by them like the friends count,screen name and the favourite count and representing it using a graph structure helping us determining the credibility of the person is he trusted or not
3. The Third feature is the phrase credibility we check if this tweet is credible or not and generating a prediction.
4. The Final feature is the API check we check if this piece of news do exist in a credible source of news like BBC or not and generating a prediction. those features differentiate between real and fake accounts and tweets on twitter .

1.3 Project Management and Deliverables

1.3.1 Tasks and Time Plan

Task	Start Date	End Date
Idea Discussion	18-7-2019	21-7-2019
Idea Research	21-7-2019	1-9-2019
Survey and Proposal	12-9-2019	8-9-2019
Implementing Prototype	4-10-2019	8-10-2019
Proposal Presentation	8-10-2019	8-10-2019
Designing Application	8-10-2019	30-10-2019
Implementing GUI Design	30-10-2019	12-11-2019
Designing Database	12-11-2019	20-11-2019
Designing Class Diagram	20-11-2019	27-11-2019
SRS Writing	27-11-2019	8-12-2019
SRS Presentation	8-12-2019	14-12-2019
Implementing Application	14-12-2019	5-2-2020
SDD Writing	5-2-2020	14-2-2020
SDD Presentation	14-2-2020	21-2-2020
Validation and Testing	21-2-2020	10-3-2020
Writing Paper	10-3-2020	25-3-2020
Delivering Papers	25-3-2020	1-4-2020
Writing Thesis	25-5-2020	2-7-2020
Delivering Thesis	2-7-2020	2-7-2020
Final Presentation	4-7-2020	4-7-2020

Figure 1.7: Task and Time plan

Chapter 2

Literature Work

2.1 Similar System Description

Fake News Detection Using A Deep Neural Network[6], The social media is a double edges weapon; although it's an easy way to be accessed and doesn't consume alot of time it can also be manipulated by different entities. so in this paper it identifies fake news using various models and classifiers; They proposed a Dataset for Kaggle which combine various technologies as machine learning, natural language processing and deep learning. Using these Dataset and techniques they investigate the analyses to identify linguistic properties that are present in the content.

Sentiment Analysis Based on Support Vector Machine and Big Data[4], In this paper Lukas Povoda, Radim Burget and Malay Kishore Dutta dicussed that Support Vector Machine[SVM] is mainly used in text analysis as it can be trained by huge amount of data and can deal with complex combined words as well as dealing with different languages. While working with big data [SVM] improved the accuracy while working with big data with percentage of 11 and the best accuracy obtained was 95.31 percent. For recognition on the rate of positivity and negativity.

Deep learning algorithms for detecting fake news in online texts[3], In this paper Dr Eslam Amer have talked in the first about the social media and how it's a good place for the fake news, he also mentioned that Facebook have a percentage of 50% of fake news traffic and he mentioned that 62% of US adults get there news from social media. He also discussed the impact of the fake news and how useful this project will be and how it will help people to over come this problem. The paper also mentioned that NLP is used to reach the optimum results. The used algorithms is RNN and LSTM and he used the Liar dataset.

Evaluating Machine Learning Algorithms for Fake News Detection[9], In This paper Gilda, Shlok used two different datasets which are signal media which gets news from local news, blogs and articles as well as outgoing list of fake and real news from OpenSource.co. They used SVM, Bounded decision tree, Random forests and Gradient Boosting as classifiers to increase accuracy and to get the diference between them and SVM happened to get the highest accuracy level with 77.2%.

Fake news identification on twitter[8], In this paper the authors aims to Identifie relevant features associated with fake news stories without previous knowledge of the domain , they used a variety of dataset like CharlieHebdo • SydneySiege • Ottawa Shooting • Germanwings-Crash • Ferguson Shooting , and classifiers like LSTM-CNN , LSTMdrop.

Identify tweets with fake news[10], This papers aims to identify fake news by making users analysis and context analysis by using NLP.using only one classifer which is SVM and the result accuracy was 62%.

Credibility Detection in Twitter Using Word N-gram Analysis and Supervised Machine Learning Techniques[11], In this paper the authors choose tweets features to work on and also choose LSVM and KNN as a classifier to test the best accuracy also worked on Effect of increasing character N-grams on accuracy of LSVM classifier to finally select the best approach.

Sentiment aware fake news detection on online social networks[12], In this paper they used machine learning and deep learning classification and the sentiment analysis feature to detect the effect of the news on people emotions by using an equation , the authors trains their classifier by using PHEME labeled twitter dataset.

Identifying fake news and fake users on twitter[2], In this paper the authors have credibility models to calculate the score for each the tweets and the users , and uses TWITTER CRAWLER for gathering data to use it as a dataset to train.

2.1.1 Business

Those systems are published and up and running in the market helping users to identify fake news using combination of features in each.

Brand24" [13],is a complete Media Monitoring as it composed of many vital features.This device have a function called"Protect your online reputation"Follow up on fine remarks from your emblem ambassadors and respond to a dissatisfied customer before the story receives beforehand of you.
"Automated sentiment analysis"We use superior sentiment detection to segment wonderful, negative and impartial mentions.
"Instant notifications"Get immediate alerts for negative mentions and have interaction key conversations earlier than it's too late.The second characteristic is:
"Improve client satisfaction"Track engage on line reviews, social media mentions, blogs, message boards, information web sites and much more.
"Get to recognize your customers"Learn what humans like or dislike approximately your company to enhance communication.
"Engage clients on-line"Access and interact on-line mentions to grow purchaser satisfaction.

Awario" [14],is a Media Monitoring internet site which have many capabilities than help the user to screen the media or a specific topic He/She want to go looking for. "Awario" Features:
- Non-forestall monitoring.Awario monitors every corner of the Web for mentions of your keywords in real time,ensuring you are the first to realize approximately the conversations that can effect your business— so you can react to them promptly, before absolutely everyone else.
-Powerful analytics.Track the growth within the wide variety of your mentions and their collective Reach, type mentionsby positive, negative, and neutral with sentiment analysis, identify top influencers by socialnetwork, compare several alerts, and examine progress with Awario's analytics. Happy withwhat you're seeing? Get a shareable link in a click to give your colleagues and clientsimmediate access to reports and statistics.

Chapter 3

Software Requirements Specifications

3.1 Introduction

3.1.1 Purpose of this document

The main purpose of this Software Requirements Specification document is to outline the requirements for detection of fake tweets on twitter: detect and separating between fake and real news/accounts on twitter. This is done with the aid of machine learning techniques and other features. This document will provide a detailed overview of our software product's parameters and goals and explain

purpose of our project. This software requirements specification (SRS) docu- ment defines how our stakeholder, team, and audience see the product and its functionality.

3.1.2 Scope of this document

This Software Requirements Specification (SRS) helps in detection of Fake news as it has an enormous social impact as it can mislead citizens into believing misinformation about a specific product/ person or situation and the spread of economic and political fake news can directly affect the stock market and government economics in general. Nevertheless, Tourism income can also be affected by fake news, as spreading fake news in countries can make tourists not interested in visiting certain places which costs losing much income.. This targets social media users that rely on social as their source of information.

3.1.3 Overview

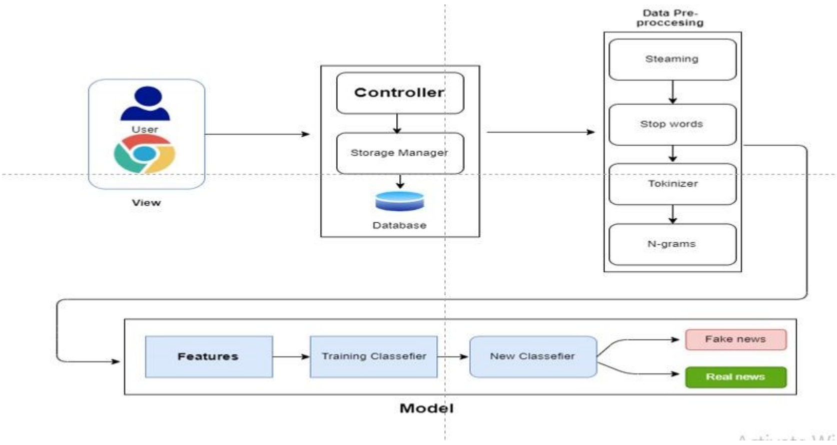


Figure 3.1: Overview diagram

Our System aims to detect fake tweets by using machine learning and a combination of algorithms The proposed diagram using MVC model (Model View Controller),The user's view a web based application ,entering a topic to search on then passing tweets related to this topic to the controller , this tweets needs pre-processing to be well defined data to work on like (stemming , stop words , toknizer, n-grams). After that the controller will send the organized tweets to work on additional features to differentiate between real and fake accounts on twitter and then neglect the fake ones and work on the real accounts to know the fake and real tweets they write, the final step is Training and testing this data on a combination of multi classifiers to produce the best accuracy in knowing the difference between fake and real tweets.

3.1.4 Business Context

Twitter fake news is a critical subject as twitter is one of the main news sources it can affect every single person life even if he/she is a normal person, company owner or even a country .As fake news can mislead and give false information for a person that take social media a source for his information in his daily life and trust it also can spread a rumor about a company's that can lead this company to lose alot of money as many of people will trust this news and can avoid this company products or a country's state that will lead to misunderstanding about wither it is a safe place to visit or not .This web based application will help them figure out and differentiate between fake and real tweets.

3.2 General Description

3.2.1 Product Functions

1) Application

- user enters keyword to search on
- system detect real and fake users and ignore fake ones
- system displays the tweets related to the keyword from the real users only
- User get to choose wither to display fake only , Real only or both together.
- system classify the real and fake news

2) Backend

- retrieve tweets from twitter API
- Pre-processing on data
- extracting tweet features
- API check
- obtain user graph for all users
- ignore fake users
- train and test data using algorithms

3.2.2 Similar System Information

In the past few years some projects were developed to achieve the same goal as the proposed project but with different approaches from both the software aspect and hardware aspect, the following are some of the most relevant to the proposed system :

3.2.2.1 Identifying Tweets with Fake News:

In this paper they proposed an advanced framework to identify tweets with fake news using statistical analysis for Twitter users, reverse image searching, cross verification of fake news sources and data mining. They assumed that Natural Language processing(NLP) won't be enough to make context analysis as Tweets are usually short and does not follow even the simplest syntactic rules. In this paper they used SVM (as it's widely accepted as baseline classifier especially with binary classification problems) and J48 Decision Tree.

3.2.2.2 Detecting Fake News in Social Media Networks

In this paper the author's purpose of the work is to come up with a solution that can be utilized by users to detect and filter out sites containing false and misleading information , they used random tree , naive bays and Logistic classifier as their methodology , the results appear to be that the logistic have the highest accuracy of them although they have close numbers of accuracy.

3.2.2.3 Deep Learning Algorithms for Detecting Fake News in Online Text

In this paper Dr Eslam Amer have talked in the first about the social media and how it's a good place for the fake news, he also mentioned that Facebook have a percentage of 50% of fake news traffic and he mentioned that 62% of US adults get there news from social media. He also discussed the impact of the fake news and how useful this project will be and how it will help people to over come this problem. The paper also mentioned that NLP is used to reach the optimum results. The used algorithms is RNN and LSTM and he used the Liar dataset.

3.2.3 Product Context

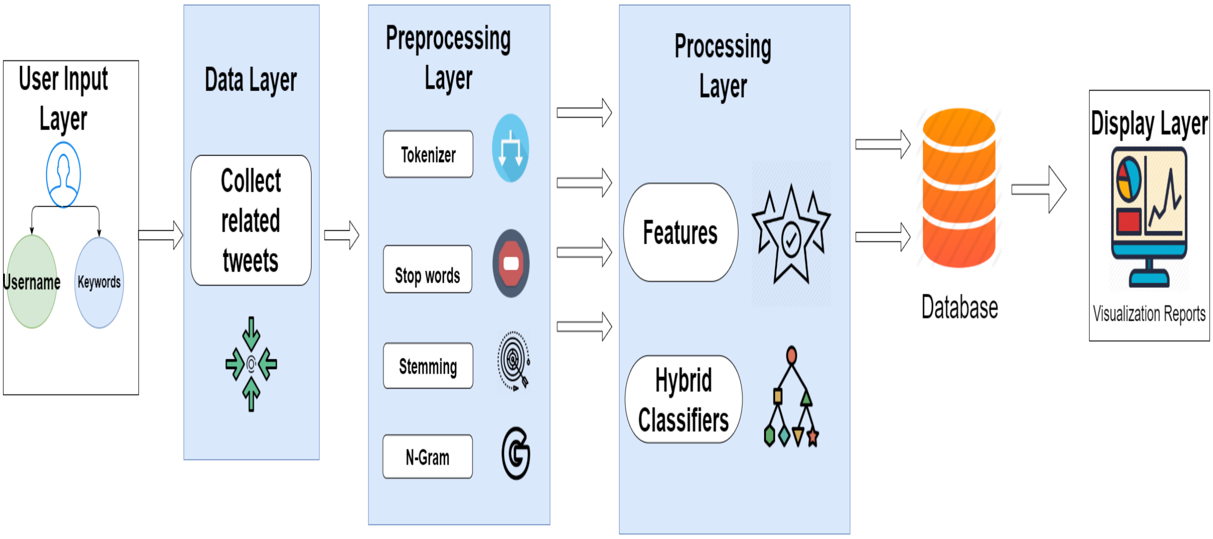


Figure 3.2: Block diagram

3.2.3.1 Features

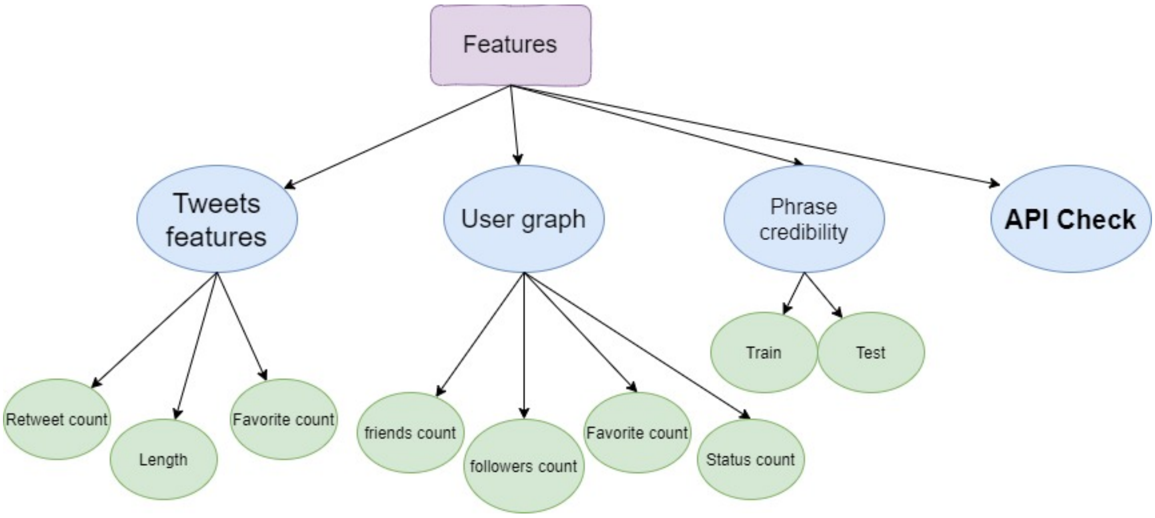


Figure 3.3: Features diagram

3.2.4 User Characteristics

User needs to have basic knowledge in using social media and websites as our Application will be user friendly and easy to use by any person.

3.2.5 User Problem Statement

Human ability to differentiate between real and fake news is 54% so this app will help people finding out the fake news on twitter.

3.2.6 User Objectives

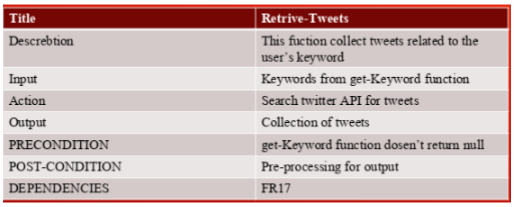
- Differentiate between fake and real news.
- High accuracy in detecting.
- User able to enter some keywords related to the topic and the app search for the tweets by this keywords
- User be able to select the category of the news shown.
- User can select how to display the selected tweets either fake only , real only or both

3.2.7 General Constraints

- User needs to enter a readable word to search on.
- User must enter the word in the right language.

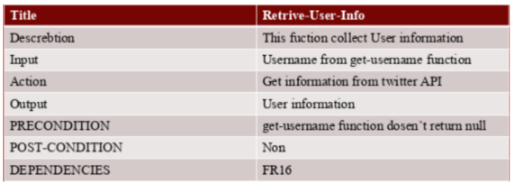
3.3 Functional Requirements

3.3.1 FR1



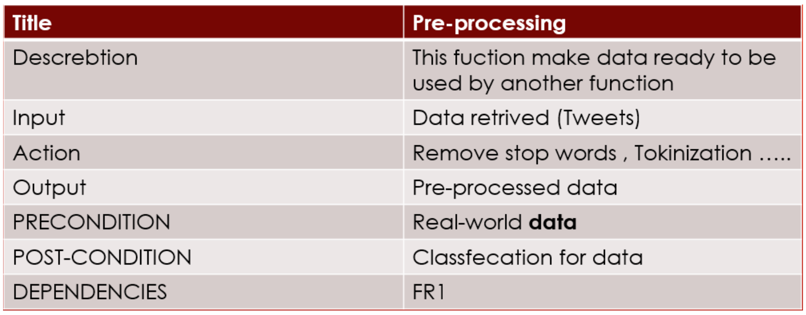
Title	Retrive-Tweets
Descrebtion	This fuction collect tweets related to the user's keyword
Input	Keywords from get-Keyword function
Action	Search twitter API for tweets
Output	Collection of tweets
PRECONDITION	get-Keyword function dosen't return null
POST-CONDITION	Pre-processing for output
DEPENDENCIES	FR17

3.3.2 FR2



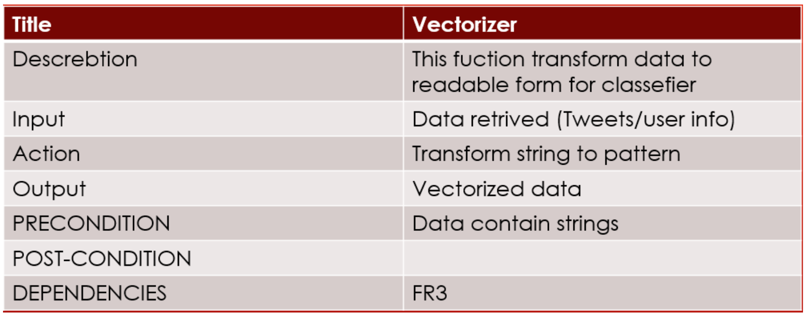
Title	Retrive-User-Info
Descrebtion	This fuction collect User information
Input	Username from get-username function
Action	Get information from twitter API
Output	User information
PRECONDITION	get-username function dosen't return null
POST-CONDITION	Non
DEPENDENCIES	FR16

3.3.3 FR3



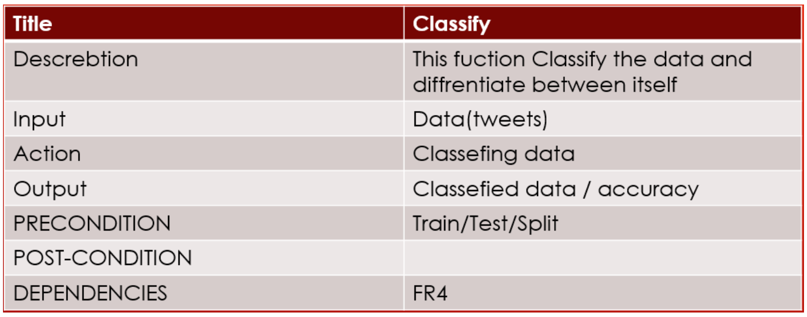
Title	Pre-processing
Descrebtion	This fuction make data ready to be used by another function
Input	Data retrived (Tweets)
Action	Remove stop words , Tokinization …..
Output	Pre-processed data
PRECONDITION	Real-world **data**
POST-CONDITION	Classfecation for data
DEPENDENCIES	FR1

3.3.4 FR4



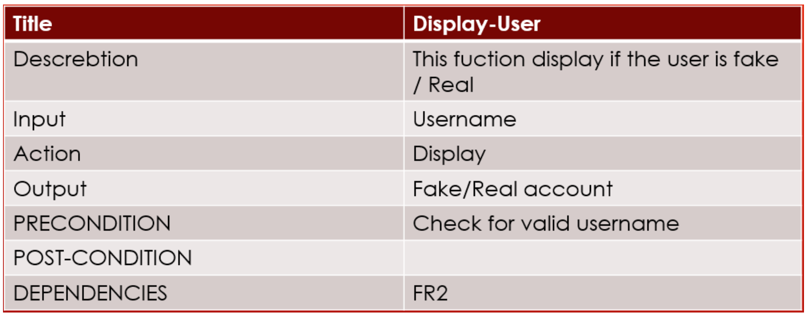
Title	Vectorizer
Descrebtion	This fuction transform data to readable form for classefier
Input	Data retrived (Tweets/user info)
Action	Transform string to pattern
Output	Vectorized data
PRECONDITION	Data contain strings
POST-CONDITION	
DEPENDENCIES	FR3

3.3.5 FR5



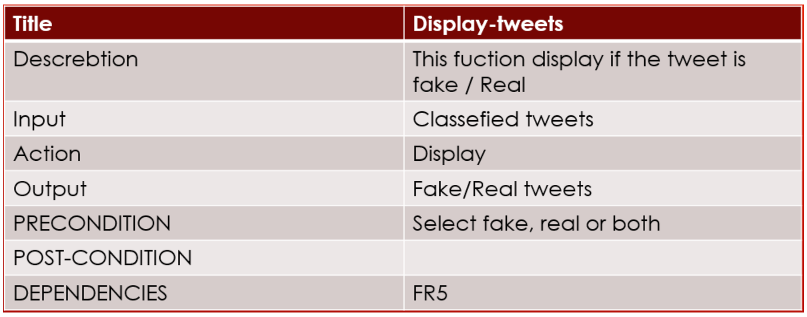
Title	Classify
Descrebtion	This fuction Classify the data and diffrentiate between itself
Input	Data(tweets)
Action	Classefing data
Output	Classefied data / accuracy
PRECONDITION	Train/Test/Split
POST-CONDITION	
DEPENDENCIES	FR4

3.3.6 FR6



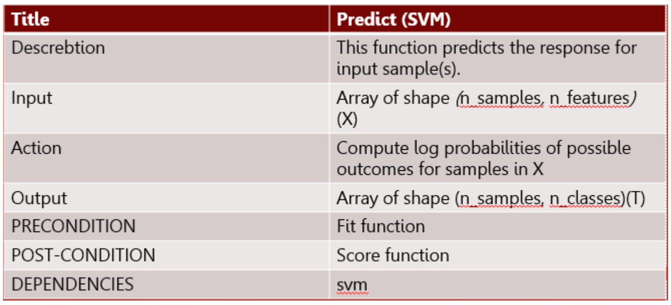
Title	Display-User
Descrebtion	This fuction display if the user is fake / Real
Input	Username
Action	Display
Output	Fake/Real account
PRECONDITION	Check for valid username
POST-CONDITION	
DEPENDENCIES	FR2

3.3.7 FR7



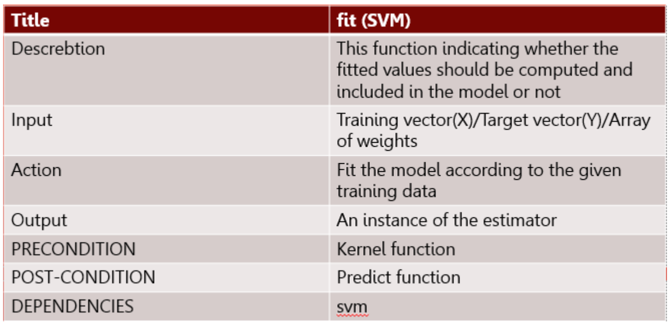
Title	Display-tweets
Descrebtion	This fuction display if the tweet is fake / Real
Input	Classefied tweets
Action	Display
Output	Fake/Real tweets
PRECONDITION	Select fake, real or both
POST-CONDITION	
DEPENDENCIES	FR5

3.3.8 FR8



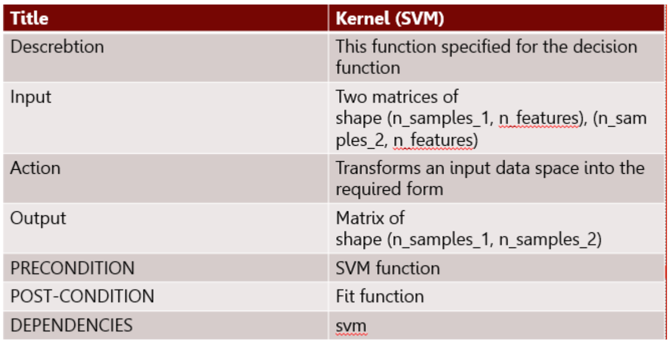
Title	Predict (SVM)
Descrebtion	This function predicts the response for input sample(s).
Input	Array of shape (n_samples, n_features) (X)
Action	Compute log probabilities of possible outcomes for samples in X
Output	Array of shape (n_samples, n_classes)(T)
PRECONDITION	Fit function
POST-CONDITION	Score function
DEPENDENCIES	svm

3.3.9 FR9



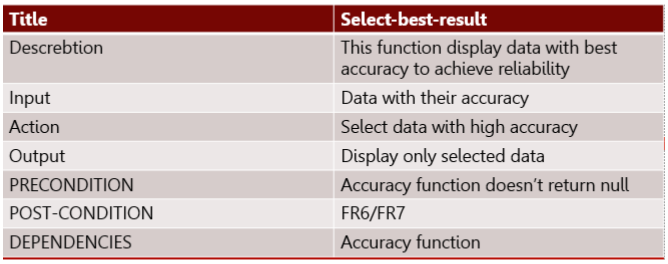
Title	fit (SVM)
Descrebtion	This function indicating whether the fitted values should be computed and included in the model or not
Input	Training vector(X)/Target vector(Y)/Array of weights
Action	Fit the model according to the given training data
Output	An instance of the estimator
PRECONDITION	Kernel function
POST-CONDITION	Predict function
DEPENDENCIES	svm

3.3.10 FR10



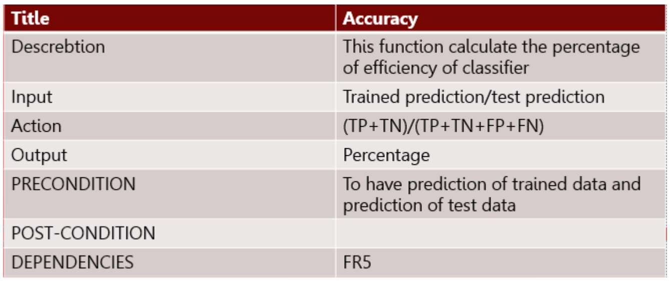
Title	Kernel (SVM)
Descrebtion	This function specified for the decision function
Input	Two matrices of shape (n_samples_1, n_features), (n_samples_2, n_features)
Action	Transforms an input data space into the required form
Output	Matrix of shape (n_samples_1, n_samples_2)
PRECONDITION	SVM function
POST-CONDITION	Fit function
DEPENDENCIES	svm

3.3.11 FR11



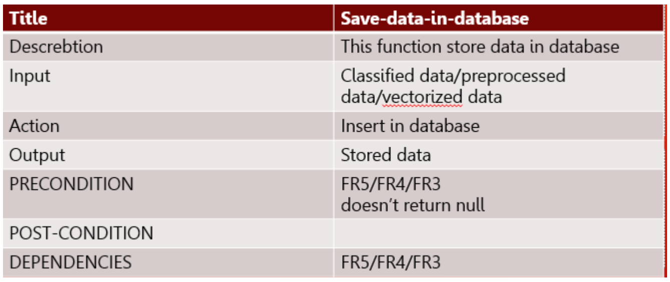
Title	Select-best-result
Descrebtion	This function display data with best accuracy to achieve reliability
Input	Data with their accuracy
Action	Select data with high accuracy
Output	Display only selected data
PRECONDITION	Accuracy function doesn't return null
POST-CONDITION	FR6/FR7
DEPENDENCIES	Accuracy function

3.3.12 FR12



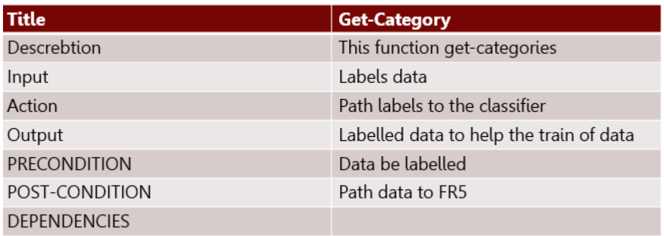
Title	Accuracy
Descrebtion	This function calculate the percentage of efficiency of classifier
Input	Trained prediction/test prediction
Action	(TP+TN)/(TP+TN+FP+FN)
Output	Percentage
PRECONDITION	To have prediction of trained data and prediction of test data
POST-CONDITION	
DEPENDENCIES	FR5

3.3.13 FR13



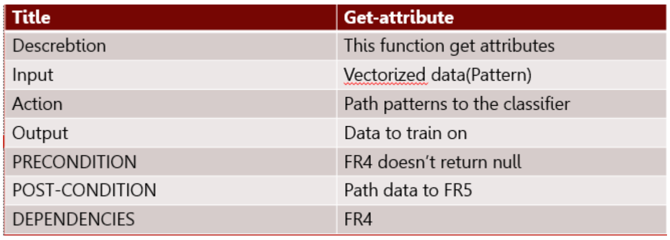
Title	Save-data-in-database
Descrebtion	This function store data in database
Input	Classified data/preprocessed data/vectorized data
Action	Insert in database
Output	Stored data
PRECONDITION	FR5/FR4/FR3 doesn't return null
POST-CONDITION	
DEPENDENCIES	FR5/FR4/FR3

3.3.14 FR14



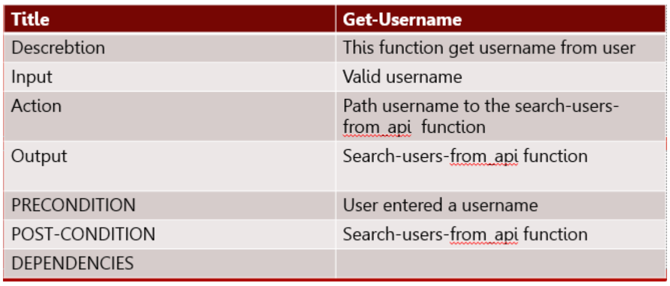
Title	Get-Category
Descrebtion	This function get-categories
Input	Labels data
Action	Path labels to the classifier
Output	Labelled data to help the train of data
PRECONDITION	Data be labelled
POST-CONDITION	Path data to FR5
DEPENDENCIES	

3.3.15 FR15



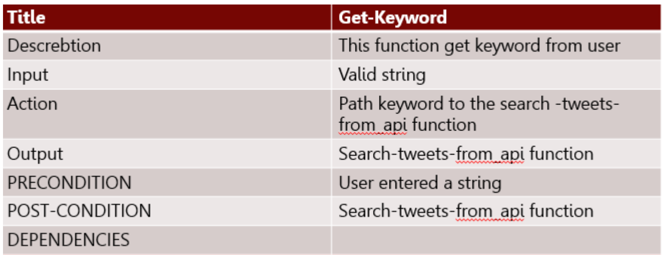
Title	Get-attribute
Descrebtion	This function get attributes
Input	Vectorized data(Pattern)
Action	Path patterns to the classifier
Output	Data to train on
PRECONDITION	FR4 doesn't return null
POST-CONDITION	Path data to FR5
DEPENDENCIES	FR4

3.3.16 FR16



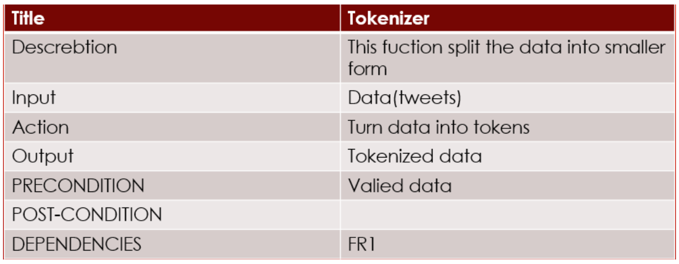
Title	Get-Username
Descrebtion	This function get username from user
Input	Valid username
Action	Path username to the search-users-from_api function
Output	Search-users-from_api function
PRECONDITION	User entered a username
POST-CONDITION	Search-users-from_api function
DEPENDENCIES	

3.3.17 FR17



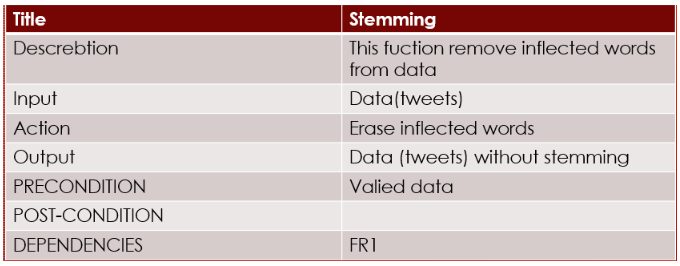
Title	Get-Keyword
Descrebtion	This function get keyword from user
Input	Valid string
Action	Path keyword to the search -tweets-from_api function
Output	Search-tweets-from_api function
PRECONDITION	User entered a string
POST-CONDITION	Search-tweets-from_api function
DEPENDENCIES	

3.3.18 FR18



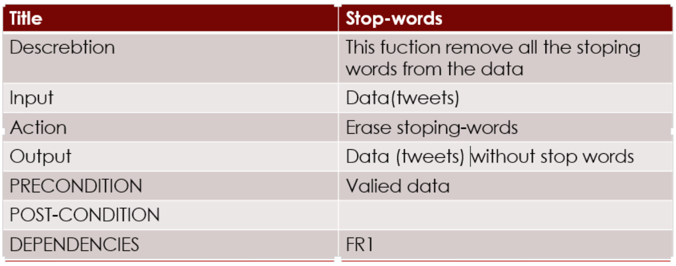
Title	Tokenizer
Descrebtion	This fuction split the data into smaller form
Input	Data(tweets)
Action	Turn data into tokens
Output	Tokenized data
PRECONDITION	Valied data
POST-CONDITION	
DEPENDENCIES	FR1

3.3.19 FR19



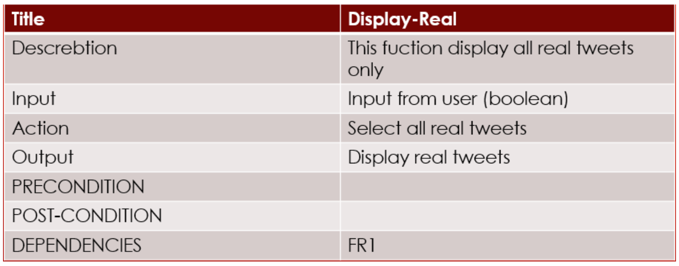
Title	Stemming
Descrebtion	This fuction remove inflected words from data
Input	Data(tweets)
Action	Erase inflected words
Output	Data (tweets) without stemming
PRECONDITION	Valied data
POST-CONDITION	
DEPENDENCIES	FR1

3.3.20 FR20



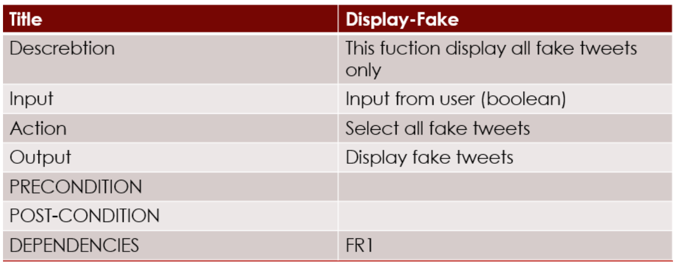
Title	Stop-words
Descrebtion	This fuction remove all the stoping words from the data
Input	Data(tweets)
Action	Erase stoping-words
Output	Data (tweets) without stop words
PRECONDITION	Valied data
POST-CONDITION	
DEPENDENCIES	FR1

3.3.21 FR21



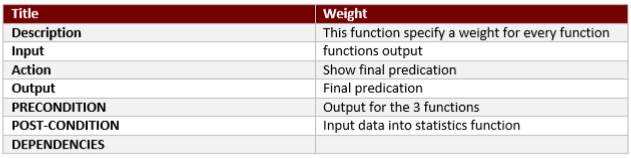
Title	Display-Real
Descrebtion	This fuction display all real tweets only
Input	Input from user (boolean)
Action	Select all real tweets
Output	Display real tweets
PRECONDITION	
POST-CONDITION	
DEPENDENCIES	FR1

3.3.22 FR22



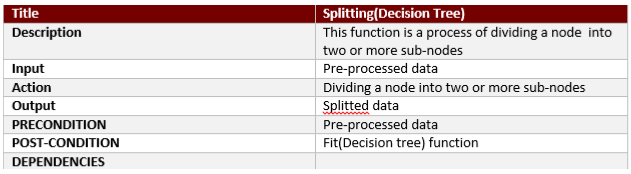
Title	Display-Fake
Descrebtion	This fuction display all fake tweets only
Input	Input from user (boolean)
Action	Select all fake tweets
Output	Display fake tweets
PRECONDITION	
POST-CONDITION	
DEPENDENCIES	FR1

3.3.23 FR23



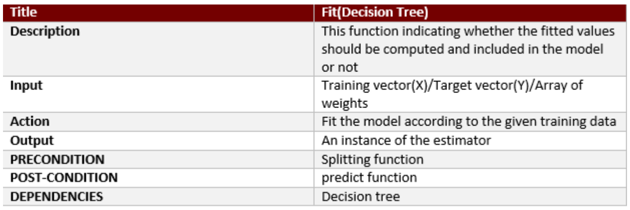
Title	Weight
Description	This function specify a weight for every function
Input	functions output
Action	Show final predication
Output	Final predication
PRECONDITION	Output for the 3 functions
POST-CONDITION	Input data into statistics function
DEPENDENCIES	

3.3.24 FR24



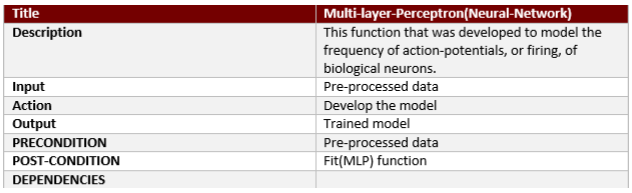
Title	Splitting(Decision Tree)
Description	This function is a process of dividing a node into two or more sub-nodes
Input	Pre-processed data
Action	Dividing a node into two or more sub-nodes
Output	Splitted data
PRECONDITION	Pre-processed data
POST-CONDITION	Fit(Decision tree) function
DEPENDENCIES	

3.3.25 FR25



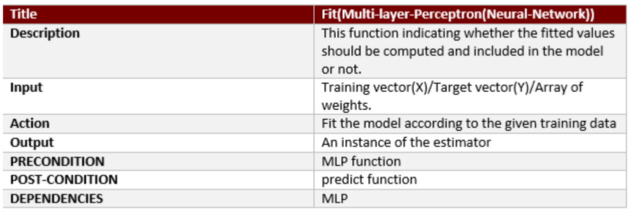
Title	Fit(Decision Tree)
Description	This function indicating whether the fitted values should be computed and included in the model or not
Input	Training vector(X)/Target vector(Y)/Array of weights
Action	Fit the model according to the given training data
Output	An instance of the estimator
PRECONDITION	Splitting function
POST-CONDITION	predict function
DEPENDENCIES	Decision tree

3.3.26 FR26



Title	Multi-layer-Perceptron(Neural-Network)
Description	This function that was developed to model the frequency of action-potentials, or firing, of biological neurons.
Input	Pre-processed data
Action	Develop the model
Output	Trained model
PRECONDITION	Pre-processed data
POST-CONDITION	Fit(MLP) function
DEPENDENCIES	

3.3.27 FR27

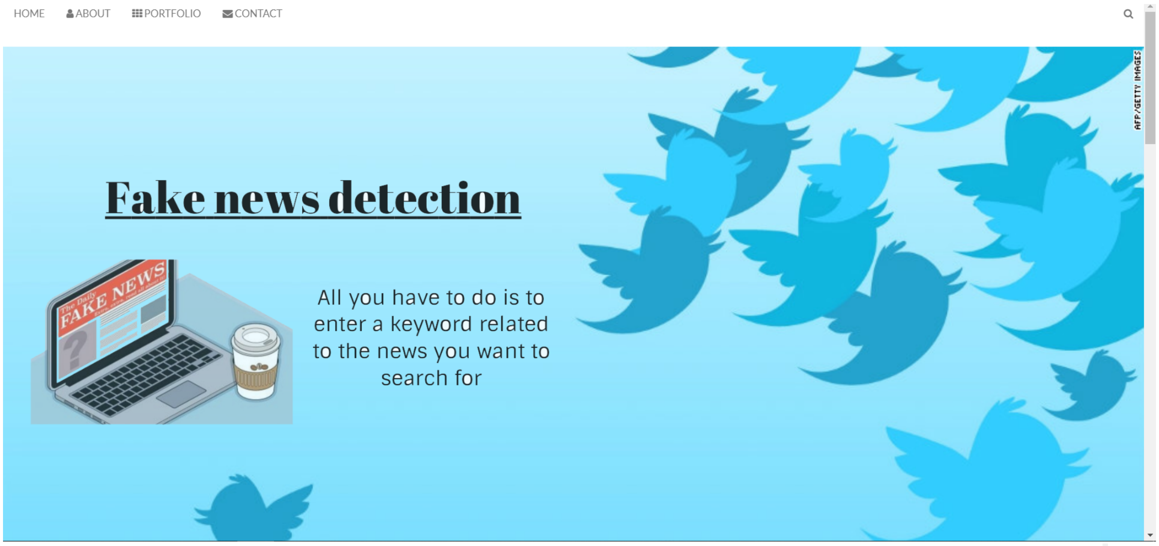


Title	Fit(Multi-layer-Perceptron(Neural-Network))
Description	This function indicating whether the fitted values should be computed and included in the model or not.
Input	Training vector(X)/Target vector(Y)/Array of weights.
Action	Fit the model according to the given training data
Output	An instance of the estimator
PRECONDITION	MLP function
POST-CONDITION	predict function
DEPENDENCIES	MLP

3.4 Interface Requirements

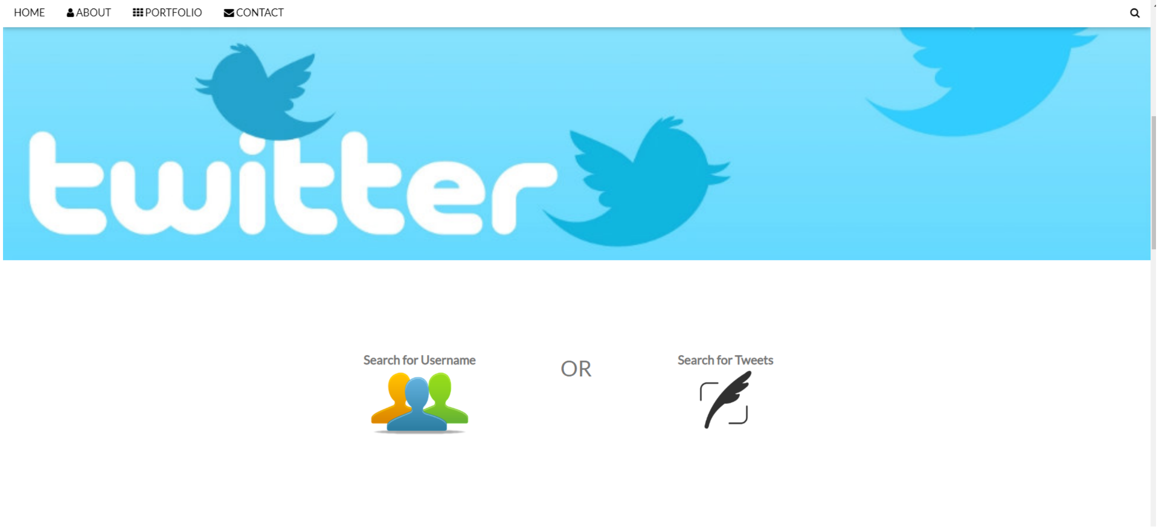
3.4.1 User Interfaces

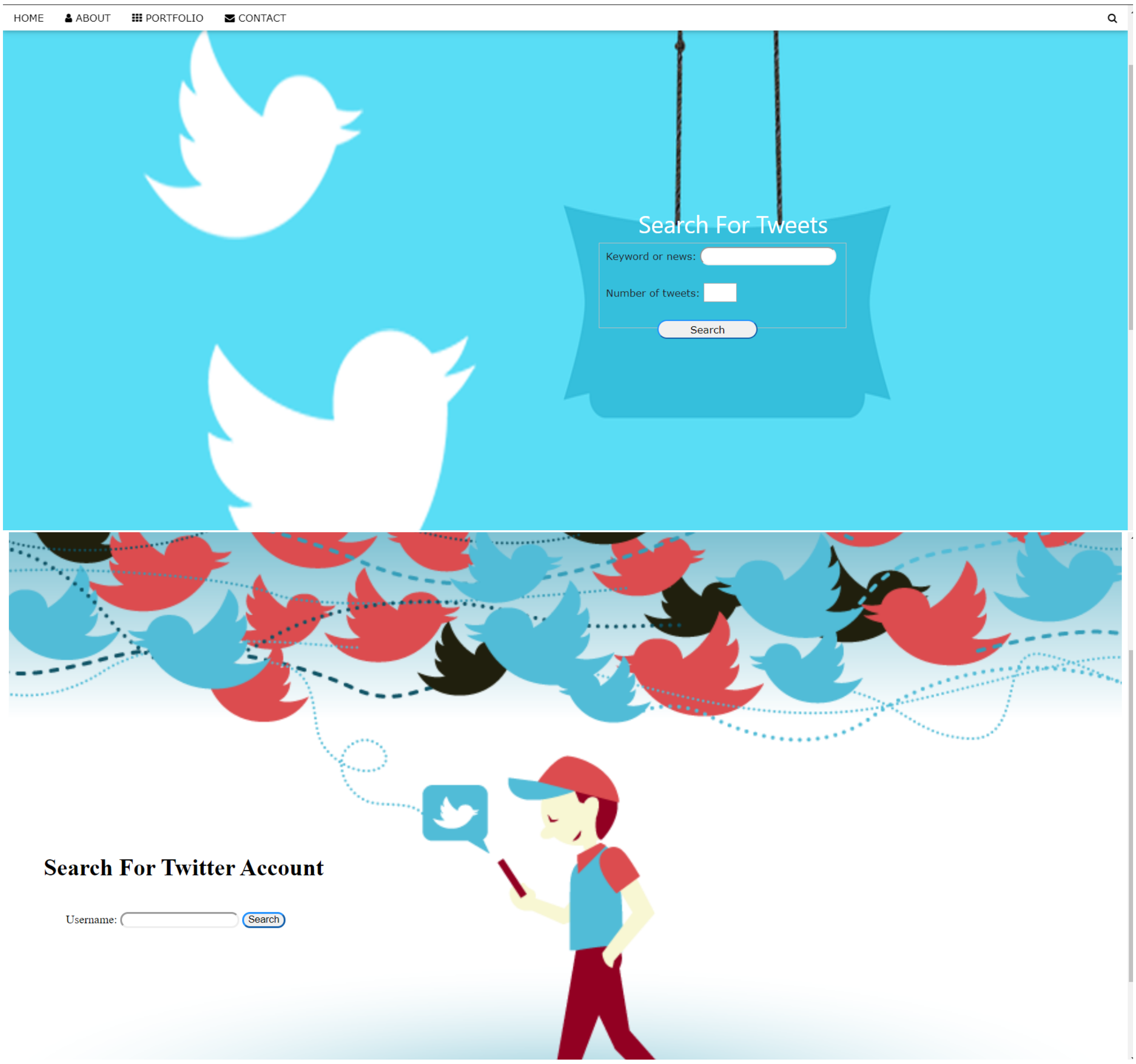
3.4.1.1 GUI



Fake news detection

All you have to do is to enter a keyword related to the news you want to search for





3.4.1.2 API

- NLP :Natural language processing is a subfield of computer science, information
- API:An application programming interface (API) is a set of routines, protocols,and tools for building software applications
- GUI:Graphical user interface
- NLTK:Natural Language Toolkit [3] (NLTK) is a platform used for building Python programs that work with human language data for applying in statistical natural language processing (NLP)

- Python An interpreted high-level programming language for general purpose programming.

3.5 Performance Requirements

Our project required large free memory to save the data and it must be fast to retrieve and write data while running.

3.6 Design Constraints

Any device that include a browser and must have the connection with the internet to use the website.

3.6.1 Web Accessibility

The system is designed as a web application accessible through an Internet browser, as such, an Internet connection is required for the various modules that make up the overall system to interact and be fully functional.

3.7 Other non-functional attributes

3.7.1 Performance and Speed

Our project works on a large twitter data that can take huge time to detect the fakes news so it's important for our project to be fast and have high performance.

3.7.2 Reliability

Our Application is built on reliability as it is the most important feature . we need to produce the highest accuracy when detecting fake news and try to make it error free to be a reliable source for end users.

3.7.3 Usability

Also, this system is easy to be memorized by the user due to the small number of tasks the user will do.

3.8 Class Diagram

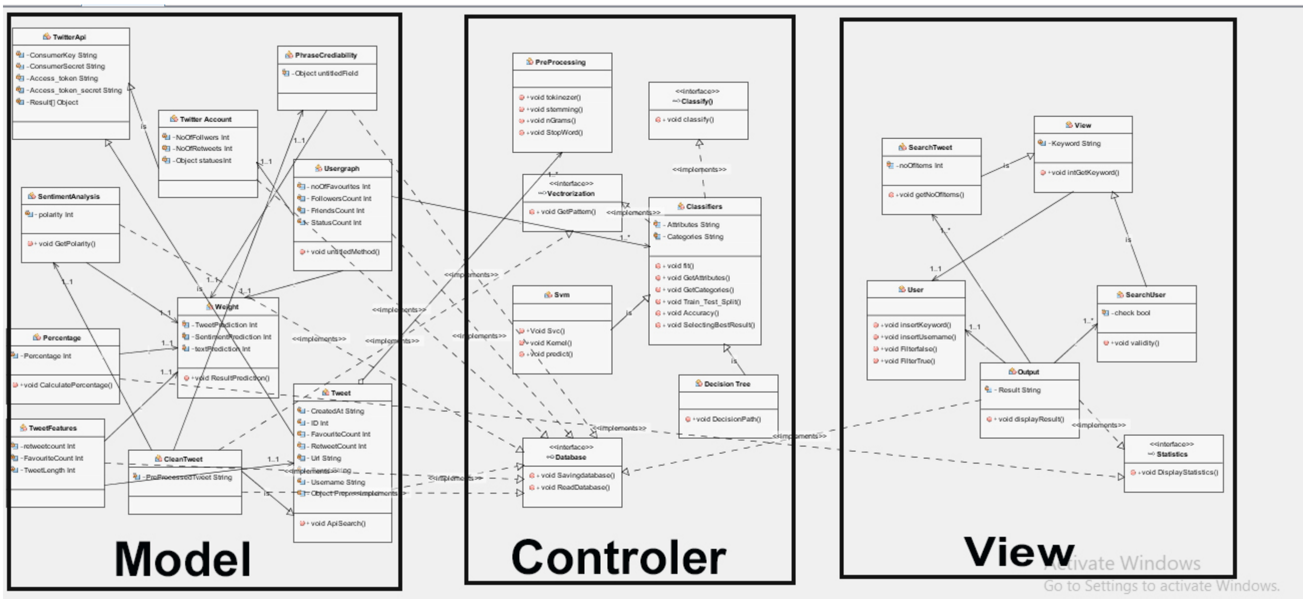
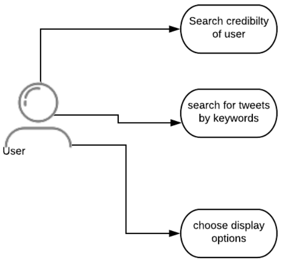


Figure 3.4: Class diagram

3.8.0.1 Constraints:

Lists any restrictions upon the general state or behavior of instances of this class.

3.9 Operational Scenarios



Scenario one:

user can search about a certain user by entering a specific username and detect if it's a fake or real user.

Scenario two:

Moreover he can also search by entering a keyword and it retrieve related tweets and he can also choose how to display those tweets.

3.10 Preliminary Schedule Adjusted

Project phase:	**Start Date**	**End Date**
Announce proposal for students	1 july 2019	15 july 2019
Register to projects	-	till end of july
Lecture writing paper skills	Second week of september 2019	
Proposal Evaluation	First week of October 2019	
SRS Evaluation	Second week of December 2019	
SDD Evalution	Third week of February 2020	
Prototype Evalution	3 days after midterm exams	
Technical Evaluation	1st week of May 2019	
Final Thesis	Last 10 days in June 2020	
Cermony	24 June 2020	

Figure 3.5: Schedule Adjusted

3.11 Appendices

3.11.1 Definitions, Acronyms, Abbreviations

- NLP :Natural language processing is a subfield of computer science, information
- API:An application programming interface (API) is a set of routines, protocols, and tools for building software applications
- GUI:Graphical user interface
- NLTK:Natural Language Toolkit [3] (NLTK) is a platform used for building Python programs that work with human language data for applying in statistical natural language processing (NLP)
- Python An interpreted high-level programming language for generalpurpose programming.

Chapter 4

Software Design Document

4.1 Introduction

4.1.1 Purpose

This software design document purpose is to fully describe the architecture of our web-based fake tweets detector.it will explain in details, the components of the system represented in the block diagram, the order of the project with sequence diagram, also the implementation of the project and its development will be shown in the class diagram . This software design document (SDD) is, therefore, intended for the stakeholders and developers of the our system

4.1.2 Scope

Detection of Fake news it has an enormous social impact as it can mislead citizens into believing misinformation about a specific product/ person or situation and the spread of economic and political fake news can directly affect the stock market and government economics in general. Also, Tourism income can be affected by fake news, as spreading fake news in countries can make tourists not interested in visiting certain places which costs losing much income.. This targets social media users that rely on social as their source of information.

4.1.3 Overview

Nowadays Twitter is one of the main source of news for a huge number of people, and twitter has no restrictions on what people write so this produce a big percentage of fake news . Those fake news become one of the most critical problems in the 21 century as it can affect politics , society and economy . This document will explore the use of an artificially intelligent computer system to help enhance the human ability to differentiate between the fake and real news and will also highlights the features and algorithms helping figuring out the fake news with the best accuracy.

4.1.4 Definitions and Acronyms

- NLP :Natural language processing is a subfield of computer science, information
- API:An application programming interface (API) is a set of routines, protocols,and tools for building software applications
- GUI:Graphical user interface
- NLTK:Natural Language Toolkit [3] (NLTK) is a platform used for building Python programs that work with human language data for applying in statistical natural language processing (NLP)
- Python An interpreted high-level programming language for generalpurpose programming.

4.2 System Overview

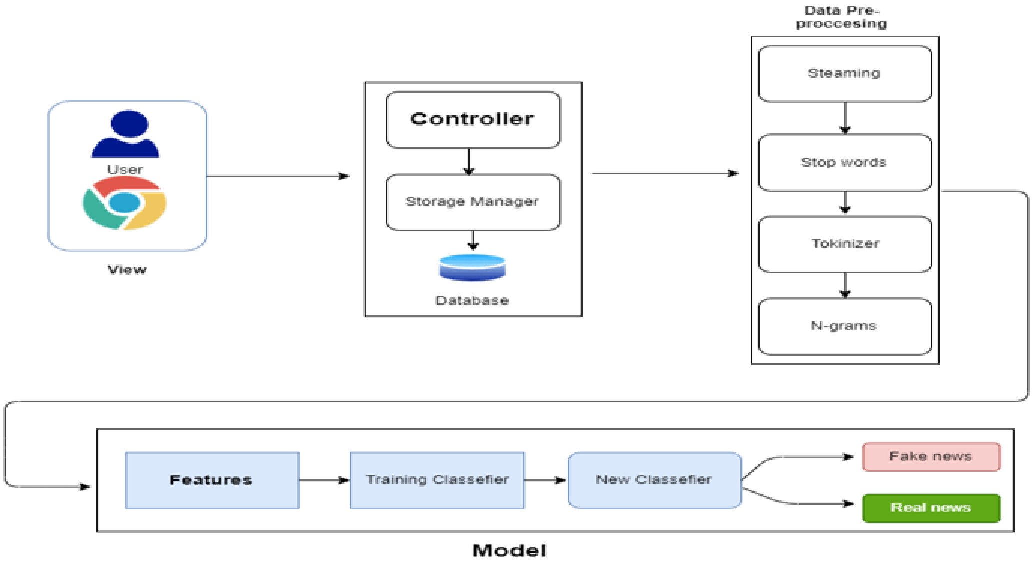


Figure 4.1: System Overview

4.2.0.1 Features

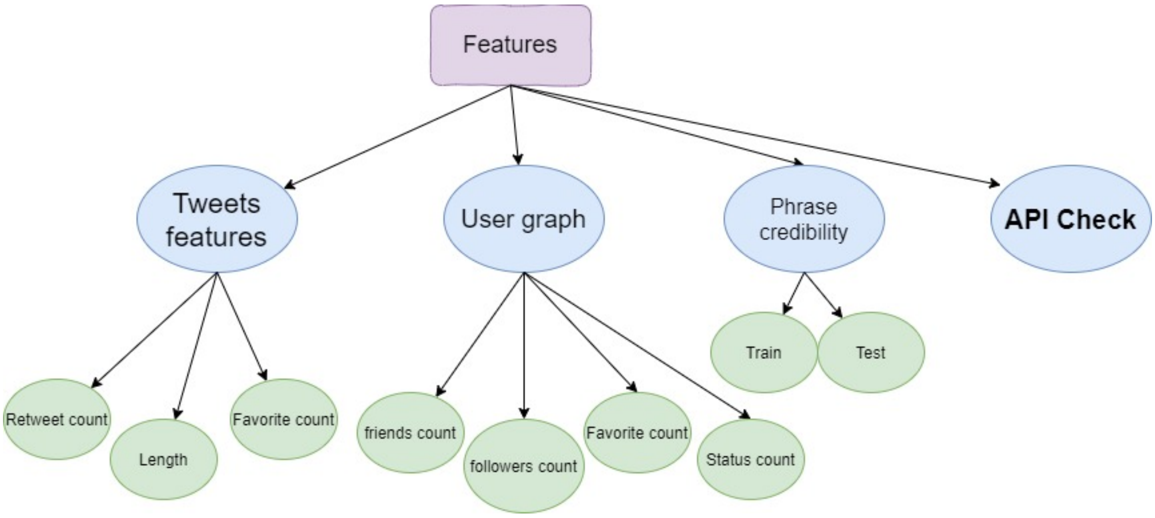


Figure 4.2: Features diagram

Our System aims to detect fake tweets by using machine learning and a combination of algorithms The proposed diagram using MVC model (Model View Controller),The user's view a web based application ,entering a topic to search on then passing tweets related to this topic to the controller , this tweets needs pre-processing to be well defined data to work on like (stemming , stop words , toknizer, n-grams). After that the controller will send the organized tweets to work on additional features:

- The first feature is gathering information about each tweet and actions made upon them like the retweet count , length of tweet and the favourite count helping us determining the credibility of the tweet and generating a pre- diction.
- The Second feature is the user graph which is gathering information about each user and actions made by them like the friends count screen name and the favourite count and representing it using a graph structure helping us determining the credibility of the person is he trusted or not.
- The third feature is the phrase credibility we check if this tweet is credible or not and generating a prediction.
- The Final feature is the API check we check if this piece of news do exist in a credible source of news like BBC or not and generating a prediction.

4.3 System Architecture

4.3.1 Architectural Design

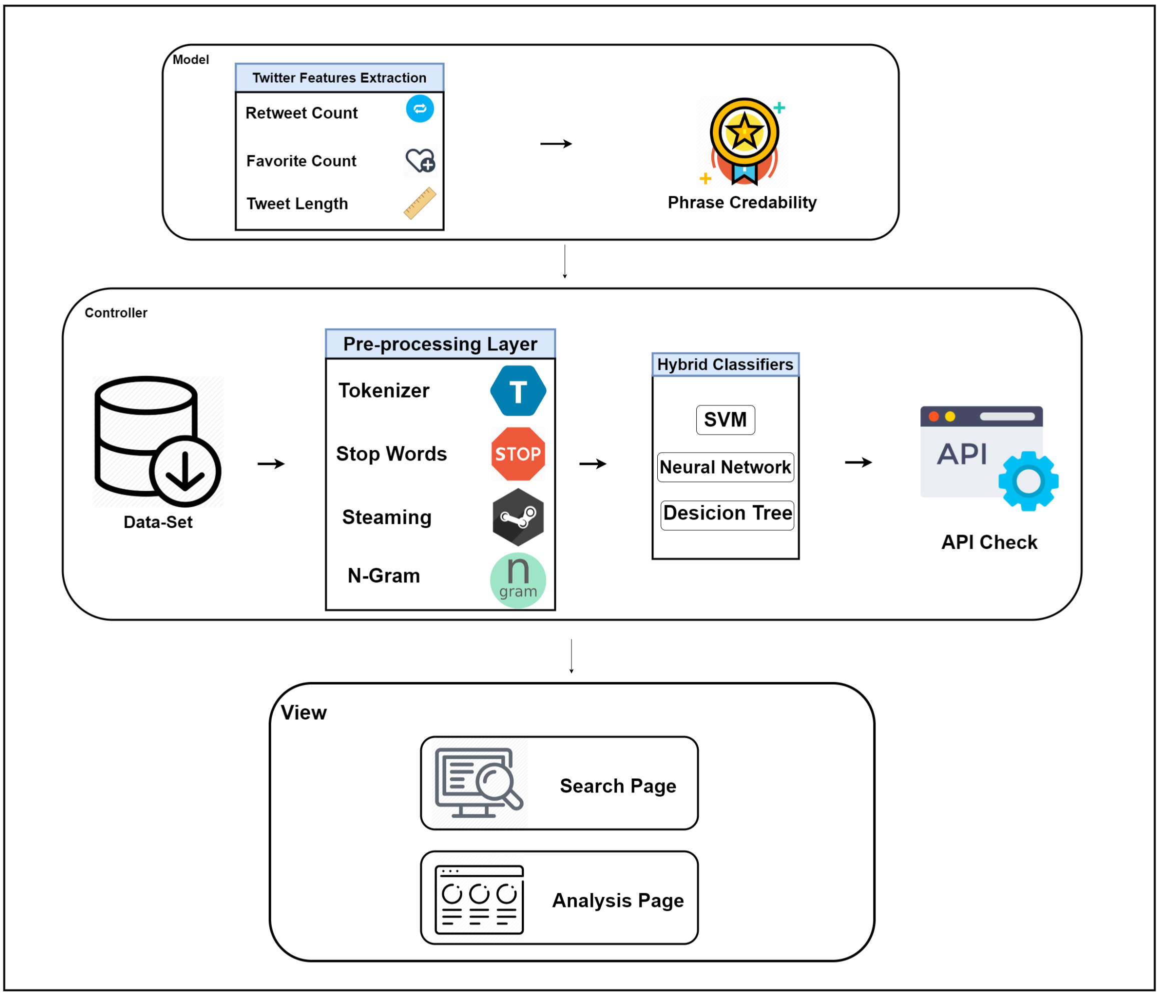


Figure 4.3: Architectural Design

4.3.1.1 Model

The model part is responsible for the functionality of the system , which is first doing preprocessing on data to make it in the form that is suitable for the functions to use (Tokenizer, stop words, Stemming,N-Gram) and then extracting tweet features like: Retweet count, Favourite count and Tweet length , sentiment analysis and phrase credibility , the final step is entering those features is a hybrid classifier between SVM and Decision Tree those are the algorithms we will use and sends it to the controller to save it in the database.

1- Algorithms:

- SVM : SVM plot each facts object as a point in n-dimensional area where n is the number of training we have which is fake and real, then we perform category by locating the hyperplane that differentiates the lessons very well.
- Decision Tree: Decision tree makes use of the tree illustration to solve the problem inwhich each leaf node corresponds to a class label and attributes are representedon the internal node of the tree.
- Neural networks :Set of algorithms, modeled loosely after the human brain, that are designed to understand patterns. They interpret sensory information through a kind of system perception, labeling or clustering raw input.

2-libraries:

- Twitter API:API lets in you to study and write Twitter information; in different words, it is able to be used to create new tweets, examine person profiles and the facts of followers (among other information from each profile), because it identifies the diverse Twitter programs and the customers who register.
- NLTK: Natural Language Toolkit (NLTK) is a platform used for building Python programs that work with human language statistics for applying in statistical herbal language processing (NLP). It consists of text processing libraries for tokenization, parsing, classification, stemming, tagging and semantic reasoning.
- SKLEARN : Scikit-learn is a free machine learning library for Python. It features various algorithms like support vector machine, random forests, and decision tree and it also supports Python numerical and scientific libraries like NumPy.
- Numpy: This library is responsible for handling arrays.

4.3.1.2 view

It is responsible for the presentation of data and representing the User Interface(UI). We have two different interfaces one is responsible for retrieving the data from the user and the second one is responsible for displaying the output data for the user and the analysis related to the data.

4.3.1.3 Controller

It is responsible for binding the view and model. The interactions and requests made within the view are taken and sent to the database to fetch data with the use of models then it forward data to the view again to be shown. The controller we have is: the user controller that deals with the user input that will be stored in the database and after applying our functionality on it, it then sends data to the view model to display the result for the user.

4.3.2 Decomposition Description

4.3.2.1 System Sequence Diagram

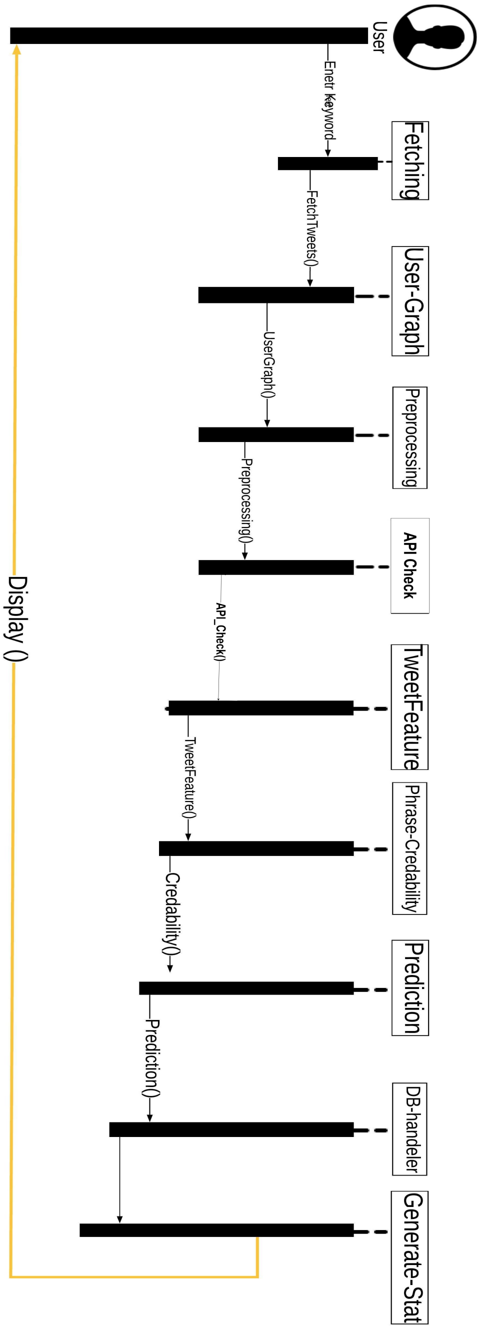


Figure 4.4: Sequence diagram

Sequence Diagram This diagram show the sequence of our project and how it will flow :

- The first step is user entering the keyword he/she want to search for
- Fetching: Get tweets related to the keyword user entered before from Twitter API and save it data-base.
- User-Graph: In this stage we search for the twitter account who posted every tweet, and check if it's a real account we save this tweet and if the account is fake we delete his tweet.
- Pre-processing: we prepare the tweet to be in the form needed for processing.
- API-Check: we check if this piece of news do exist in a credible source of news like BBC or not and generating a prediction.
- Tweet-Features: we gather information about each tweet and actions made upon them like the retweet count , length of tweet and the favourite count helping us determining the credibility of the tweet and generating a prediction.
- Phrase-Credibility: we check if this tweet is credible or not and generating a prediction.
- Prediction: In this stage it give a submission of every prediction multiply by it's weight.

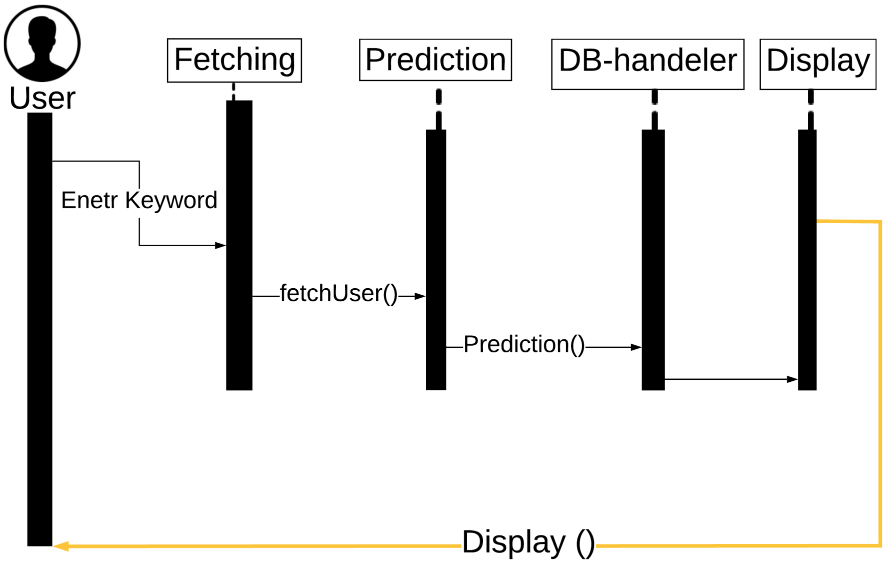


Figure 4.5: Sequence Diagram

This diagram shows the flow of the user search side

- first the user enters a username to search on.
- System starts to search this username on twitter from twitter API then it fetch Information related to this username.
- After fetching the information about the user(Screen-name,status-count,etc.) we forward the information to hybrid classifiers to detect the credibility of this user then the system send the result for the database.
- The finale stage is to get the data from the database and display it.

4.3.3 Activity Diagram

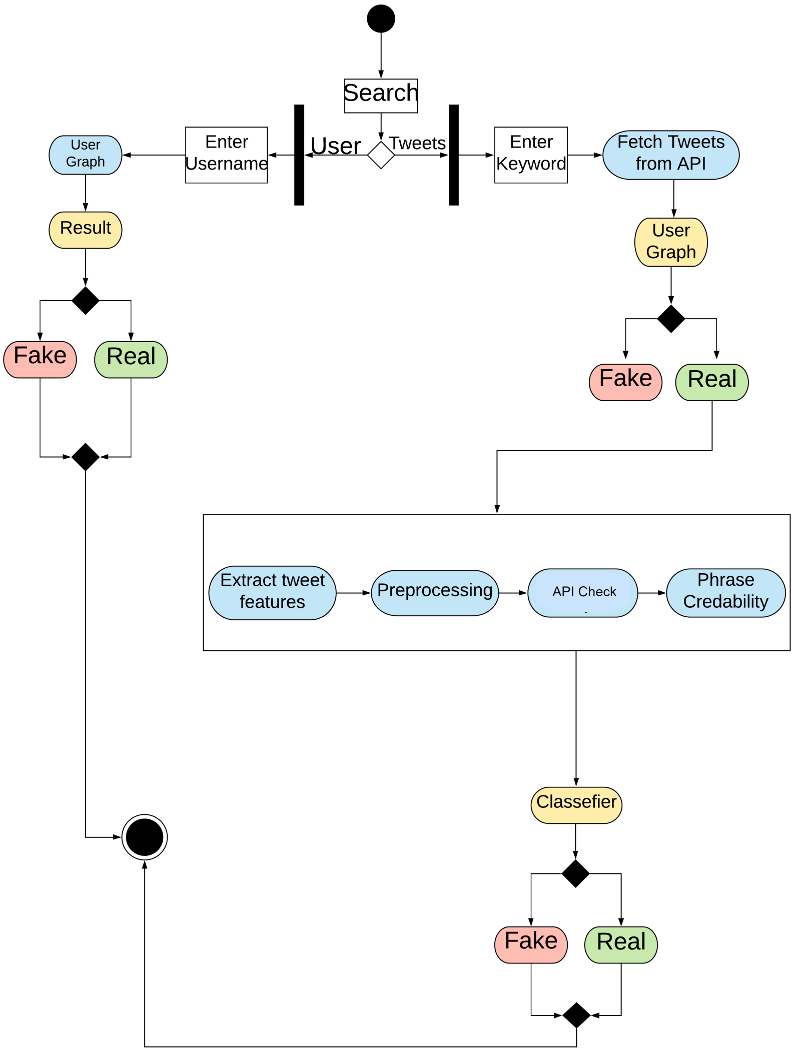


Figure 4.6: Activity Diagram

User side:

User first enters a username to search one and then we perform a user graph to show the result which is the user is credible or not

Tweet side:

user enters a tweet to search on and then the system fetch from twitter API returning the related tweets , after that we perform user graph and neglect the fake ones , the real user's tweets entered in the pre-processing stage , tweet features and the phrase credibility and api-check. All those stage's output entered in a classifier helping in differentiation between real and fake tweets

4.3.3.1 Class Diagram

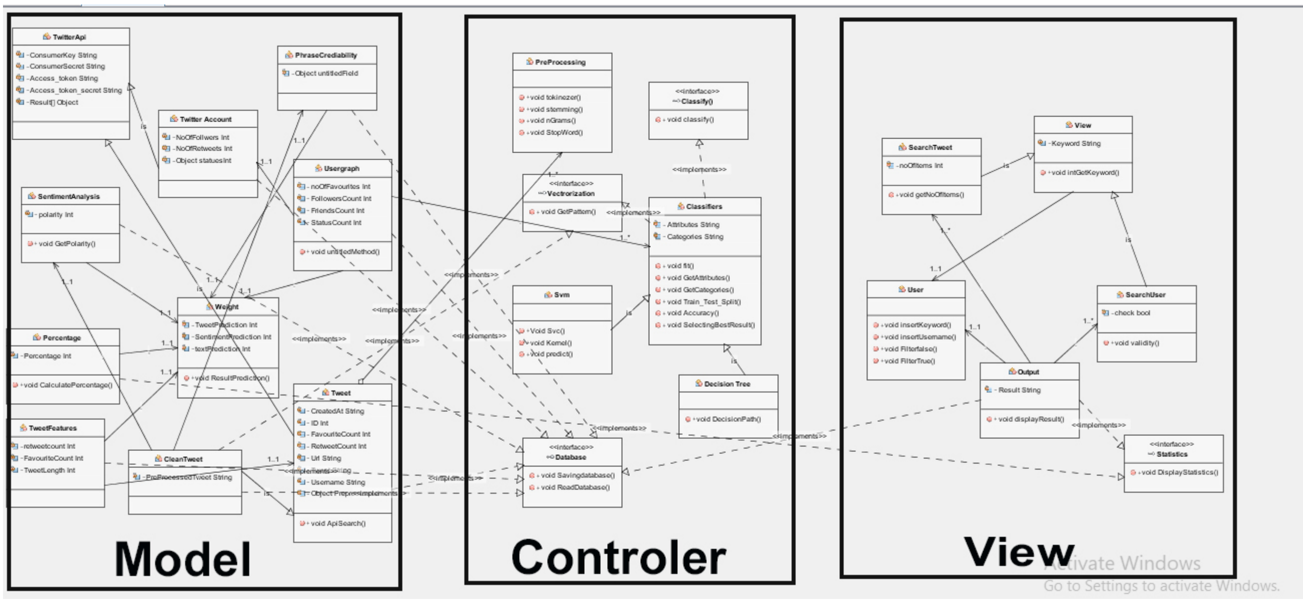


Figure 4.7: Class diagram

class name	twitterAPI
SuperClass	none
SubClass	Tweet and twitterAccount
purpose	this class saves information needed from twitterapi
Collaboration	TwitterAccount and tweet inherit the information in it
Attributes	Tweet
Operations	none

class name	twitterAccount
SuperClass	twitterAPI
SubClass	none
purpose	this class saves information needed about the users account on twitter
Collaboration	this class is associated with usergraph and implements database
Attributes	noOfFollowers , NoOfRetweets and Status
Operations	none

class name	API-Check
SuperClass	none
SubClass	none
purpose	this class saves importance of the tweet based on its existing in credible sites
Collaboration	this class is associated with weight , classifier and cleantweet also implements database
Attributes	User keyword
Operations	None

class name	Percentage
SuperClass	none
SubClass	none
purpose	this class takes prediction from weight class and calculates Percentages then save it in the database
Collaboration	associated with weight and implements database
Attributes	percentage
Operations	CalcutePercentage

class name	tweetFeatures
SuperClass	none
SubClass	none
purpose	this class saves information needed about the tweets and it's features
Collaboration	associated with weight and tweet and implements database
Attributes	RetweetCount , FavouritesCount and tweetLength
Operations	none

class name	CleanTweet
SuperClass	Tweet
SubClass	none
purpose	this class saves the tweet after being pre-processed and ready for classifier
Collaboration	Associated with sentiment analysis and phrase credibility , inherit Tweet and implements vectorization and database
Attributes	PreProcessedTweet
Operations	none

class name	weight
SuperClass	none
SubClass	none
purpose	this class saves the prediction of the three features and calculate the weight
Collaboration	associated with 5 classes sentimentAnalysis , percentage , tweetfeatures , phraseCreibility and usergrapgh
Attributes	tweetPrediction , sentiment Predicition , and textPredicition
Operations	ResultPrediction

class name	Tweet
SuperClass	twitterAPI
SubClass	CleanTweet
purpose	this class saves information about Tweets
Collaboration	Associated with tweetfeatures , Aggregated by pre-processing and implements database
Attributes	RetweetCount , FavouritesCount and tweetLength
Operations	ApiSearch

class name	usergraph
SuperClass	none
SubClass	none
purpose	this class saves information about the user tp perform usergraph function
Collaboration	Associated with twitteraccount and classifier
Attributes	StatusCount , FavouritesCount and friendsCount
Operations	UserGraph

class name	PhraseCredibility
SuperClass	twitterAPI
SubClass	CleanTweet
purpose	this class saves information about Tweets
Collaboration	Associated with weight and cleantweet
Attributes	RetweetCount , FavouritesCount and tweetLength
Operations	ApiSearch

class name	PreProcessing
SuperClass	none
SubClass	none
purpose	this class perform 5 functions of preprocessing on tweet
Collaboration	aggregated by tweet
Attributes	none
Operations	tokinezer , steemming , ngrams , stopwords

class name	classifiers
SuperClass	none
SubClass	SVM and DecisionTree
purpose	this class saves information about Classifiers used to train and test the data
Collaboration	Associated with usergraph and inherted by svm and decision tree
Attributes	attributes and categories
Operations	fit , train test split , selectingbestresult , classify

class name	SVM
SuperClass	classifier
SubClass	none
purpose	this class perform svm functions
Collaboration	inherit classifier
Attributes	none
Operations	svm , kernel and predict

class name	decisionTree
SuperClass	classifier
SubClass	none
purpose	this class perform decisiontree functions
Collaboration	inherit classifier
Attributes	none
Operations	DecisionPath

class name	view
SuperClass	none
SubClass	SearchTweet and SearchUser
purpose	this class saves the keyword entered by the user
Collaboration	inherited by searchtweet and searchuser and associated by user
Attributes	keyword
Operations	getkeyword

class name	searchtweet
SuperClass	view
SubClass	none
purpose	this class view the searchpage of output of tweets
Collaboration	inherit view and associated by output
Attributes	noOfItems
Operations	getnoOfItems

class name	searchuser
SuperClass	view
SubClass	none
purpose	this class view the searchpage of output of users
Collaboration	inherit view and associated by output
Attributes	check
Operations	Validity

class name	user
SuperClass	none
SubClass	none
purpose	this class takes input form the user to search on
Collaboration	associated with view and output
Attributes	none
Operations	insertkeyword , insertusername , filter true and filter false

class name	output
SuperClass	none
SubClass	none
purpose	this class saves the result and display it
Collaboration	associated by searchtweet , searchuser , and user
Attributes	result
Operations	displayresult

4.3.4 Design Rationale

As mentioned previously, we have used Model-View-Controller (MVC) as our architecture as it helped us separate the functionality and data of our system from the presentation. So, we can easily make modifications, re-use and optimize functionality part as it is our core. Also the software we are developing efficiency and accuracy is a very important aspect of it so it will be very sensitive with data so this should be developed in a very accurate and efficient way.

4.3.5 Possible Algorithms

There were so many alternative algorithms that we could have used like decision trees , support vector machine and neural network that are generally very good for text classification.

Decision Tree: Decision tree makes use of the tree illustration to solve the problem inwhich each leaf node corresponds to a class label and attributes are representing the internal node of the tree.
SVM: Linear SVM is given a set of train data which belong to a certain class to find an optimal separating line. It tries to maximize the distance between each class to avoid mis-classification. Then a test data are given to be classified to one of the classes formed before[5]. We have chooses the linear SVM as our classifier as after several experiments it was found out that the SVM gave the best result and most accurate with the highest f-measure which is technically the mean between the precision and the recall score.
Neural networks :Set of algorithms, modeled loosely after the human brain, that are designed to understand patterns. They interpret sensory information through a kind of system perception, labeling or clustering raw input.

4.4 Data Design

4.4.1 Data Description

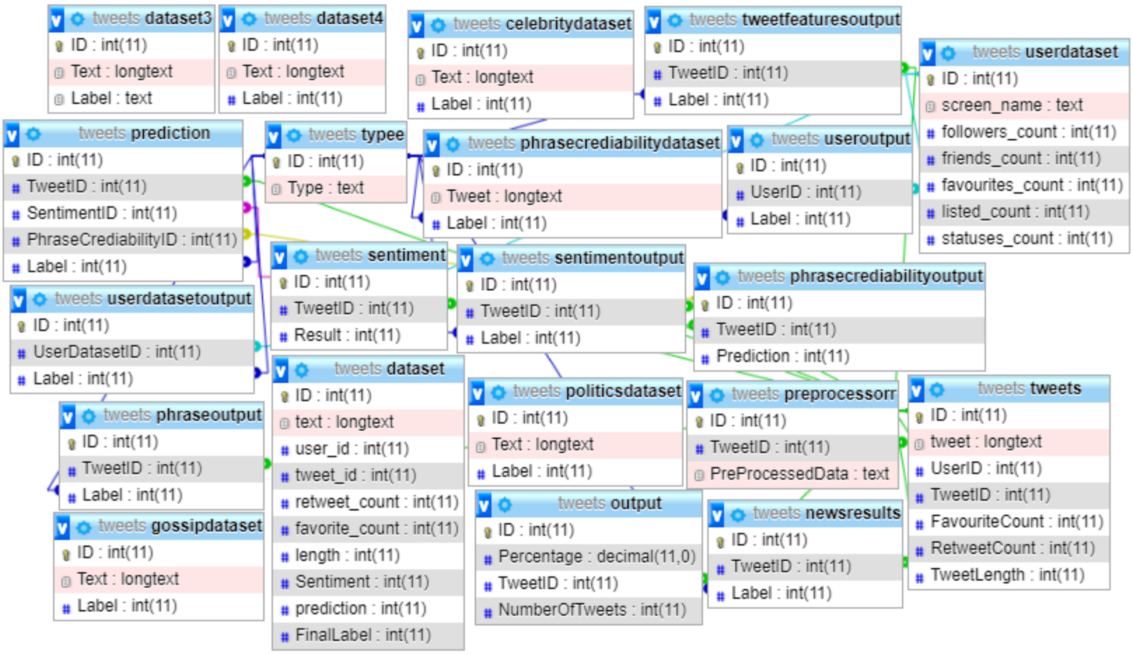


Figure 4.8: Database

4.4.2 Data Dictionary

- Userdataset :this table saves all information about the user like number of favourites , number of followers and screen name . also saves the searched on users.
- Pre-processor: In this table we saves all the data after pre-processing done on it. it has relation with history and tweets.
- Tweets: this table saves all information about the tweets like number of favourites , number of retweets on this tweets. also saves the searched on tweets extracted from twitter API.
- Output:Saves the statistics of each tweet and the percentage of the trueness of the tweet so it has relation with tweets table.
- Sentiment:Saves the result of the sentiment analysis feature which is the tweet having positive , negative or neutral effect so it has relation with tweets table.
- Type: the category of the tweet or user either fake or real and has relation with phraseoutput , prediction , useroutput , sentimentoutput and tweet featureoutput.
- Sentimentoutput : saves the searched on tweets from API with it's prediction of polarity after entered in a classifier.
- phraseCredibilitydataset: saves the dataset used to train the classifier with and has relations with phraseoutput and type.
- tweetfeatureoutput: saves the searched on tweets from API with it's prediction after applying tweetFeatures Feature on it.
- phrasecredibilityoutput: saves the result of the tweets dataset after entering the classifier.
- prediction : saves the prediction of the 3 features and the result of the weight function.
- userdatasetoutput:saves the result of the users dataset after entering the classifier.
- phraseoutput:saves the searched on tweets from API with it's prediction after entering in a classifier.
- newsresult:save the importance of searched tweet from api

4.5 Component Design

4.5.1 Algorithms

1-SVM : ”SVM” plot each data item as a point in n-dimensional space where n is the number of classes we have which is fake and real ,then we perform classification by finding the hyper-plane that differentiate the classes very well by maximize the distance between each class for decreasing error percentage.

2- Decision Tree : Decision tree uses the tree representation to solve the problem in which each leaf node corresponds to a class label and attributes are represented on the internal node of the tree.

3- Neural networks : Set of algorithms, modeled loosely after the human brain, that are designed to recognize patterns. They interpret sensory data through a kind of machine perception, labeling or clustering raw input.

4.5.2 Features

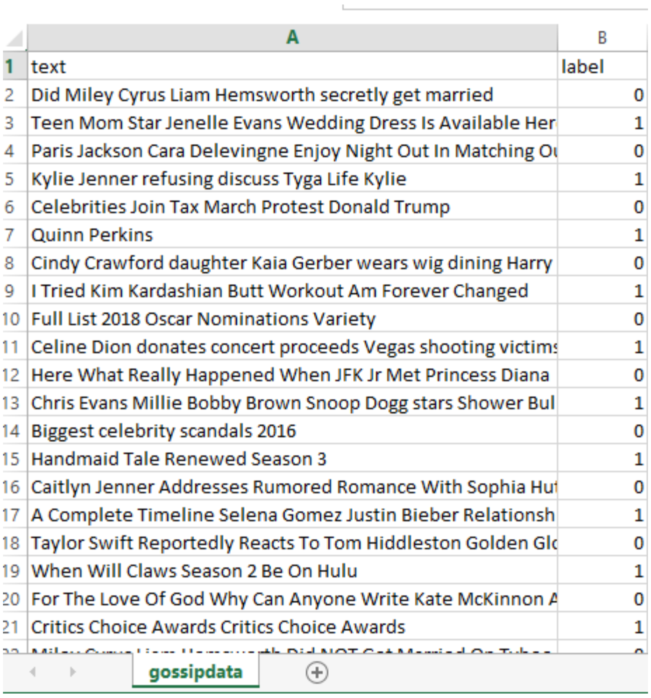
1- API check: we check if this piece of news do exist in a credible source of news like BBC or not and generating a prediction.

2-Tweets features: we gather information about each tweet and actions made upon them like the retweet count , length of tweet and the favourite count helping us determining the credibility of the tweet.

3-User graph:we gather information about each user and actions made by them like the friends count , screen name and the favourite count and representing it using a graph structure helping us determining the credibility of the person is he trusted or not.

4-Phrase credibility : Training and testing multiple data sets to help use in the classification.

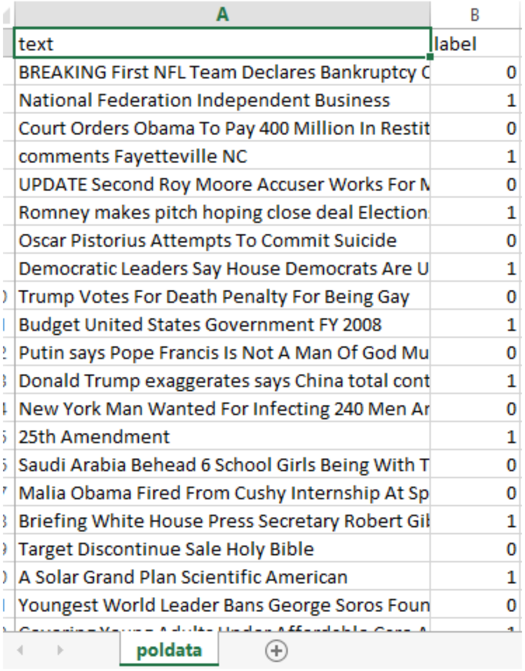
4.5.3 Data-set



	A	B
1	text	label
2	Did Miley Cyrus Liam Hemsworth secretly get married	0
3	Teen Mom Star Jenelle Evans Wedding Dress Is Available Her	1
4	Paris Jackson Cara Delevingne Enjoy Night Out In Matching Ou	0
5	Kylie Jenner refusing discuss Tyga Life Kylie	1
6	Celebrities Join Tax March Protest Donald Trump	0
7	Quinn Perkins	1
8	Cindy Crawford daughter Kaia Gerber wears wig dining Harry	0
9	I Tried Kim Kardashian Butt Workout Am Forever Changed	1
10	Full List 2018 Oscar Nominations Variety	0
11	Celine Dion donates concert proceeds Vegas shooting victims	1
12	Here What Really Happened When JFK Jr Met Princess Diana	0
13	Chris Evans Millie Bobby Brown Snoop Dogg stars Shower Bul	1
14	Biggest celebrity scandals 2016	0
15	Handmaid Tale Renewed Season 3	1
16	Caitlyn Jenner Addresses Rumored Romance With Sophia Hut	0
17	A Complete Timeline Selena Gomez Justin Bieber Relationsh	1
18	Taylor Swift Reportedly Reacts To Tom Hiddleston Golden Glc	0
19	When Will Claws Season 2 Be On Hulu	1
20	For The Love Of God Why Can Anyone Write Kate McKinnon A	0
21	Critics Choice Awards Critics Choice Awards	1
22	Miley Cyrus Liam Hemsworth Did NOT Get Married On Tubes	0

Our first data set is for celebrity category ,contain the data used for training and testing the classifiers which was found on kaggle , by dividing it into 70-30 for training and testing.Our data set contain 2 columns

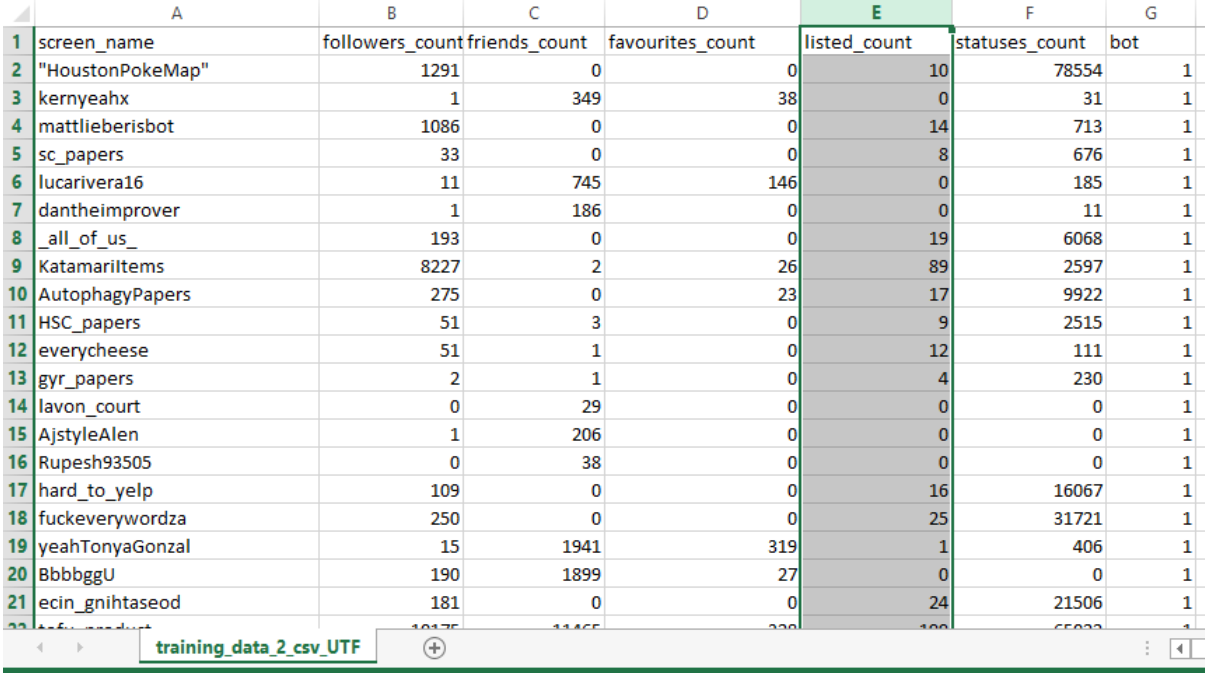
- text: This column contain the tweets itself.
- Label: "1" means tweet is Real and "0" means tweet is Fake.



A	B
text	label
BREAKING First NFL Team Declares Bankruptcy C	0
National Federation Independent Business	1
Court Orders Obama To Pay 400 Million In Restit	0
comments Fayetteville NC	1
UPDATE Second Roy Moore Accuser Works For M	0
Romney makes pitch hoping close deal Election	1
Oscar Pistorius Attempts To Commit Suicide	0
Democratic Leaders Say House Democrats Are U	1
Trump Votes For Death Penalty For Being Gay	0
Budget United States Government FY 2008	1
Putin says Pope Francis Is Not A Man Of God Mu	0
Donald Trump exaggerates says China total cont	1
New York Man Wanted For Infecting 240 Men Ar	0
25th Amendment	1
Saudi Arabia Behead 6 School Girls Being With T	0
Malia Obama Fired From Cushy Internship At Sp	0
Briefing White House Press Secretary Robert Gil	1
Target Discontinue Sale Holy Bible	0
A Solar Grand Plan Scientific American	1
Youngest World Leader Bans George Soros Foun	0

The second data set is for politics category ,contain the data used for training and testing the classifiers which was found on kaggle , by dividing it into 70-30 for training and testing.Our data set contain 2 columns

- text: This column contain the tweets itself.
- Label: ”1” means tweet is Real and ”0” means tweet is Fake.



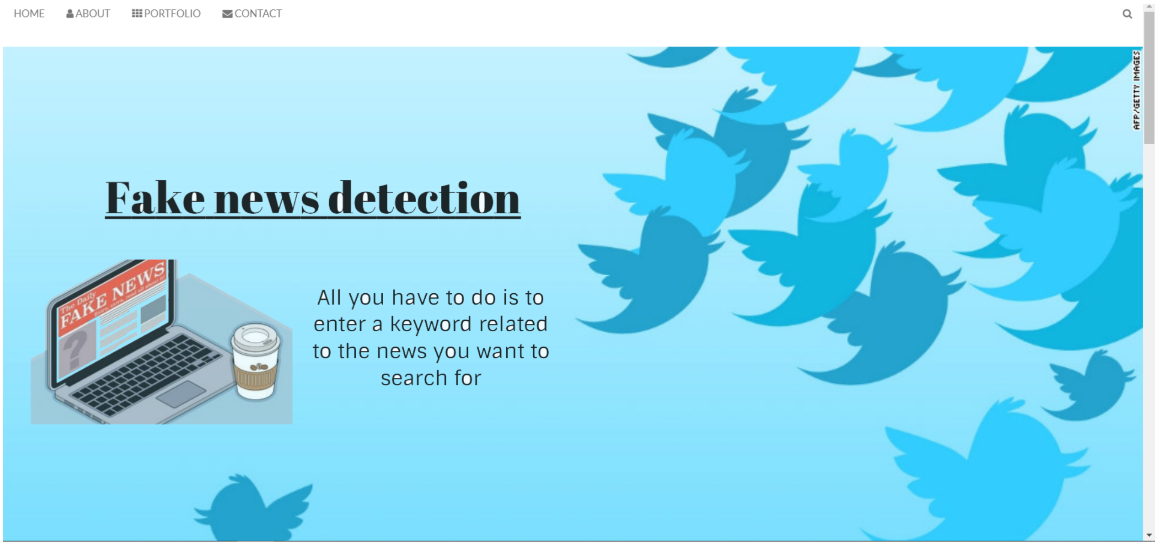
	A	B	C	D	E	F	G
1	screen_name	followers_count	friends_count	favourites_count	listed_count	statuses_count	bot
2	"HoustonPokeMap"	1291	0	0	10	78554	1
3	kernyeahx	1	349	38	0	31	1
4	mattlieberisbot	1086	0	0	14	713	1
5	sc_papers	33	0	0	8	676	1
6	lucarivera16	11	745	146	0	185	1
7	dantheimprover	1	186	0	0	11	1
8	_all_of_us_	193	0	0	19	6068	1
9	KatamariItems	8227	2	26	89	2597	1
10	AutophagyPapers	275	0	23	17	9922	1
11	HSC_papers	51	3	0	9	2515	1
12	everycheese	51	1	0	12	111	1
13	gyr_papers	2	1	0	4	230	1
14	lavon_court	0	29	0	0	0	1
15	AjstyleAlen	1	206	0	0	0	1
16	Rupesh93505	0	38	0	0	0	1
17	hard_to_yelp	109	0	0	16	16067	1
18	fuckeverywordza	250	0	0	25	31721	1
19	yeahTonyaGonzal	15	1941	319	1	406	1
20	BbbbggU	190	1899	27	0	0	1
21	ecin_gnihtaseod	181	0	0	24	21506	1

The third data set is for user-graph ,contain the data used for training and testing the classifiers which was found on kaggle , by dividing it into 70-30 for training and testing.Our data set contain 7 columns

- Screen-name: This column contain the username of user account .
- Followers-count:Number of people that follow this user .
- Friends-count Number of friends that the user follow them.
- favorite-count:Number of tweets that this user had liked.
- listed-count: How many people have added this user to a list.
- Status-count: How many times user changed his status.
- Bot: ”1” means tweet is Real and ”0” means tweet is Fake.

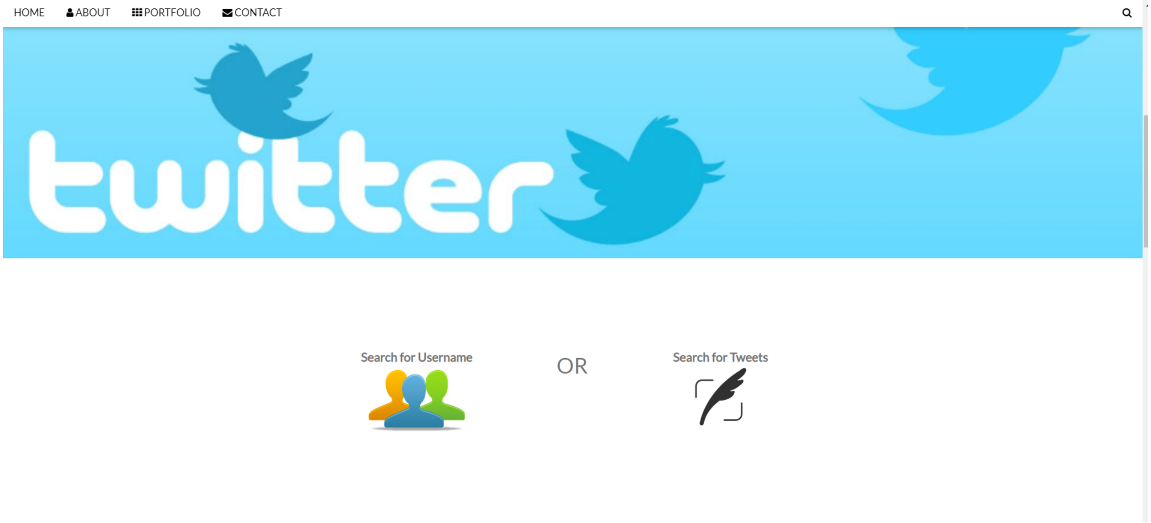
4.6 Human Interface Design

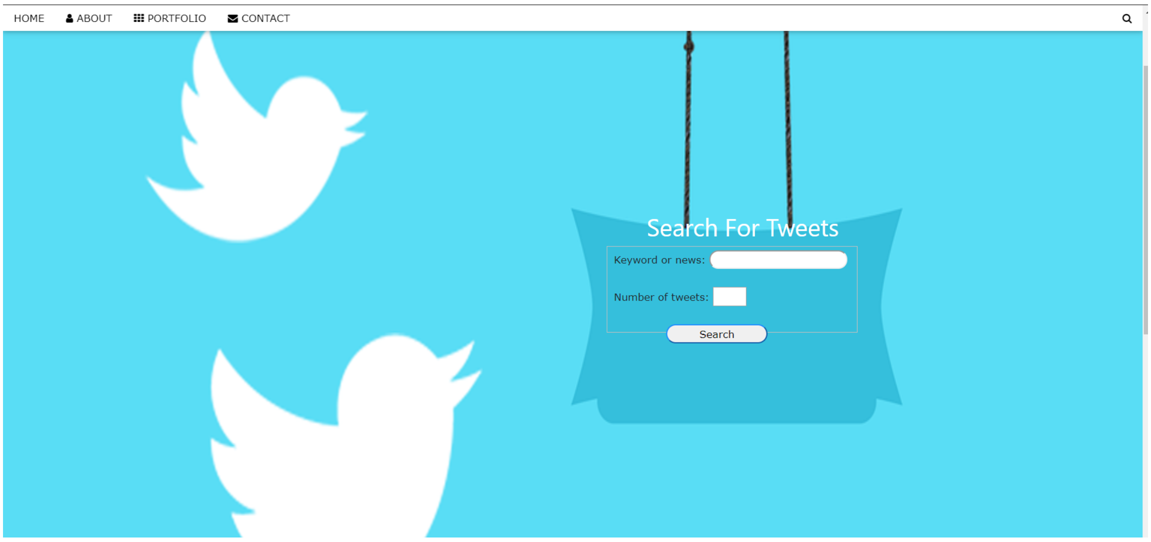
4.6.1 Screen Images



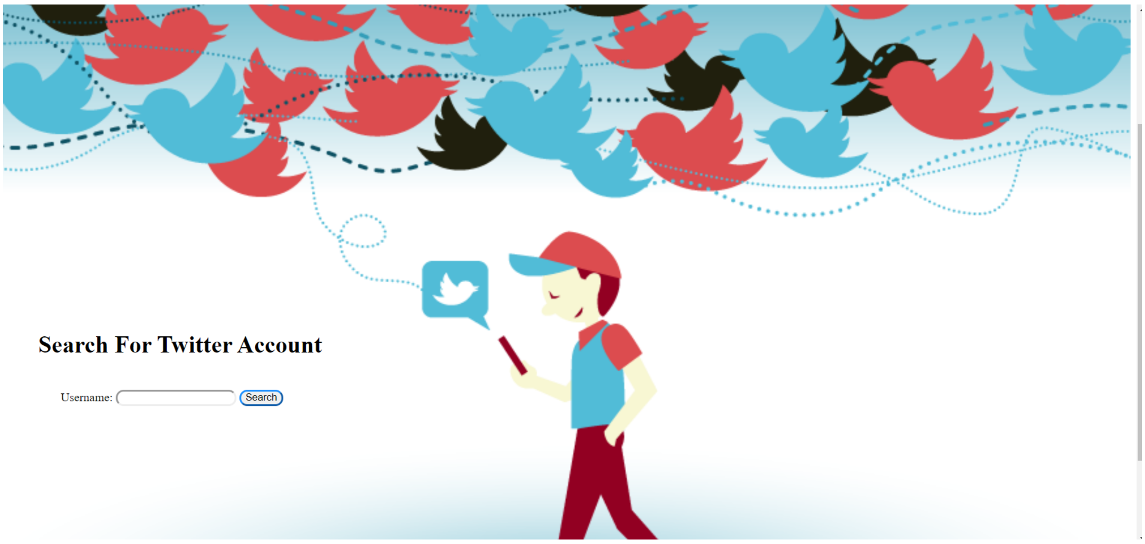
Fake news detection

All you have to do is to enter a keyword related to the news you want to search for


HOME
ABOUT
PORTFOLIO
CONTACT
twitter
Search for Username
OR
Search for Tweets



HOME
ABOUT
PORTFOLIO
CONTACT
Search For Tweets
Keyword or news:
Number of tweets:
Search

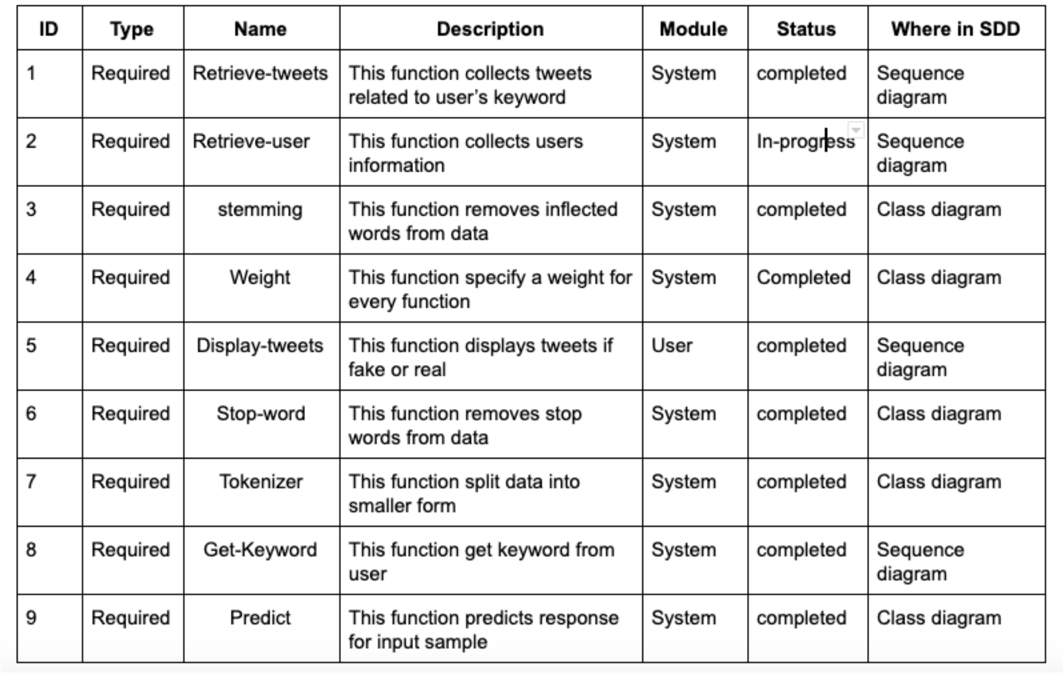


Search For Twitter Account

4.6.2 Screen Objects and Actions

Our web-based system is constructed in a friendly way to all type of users , as it have a small number of instructions that can be easily memorized which give the user a privilege to navigate through our system pages smoothly . The user starts by entering a keyword to search on and can specify the max number of tweets he wants to search for , the way to show it and also the interval of time of the tweets , Also the user can enter a username to know wither this user is trust-worthy or not.

4.7 Requirements Matrix



ID	Type	Name	Description	Module	Status	Where in SDD
1	Required	Retrieve-tweets	This function collects tweets related to user's keyword	System	completed	Sequence diagram
2	Required	Retrieve-user	This function collects users information	System	In-progress	Sequence diagram
3	Required	stemming	This function removes inflected words from data	System	completed	Class diagram
4	Required	Weight	This function specify a weight for every function	System	Completed	Class diagram
5	Required	Display-tweets	This function displays tweets if fake or real	User	completed	Sequence diagram
6	Required	Stop-word	This function removes stop words from data	System	completed	Class diagram
7	Required	Tokenizer	This function split data into smaller form	System	completed	Class diagram
8	Required	Get-Keyword	This function get keyword from user	System	completed	Sequence diagram
9	Required	Predict	This function predicts response for input sample	System	completed	Class diagram

Chapter 5

Evaluation

5.1 Introduction

The user has two ways for searching the first one is searching about the credibility of a specific user by entering the username. The second one is by searching about a piece of news which also has two ways; either by entering the news itself or by entering a keyword and the system gets all the news related and defining its credibility. If the user choose the second option which is searching about a news then the system go checks the credibility of the user before gathering the news needed related to this news or keyword. After the implementation process where all the system's functionalities are implemented, the system should pass through the evaluation process, in order to decide the best features to be used and the best algorithm. In this phase, the system is tested through many experiments. The experiments are divided into three experiments in which the first experiment aims to show a comparison between different weights we have given to some Features in order to select the best and accurate weights for them. The second one shows the comparison between different weights given to different classifiers. Finally the third one shows how we applied these algorithms in the whole system to improve the performance of the system.

5.2 Experiment 1 - Features Selection

5.2.1 Setup

Our system works with three different Datasets:

1. Our first dataset is for the first category; Celebrities. This one contain the data used for training and testing the classifiers which was found on Kaggle. This dataset contain 2 columns and it works by dividing it into 70-30 percent for training and testing.
2. Our second dataset is for the second category; Politics. This one contains the data used for training and testing the classifiers which was also found on kaggle. This dataset contain 2 columns and it works by dividing it into 70-30 percent for training and testing.
3. The third dataset is used for the user-graph. It contains the data used for training and testing the classifiers.It was also found on kaggle.

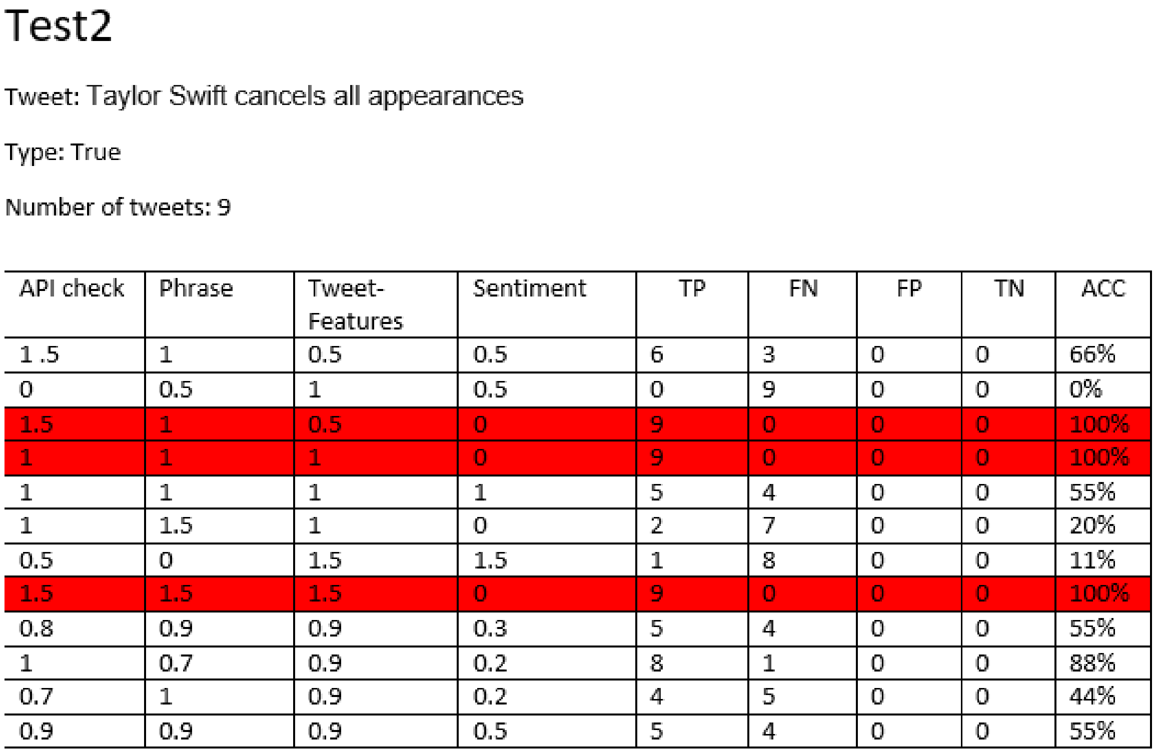
5.2.2 Goal

This experiment aims to determine the best weight for each feature that when we combine all the features together they gave us the best accuracy.

5.2.3 Results

Now after applying different range of weights on each feature to reach highest accuracy .The selected features are Tweet Features, Phrase credibility and API check .Testing these weights we reached that the Best accuracy was reached by those weights for each one : API check had the highest weight which is 1.5, given the phrase credibility weight of 1 and tweet features 0.5.(as shown in Table 5.1).

5.2.4 Sample of testing



Test2

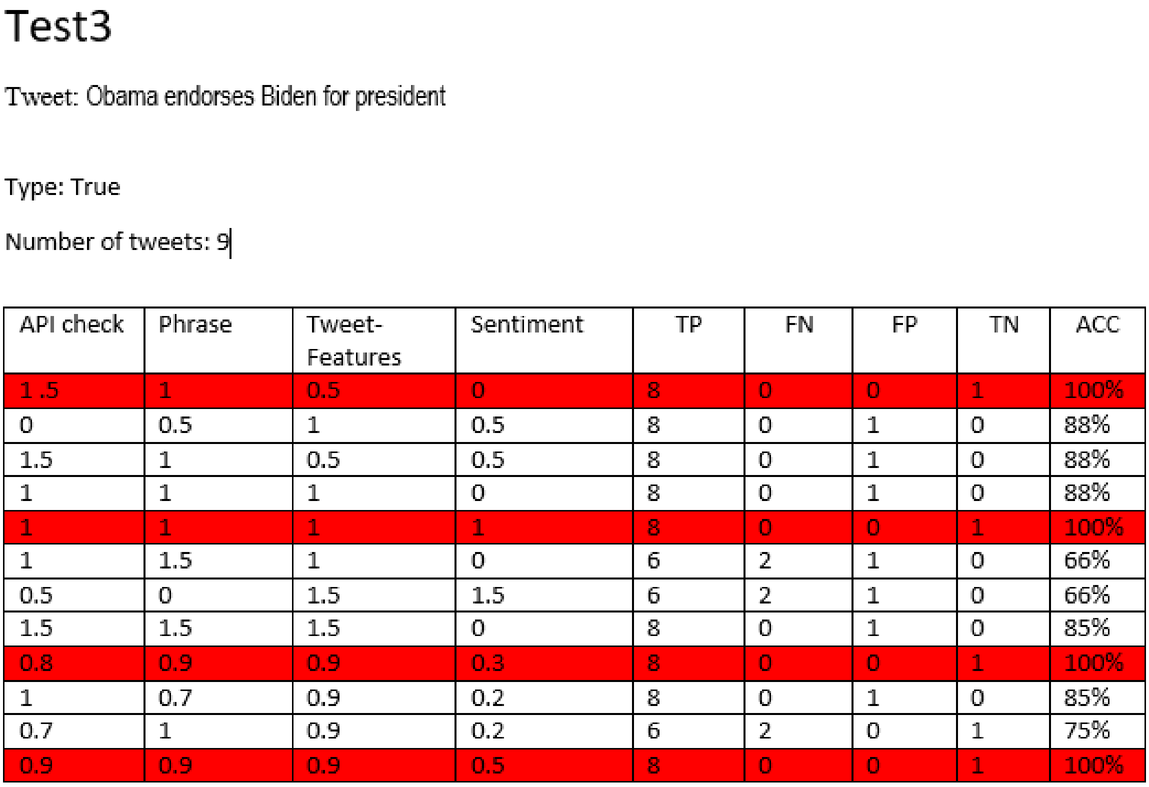
Tweet: Taylor Swift cancels all appearances

Type: True

Number of tweets: 9

API check	Phrase	Tweet-Features	Sentiment	TP	FN	FP	TN	ACC
1 .5	1	0.5	0.5	6	3	0	0	66%
0	0.5	1	0.5	0	9	0	0	0%
1.5	1	0.5	0	9	0	0	0	100%
1	1	1	0	9	0	0	0	100%
1	1	1	1	5	4	0	0	55%
1	1.5	1	0	2	7	0	0	20%
0.5	0	1.5	1.5	1	8	0	0	11%
1.5	1.5	1.5	0	9	0	0	0	100%
0.8	0.9	0.9	0.3	5	4	0	0	55%
1	0.7	0.9	0.2	8	1	0	0	88%
0.7	1	0.9	0.2	4	5	0	0	44%
0.9	0.9	0.9	0.5	5	4	0	0	55%

Figure 5.1: Testing on Celebrities category



Test3

Tweet: Obama endorses Biden for president

Type: True

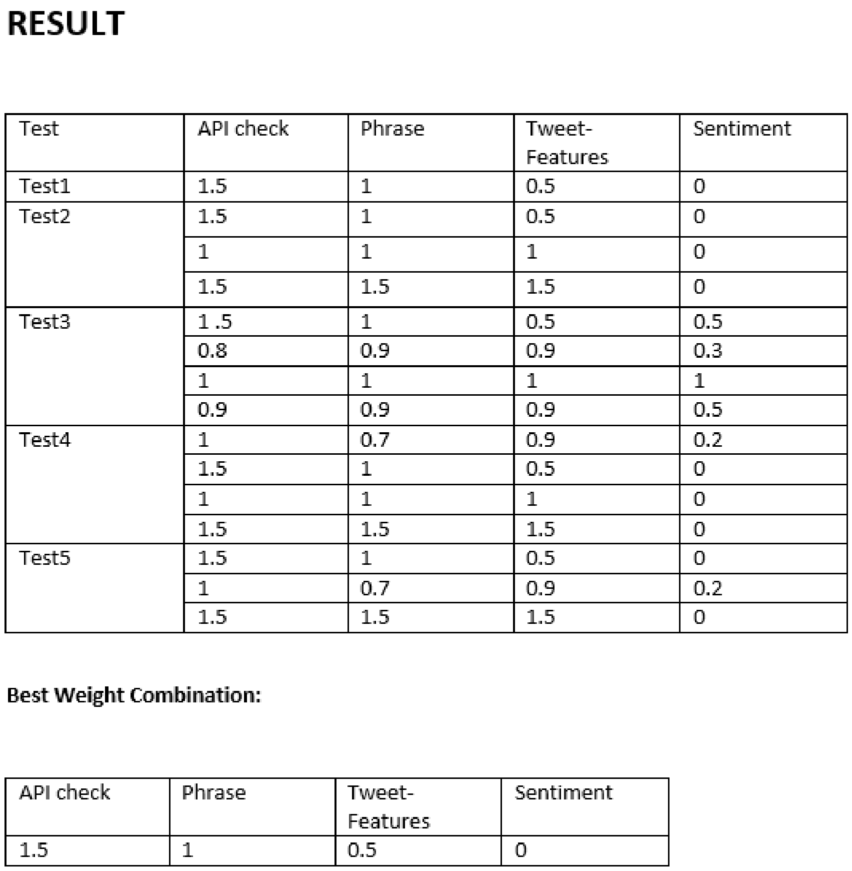
Number of tweets: 9

API check	Phrase	Tweet-Features	Sentiment	TP	FN	FP	TN	ACC
1 .5	1	0.5	0	8	0	0	1	100%
0	0.5	1	0.5	8	0	1	0	88%
1.5	1	0.5	0.5	8	0	1	0	88%
1	1	1	0	8	0	1	0	88%
1	1	1	1	8	0	0	1	100%
1	1.5	1	0	6	2	1	0	66%
0.5	0	1.5	1.5	6	2	1	0	66%
1.5	1.5	1.5	0	8	0	1	0	85%
0.8	0.9	0.9	0.3	8	0	0	1	100%
1	0.7	0.9	0.2	8	0	1	0	85%
0.7	1	0.9	0.2	6	2	0	1	75%
0.9	0.9	0.9	0.5	8	0	0	1	100%

Figure 5.2: Testing on the Politics category

Here in each test we combined 4 different features and we changed the weight of each feature 12 times to achieve the best combination accuracy on the same topic as showed in tweet field to find out the highest accuracy.

5.2.5 Results



RESULT

Test	API check	Phrase	Tweet-Features	Sentiment
Test1	1.5	1	0.5	0
Test2	1.5	1	0.5	0
	1	1	1	0
	1.5	1.5	1.5	0
Test3	1 .5	1	0.5	0.5
	0.8	0.9	0.9	0.3
	1	1	1	1
	0.9	0.9	0.9	0.5
Test4	1	0.7	0.9	0.2
	1.5	1	0.5	0
	1	1	1	0
	1.5	1.5	1.5	0
Test5	1.5	1	0.5	0
	1	0.7	0.9	0.2
	1.5	1.5	1.5	0

Best Weight Combination:

API check	Phrase	Tweet-Features	Sentiment
1.5	1	0.5	0

Figure 5.3: Comparison result table

Our result shows best combination in each test ,there is more than one combination of weights that reached the highest accuracy , so we choose the combination that fits and gave us the highest accuracy in the majority of tests we made.

5.3 Experiment 2 - Testing the classifier

5.3.1 Setup

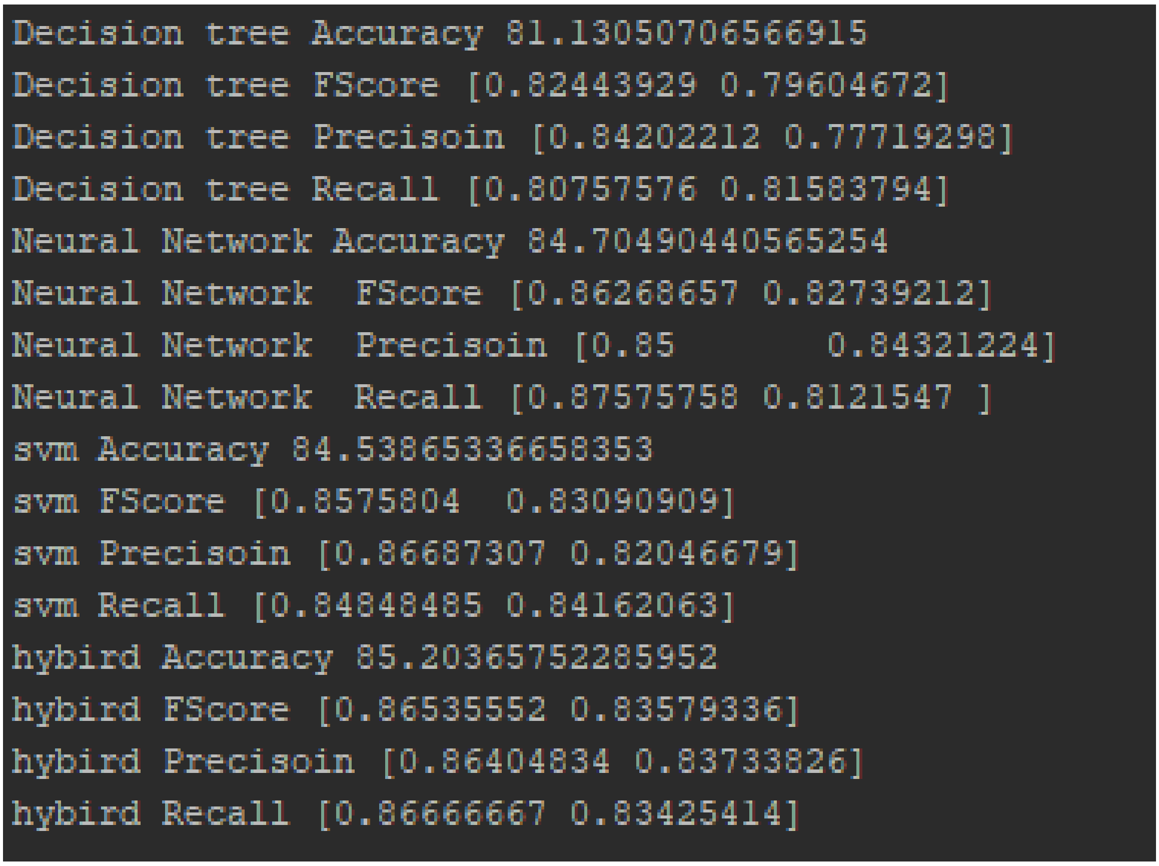
We classified the news into two categories. First Category is for celebrities and the second category is for Politics. Each category containing different set of news.

5.3.2 Goal

These experiments aim to design an approach which is totally automated and running without the doctor's supervision. Also, to determine which classifier will be used with each layer.

5.3.3 Results

We combined selected algorithms which are Decision Tree, Neural Networks and support vector machine (SVM). combing these classifiers the highest accuracy achieved was 85.2 percent(as shown in Table 5.4) So after some observations that were made on the accuracies resulted, it was noticed that when we combined those classifiers and after testing the suitable features.



```
Decision tree Accuracy 81.13050706566915
Decision tree FScore [0.82443929 0.79604672]
Decision tree Precisoin [0.84202212 0.77719298]
Decision tree Recall [0.80757576 0.81583794]
Neural Network Accuracy 84.70490440565254
Neural Network  FScore [0.86268657 0.82739212]
Neural Network  Precisoin [0.85       0.84321224]
Neural Network  Recall [0.87575758 0.8121547 ]
svm Accuracy 84.53865336658353
svm FScore [0.8575804  0.83090909]
svm Precisoin [0.86687307 0.82046679]
svm Recall [0.84848485 0.84162063]
hybird Accuracy 85.20365752285952
hybird FScore [0.86535552 0.83579336]
hybird Precisoin [0.86404834 0.83733826]
hybird Recall [0.86666667 0.83425414]
```

Figure 5.4: Hybrid classifier result

Chapter 6

Conclusion

In our document, we have presented the design, development and evaluation of our system to detect and classify the real and fake news using machine learning. The system mainly detects fake and real news along with detecting fake user using the user graph. The recognition process starts with detecting the credibility of the user, if user is credible then we proceed to the following phase if not the analysis stops. if user is credible then it proceeds pre-processing, segmentation, features extraction and classification. The proposed method works using a multi layered cascaded architecture of three efficient classifiers, the first is Neural Network(NN), the second on is Decision Tree and the last one is Support Vector Machine (SVM), which achieved accuracy of 85.2 percent. This works with two categories which are Celebrities and Politics. in Our Project we are introduced an easy reliable website that anyone can use to search for the credibility of a certain user or a piece of news. Also we wanted to make this project useful from different aspects by providing an additional feature which is allowing the user to enter keywords for the news they want to track for a certain duration.

6.1 Future directions

In the near future, we aim to accomplish an overall system for more categories beside increasing the size of the dataset to maintain system stability. Moreover we aim to increase the performance by decrease the time taken to detect the news. s

Bibliography

[1] Jang, Y., Park, C., amp; Seo, Y. (2019). Fake News Analysis Modeling Using Quote Retweet. Electronics, 8(12), 1377. doi:10.3390/electronics8121377

[2]Atodiresei, C., Tănăselea, A., amp; Iftene, A. (2018). Identifying Fake News and Fake Users on Twitter. Procedia Computer Science, 126, 451-461. doi:10.1016/j.procs.2018.07.279

[3]Girgis, S., Amer, E., amp; Gadallah, M. (2018). Deep Learning Algorithms for Detecting Fake News in Online Text. 2018 13th International Conference on Computer Engineering and Systems (ICCES). doi:10.1109/icces.2018.8639198

[4]Povoda, L., Burget, R., amp; Dutta, M. K. (2016). Sentiment analysis based on Support Vector Machine and Big Data. 2016 39th International Conference on Telecommunications and Signal Processing (TSP). doi:10.1109/tsp.2016.7760939

[5]Jain, A., amp; Kasbe, A. (2018). Fake News Detection. 2018 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS). doi:10.1109/sceecs.2018.8

[6]Kaliyar, R. K. (2018). Fake News Detection Using A Deep Neural Network. 2018 4th International Conference on Computing Communication and Automation (ICCCA). doi:10.1109/ccaa.2018.8777343

[7]Gilda, S. (2017). Notice of Violation of IEEE Publication Principles: Evaluating machine learning algorithms for fake news detection. 2017 IEEE 15th Student Conference on Research and Development (SCOReD). doi:10.1109/scored.2017.8305411

[8]Ajao, O., Bhowmik, D., amp; Zargari, S. (2018). Fake News Identification on Twitter with Hybrid CNN and RNN Models. Proceedings of the 9th International Conference on Social Media and Society. doi:10.1145/3217804.3217917

[9]Gilda, Shlok. (2017). Evaluating machine learning algorithms for fake news detection. 110-115. 10.1109/SCORED.2017.8305411.

[10]S. Krishnan and M. Chen, "Identifying Tweets with Fake News," 2018 IEEE International Conference on Information Reuse and Integration (IRI), Salt Lake City, UT, 2018, pp. 460-464, doi: 10.1109/IRI.2018.00073.

[11]Hassan, N., Gomaa, W., Khoriba, G., amp; Haggag, M. (2020). Credibility Detection in Twitter Using Word N-gram Analysis and Supervised Machine Learning Techniques. International Journal of Intelligent Engineering and Systems, 13(1), 291-300. doi:10.22266/ijies2020.0229

[12]O. Ajao, D. Bhowmik and S. Zargari, "Sentiment Aware Fake News Detection on Online Social Networks," ICASSP 2019 - 2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Brighton, United Kingdom, 2019, pp. 2507-2511, doi: 10.1109/ICASSP.2019.8683170.

[13]https://brand24.com

[14]https://app.awario.com//project/9684/alert/600031436