VIVEKANAND EDUCATION SOCIETY'S

INSTITUTE OF TECHNOLOGY

Department of Computer Engineering

Project Report on

Fake News Detection

In partial fulfillment of the Fourth Year (Semester–VII),

Bachelor of Engineering

(B.E.) Degree in Computer Engineering at the University of Mumbai Academic

Year 2017-2018

Project Mentor

Mrs. Manisha Gahirwal
Assistant Professor

Submitted by

Jayesh Bhatia	D17B-08
Devansh Khakhar	D17B-31
Tanvi Kulkarni	D17B-36
Sanjana Moghe	D17B-43

(2017-18)

VIVEKANAND EDUCATION SOCIETY'S

INSTITUTE OF TECHNOLOGY

Department of Computer Engineering

Certificate

This is to certify that **Jayesh Bhatia, Devansh Khakhar, Tanvi Kulkarni, Sanjana Moghe** of Fourth Year Computer Engineering studying under the University of Mumbai have satisfactorily completed the project on "**Fake News Detection**" as a part of their coursework of PROJECT-II for Semester-VIII under the guidance of their mentor **Mrs. Manisha Gahirwal** in the year 2017-2018.

This project report entitled "**Fake News Detection**" by **Jayesh Bhatia, Devansh Khakhar, Tanvi Kulkarni, Sanjana Moghe** is approved for the degree of Bachelor of Engineering.

Programme Outcomes	Grade
PO1,PO2,PO3,PO4,PO5,PO6,PO7 ,PO8, PO9, PO10, PO11, PO12 PSO1, PSO2	

Date:
Project Guide:
Mrs. Manisha Gahirwal

Project Report Approval

For

B. E (Computer Engineering)

This thesis/dissertation/project report entitled *Fake News Detection* by *Jayesh Bhatia, Devansh Khakhar, Tanvi Kulkarni, Sanjana Moghe* is approved for the degree of Bachelor of Engineering.

Internal Examiner

External Examiner

Head of the Department

Principal

Date:
Place:

Declaration

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

--   --

 Jayesh Bhatia, D17B-08   Devansh Khakhar, D17B-31

--   --

 Tanvi Kulkarni, D17B-36   Sanjana Moghe, D17B-43

Date:

ACKNOWLEDGEMENT

We are thankful to our college Vivekanand Education Society's Institute of Technology for considering our project and extending help at all stages needed during our work of collecting information regarding the project.

It gives us immense pleasure to express our deep and sincere gratitude to Assistant Professor **Mrs. Manisha Gahirwal** for her kind help and valuable advice during the development of project synopsis and for her guidance and suggestions.

We are deeply indebted to Head of the Computer Department **Dr.(Mrs.) Nupur Giri** and our Principal **Dr. (Mrs.) J.M. Nair ,** for giving us this valuable opportunity to do this project.

We express our hearty thanks to them for their assistance without which it would have been difficult in finishing this project synopsis and project review successfully.

We convey our deep sense of gratitude to all teaching and non-teaching staff for their constant encouragement, support and selfless help throughout the project work. It is great pleasure to acknowledge the help and suggestion, which we received from the Department of Computer Engineering.

We wish to express our profound thanks to all those who helped us in gathering information about the project. Our families too have provided moral support and encouragement at several times.

Computer Engineering Department
COURSE OUTCOMES FOR B.E PROJECT

Learners will be to,

Course Outcome	Description of the Course Outcome
CO 1	Able to apply the relevant engineering concepts, knowledge and skills towards the project.
CO2	Able to identify, formulate and interpret the various relevant research papers and to determine the problem.
CO 3	Able to apply the engineering concepts towards designing solution for the problem.
CO 4	Able to interpret the data and datasets to be utilized.
CO 5	Able to create, select and apply appropriate technologies, techniques, resources and tools for the project.
CO 6	Able to apply ethical, professional policies and principles towards societal, environmental, safety and cultural benefit.
CO 7	Able to function effectively as an individual, and as a member of a team, allocating roles with clear lines of responsibility and accountability.
CO 8	Able to write effective reports, design documents and make effective presentations.
CO 9	Able to apply engineering and management principles to the project as a team member.
CO 10	Able to apply the project domain knowledge to sharpen one's competency.
CO 11	Able to develop professional, presentational, balanced and structured approach towards project development.
CO 12	Able to adopt skills, languages, environment and platforms for creating innovative solutions for the project.

ABSTRACT

Social media for news consumption is a double-edged sword. On the one hand, its low cost and easy access lead people to seek out and consume news from social media. On the other hand, it enables the widespread of "fake news", i.e., low quality news with intentionally false information. Fake news is a growing menace in the society. Fake news is intentionally written to mislead readers to believe false information, which makes it difficult to detect based on news content. Two major psychology factors make consumers naturally vulnerable to the fake news: (i) Naive Realism: consumers tend to believe that their perceptions of reality are the only accurate views. (ii) Confirmation Bias: consumers prefer to receive information that confirms their existing views.

This project aims to solve the problem by developing a system which classifies the news as fake and real. The input news is taken through a text box and the output classifies the news into two categories namely 'True' and 'Fake' depending upon the percentage of F-score. The main processes which lead to the generation of F-score are extraction, preprocessing, analysis of the data and then classifying it using a suitable algorithm. We use methods like tokenization and generation of word cloud to process the extracted data. Further classification of the data(news) is done by a suitable algorithm either Regression,SVM, Random Forest which leads to the generation of F-score.

Table of Contents

Chapter 1: Introduction

In this chapter, we give a brief introduction to the project. The motivation behind choosing to work on this project is also given. We mention the shortcomings of already existing systems and define the problem, while recapitulating the relevance of our system. Here, the methodology that we will be using is highlighted.

1.1 Introduction:

Fake news, defined by the New York Times as "a made-up story with an intention to deceive", often for a secondary gain, is arguably one of the most serious challenges facing the news industry today.

Facebook and Google have had a significant role in the spread of fake news.But both the companies are working their way to curb this phenemenon.Google came up with a new product called Fact Check that will be available in Search and News. Google itself will not verify the accuracy of reports, but the company created the "Fact Check" tag to identify news reports as having been fact-checked by other news publishers and fact-checking organizations.Facebook explained that it's been focusing on three areas, including the disruption of economic incentives for fake news creators to push such stories, new products to stop the spread of fake news, and helping people make more informed decisions when they see potential fake news.

Facebook had initially used a plug-in called BS-Detector which gave a warning message whenever any fake article was being accessed.But it later got rejected by Mark Zuckerberg. Thus, fake news is becoming a major topic of discussion nowadays.

1.2 Motivation:

Fake news is increasingly becoming a menace to our society. Fake news is usually generated for commercial interests however in the recent times many groups have been known to initiate fake news in order to influence policies and events around the world.The extensive spread of fake news has the potential for extremely negative impacts on individuals and society. Therefore, fake news detection on social media has recently become an emerging research that is

attracting tremendous attention For example in India, circulation of fake news lead to spreading of various hoaxes during the Demonetization period.There should be proper functioning system to distinguish the legitimate news from the fake news and hence this project. At the end the user will know the probability of the news being fake or not.

1.3 Drawback of the existing system:

1.BSDetector:

A browser extension for both Chrome and Mozilla-based browsers, B.S. Detector searches all links on a given webpage for references to unreliable sources. It then provides visual warnings about the presence of questionable links or the browsing of questionable websites This system had been used by Facebook as a method to better detect fake news until Mark Zuckerberg handicapped the plug-in by displaying a warning as unsafe when attempted to use.

2.PolitiFact:

PolitiFact is a fact-checking website that rates the accuracy of claims used by news reporters and editors.The drawback of this system is that the article claimed is reviewed personally by three of their editors before it goes for further classification.Thus, a lot of manual work is required for every claim.

1.4 Problem Definition:

The problem definition for this project is to implement a model which classifies news articles as fake or legitimate. To do that, we input any news user wants through an URL. It then summarizes the link given and generates results which tells us the correctness of the news.

1.5 Relevance of the project:

Social media is our go-to for any sort of information and knowledge gathering.When this same media is in speculation of providing false news or fake news in order to deceive the user of the

original claim, techniques need to be used to prevent this menace from growing.There should be a system to identify the fake news, prevent it from reaching the masses and making sure it is not repeated. Thus a fake news detector which inputs text of an article which user wants to verify and classifying it to being fake or not is important to be developed today.

1.6 Methodology employed for development:

We have used the Agile methodology to implement our project. The reason for using the an agile methodology is that frequent changes can be easily accommodated and the stakeholders involvement is high.

Agile provides multiple opportunities for stakeholder and team engagement – before, during, and after each Sprint. By involving the client in every step of the project, there is a high degree of collaboration between the client and project team, providing more opportunities for the team to truly understand the client's vision.

By breaking down the project into manageable units, the project team can focus on high-quality development, testing, and collaboration. Also, by producing frequent builds and conducting testing and reviews during each iteration, quality is improved by finding and fixing defects quickly and identifying expectation mismatches early.

Chapter 2: Literature Survey

In the literature survey, we have given a detailed explanation of all the sources considered.This includes papers referred with their abstracts and the inferences we have drawn from each one of them.It helps us to analyze the requirements of our project better.

2.1 Research Papers

2.1.1. Niall J. Conroy, Victoria L. Rubin, and Yimin Chen: Automatic Deception Detection: Methods for Finding Fake News, Published in: ASIST 2015, November 6-10, 2015, St. Louis, MO, USA

Abstract: This research surveys the current state-of-the-art technologies that are instrumental in the adoption and development of fake news detection. Fake news detection is defined as the task of categorizing news along a continuum of veracity, with an associated measure of certainty. Veracity is compromised by the occurrence of intentional deceptions. The nature of online news publication has changed, such that traditional fact checking and vetting from potential deception is impossible against the flood arising from content generators, as well as various formats and genres. The paper provides a typology of several varieties of veracity assessment methods emerging from two major categories – linguistic cue approaches (with machine learning), and network analysis approaches. The paper proposes an innovative hybrid approach that combines linguistic cue and machine learning, with network-based behavioral data.

Inference: Linguistic and network-based approaches have shown high accuracy results in classification tasks within limited domains. This discussion drafts a basic typology of methods available for further refinement and evaluation, and provides a basis for the design of a comprehensive fake news detection tool. Techniques arising from disparate approaches may be utilized together in a hybrid system, whose features are summarized:

•Linguistic processing should be built on multiple layers from word/lexical analysis to highest discourse-level analysis for maximum performance.

• As a viable alternative to strictly content-based approaches, network behavior should be combined to incorporate the 'trust' dimension by identifying credible source see .

• Tools should be designed to augment human judgement, not replace it. Relations between machine output and methods should be transparent.

• Contributions in the form of publicly available gold standard datasets should be in linked data format to assist in up-to-date fact checking.

2.1.2   Leslie Ball, Jennifer Elworthy: Fake or real? The computational detection of online deceptive text, Published in: Journal of Marketing Analytics September 2014, Volume 2, Issue 3, pp 187–201

Abstract: Online repositories are providing business opportunities to gain feedback and opinions on products and services in the form of digital deposits. Such deposits are, in turn, capable of influencing the readers' views and behaviours from the posting of misinformation intended to deceive or manipulate. Establishing the veracity of these digital deposits could thus bring key benefits to both online businesses and internet users. Although machine learning techniques are well established for classifying text in terms of their content, techniques to categorise them in terms of their veracity remain a challenge for the domain of feature set extraction and analysis. To date, text categorisation techniques for veracity have reported a wide and inconsistent range of accuracies between 57 and 90 per cent. This paper evaluates the accuracy of detecting online deceptive text using a logistic regression classifier based on part of speech tags extracted from a corpus of known truthful and deceptive statements. An accuracy of 72 per cent is achieved by reducing 42 extracted part of speech tags to a feature vector of six using principal component analysis. The results compare favourably to other studies. Further improvements can be made by training machine learning algorithms on more complex feature vectors by combining the key features identified in this study with others from disparate feature domains.

Inference: This paper proposed the use of logistic regression to discriminate between truthful and deceptive text statements in relation to product reviews. Trained on POS feature vectors, the classifier produced an average accuracy of 71.67 per cent when optimised using PCA (reduction to six features), regularisation, feature scaling and the second highest cross-validation accuracy. Deceptive text was characterised most strongly by superlative adverbs, superlative adjectives and possessive pronouns, while technical symbols, interjections, foreign words, particles and pre-determiners typified truthful text. Further analysis is required into the benefits of reducing the size of the input feature vector both through PCA and through the evaluation of the logistic regression feature parameters. More emphasis should be placed on cross-corpus analysis of classification models and the composition of features from disparate domains. Finally, model accuracy may be enhanced by combining text classification with scales of truthfulness or multiple categories that are more useful to an end user in a review-oriented domain

2.1.3   Kai Shu , Amy Sliva , Suhang Wang , Jiliang Tang , and Huan Liu: Fake News Detection on Social Media: A Data Mining Perspective, published in: ACM SIGKDD Explorations Newsletter, 2017

Abstract: The extensive spread of fake news has the potential for extremely negative impacts on individuals and society. Therefore, fake news detection on social media has recently become an emerging research that is attracting tremendous attention. Fake news detection on social media presents unique characteristics and challenges that make existing detection algorithms from traditional news media ineffective or not applicable. First, fake news is intentionally written to mislead readers to believe false information, which makes it difficult and nontrivial to detect based on news content; therefore, we need to include auxiliary information, such as user social engagements on social media, to help make a determination. Second, exploiting this auxiliary information is challenging in and of itself as users' social engagements with fake news produce data that is big, incomplete, unstructured, and noisy. In this survey, we present a comprehensive review of detecting fake news on social media, including fake news characterizations on psychology and social theories, existing algorithms from a data mining perspective, evaluation metrics and representative datasets.

Inference: With the increasing popularity of social media, more and more people consume news from social media instead of traditional news media. However, social media has also been used to spread fake news, which has strong negative impacts on individual users and broader society. This article explored the fake news problem by reviewing existing literature in two phases: characterization and detection. In the characterization phase, it introduced the basic concepts and principles of fake news in both traditional media and social media. In the detection phase, it reviewed existing fake news detection approaches from a data mining perspective, including feature extraction and model construction. It also further discussed the datasets, evaluation metrics, and promising future directions in fake news detection research and expand the field to other applications.

2.1.4 Victoria L. Rubin, Niall J. Conroy, Yimin Chen, and Sarah Cornwell: Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News, Published in: Proceedings of NAACL-HLT 2016, pages 7–17, San Diego, California, June 12-17, 2016.

Abstract: Satire is an attractive subject in deception detection research: it is a type of deception that intentionally incorporates cues revealing its own deceptiveness. Whereas other types of fabrications aim to instill a false sense of truth in the reader, a successful satirical hoax must eventually be exposed as a jest. This paper provides a conceptual overview of satire and humor, elaborating and illustrating the unique features of satirical news, which mimics the format and style of journalistic reporting. Satirical news stories were carefully matched and examined in contrast with their legitimate news counterparts in 12 contemporary news topics in 4 domains (civics, science, business, and "soft" news). Building on previous work in satire detection, this article proposed an SVM based algorithm, enriched with 5 predictive features (Absurdity, Humor, Grammar, Negative Affect, and Punctuation) and tested their combinations on 360 news articles. Our best predicting feature combination (Absurdity, Grammar and Punctuation) detects satirical news with a 90% precision and 84% recall (F-score=87%). This work in algorithmically identifying satirical news pieces can aid in minimizing the potential deceptive impact of satire.

Inference: This paper translated theories of humor, irony, and satire into a predictive method for satire detection that reaches relatively high accuracy rates (90% precision, 84% recall, 87% F-score). Since satirical news is at least part of the time deceptive, identifying satirical news pieces can aid in minimizing the potential deceptive impact of satirical news. Practically, this study frames fake news as a worthy target for filtering due to its potential to mislead news readers. Areas of further investigation can include ways to translate more complex characteristics of the anatomy of satire into linguistic cues. Critique and call to action, combined with mockery, is a key component of satire, but this critical component has not yet received much attention in the field of NLP. This feature could be subject to automated discourse-level quantification through the presence of imperative sentences. Also, their positive results of shallow sy hintax features showed us that more complex language patterns, for example deep syntax and the ordering of grammatical patterns might also be detectable in satire through techniques such as regular expression pattern matching against a grammatical parse of article content.

2.2 Summary

Papers	Abstract	Methodology	Drawbacks
Paper 1 Automatic Deception Detection: Methods for Finding Fake News	The paper provides a typology of several varieties of veracity assessment methods emerging from two major categories – linguistic cue approaches and	Bag of words,Analysis of deception cues using n-grams frequencies and PCFG.	Linguistic processing should be built on multiple layers from word/lexical analysis to highest discourse-level analysis for maximum

	network analysis approaches.		performance
Paper 2 Fake or real? The computational detection of online deceptive text	This paper evaluates the accuracy of detecting online deceptive text using a logistic regression classifier based on part of speech tags extracted from a corpus of known truthful and deceptive statements.	Corpus loaded into GATE, tokenized with POS tags, queried and exported to spreadsheet as input to ML algorithm.	Reduce the size of the input feature vector through PCA and logistic regression,more analysis on cross-corpus analysis of classification models.
Paper 3 Fake News Detection on Social Media: A Data Mining Perspective	This paper presents a comprehensive review of detecting fake news on social media, including fake news characterizations on psychology and social theories, existing algorithms	N grams , POS tagger, Latent Dirichlet allocation (LDA), Recurrent Neural Network (RNN), Google Relation Extraction Corpus, PCFG, Convolutional Neural Networks(CNN).	Since fake news may commonly mix true statements with false claims, it makes more sense to predict the likelihood of fake news instead of producing a binary value.

	from a data mining perspective, evaluation metrics and representative datasets.		
Paper 4 Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News.	This paper provides a conceptual overview of satire and humor, elaborating and illustrating the unique features of satirical news, which mimics the format and style of journalistic reporting. It translates theories of humor, irony, and satire into a predictive method for satire detection with a relatively high accuracy rate (90% precision, 84% recall, 87% F-score)	N grams , POS tagger, TF-IDF, Linguistic Inquiry and Word Count (LIWC), Support Vector Machines (SVM).	Does not include ways to translate more complex characteristics of the anatomy of satire into linguistic cues.

Table 1

2.2 Newspaper articles

nk_social icon

ED

WhatsApp hits 200 mn user milestone in India

PIL to regulate calls on FB, WhatsApp

It's not easy in a digital world to deal with fake news

Social media has become a prime mover of news today, and while it can be a great tool of engagement and information, there are many challenges it faces in terms of credibility. Platforms such as Facebook, Twitter and Whatsapp are flooded with information: How do you separate the wheat from the chaff?

Last week a post claimed that India had launched the first hospital on rails in the world and there was a flood of praise for the Government and the Railways. However, the Lifeline Express launched way back in 1991 has already covered 18 States and two lakh km. Social media tells us that the Unesco declared 'Jana Gana Mana' the best national anthem in the world, and that the new 2000 rupee note has a GPS chip to detect hidden money. The list goes on. As media persons we may think twice before believing such stories, but others often take what's flashing on the screen as the truth. Therein lies the problem. Fake news may not just be frivolous or mischievous. It can have serious repercussions should it convey communal, racist or sexist overtones. We saw it in action a few years ago when Nort-Easterners fled Bengaluru due to threats conveyed over social media.

Fig 1

e Indian EXPRESS   Home   India   World   Cities   Opinion   Sports   IPL 2018   Entertainment   Life

With fake news becoming a growing concern across the world, many countries have introduced anti-fake news bill which has attracted a lot of attention and widespread criticism as well. In India, the Narendra Modi government withdrew a guideline punishing journalists for fake news after the Information and Broadcasting Ministry's move was severely criticised. Recently, Mark Zuckerberg was under scrutiny over breach of the data of 50 million Facebook users.

Fig 2

≡   TH   How to spot fake news?

Birla and P slot hoax messages into three broad categories –
political/ideological, money-based schemes that often infect your system with
malware, and the ones that exist merely for nuisance value. Birla says, "Some of
the forwards, such as the frequent UNESCO awards that the national anthem
wins, can be easily debunked. However, there are some that are tougher to
crack, such as the rumour that the Shivaji statue in Mumbai is supposed to have
many scientific benefits. We check by googling it, and looking for the original
source of the information. We do not use any high-end gadgets. If we find that a
hoax has already been busted, we give due credit."

Software engineer Prashant KM gives some basic tips to stave off false
information. "An image file can be verified on Google image search and will give
you a quick match. I use plug-ins like RevEye on Chrome to check the veracity
of any forward I receive. Reverse imaging is also helpful, especially in
discovering the truth behind many missing cases."

He adds, "I spend hours convincing friends and family that everything they find
online is not necessarily true. I wish people would treat these messages with
some scepticism."

Fig 3

Chapter 3: Requirements

3.1 Functional Requirements

- Accurately determining the credibility of the news article.
- Display a list of trending news already classified as fake.
- The response time should be minimum..

3.2 Non-Functional Requirements

1. Reliability: Reliability is an attribute of any computer-related component that consistently performs according to its specifications.

2. Portability: Portability is a characteristic attributed to a computer program if it can be used in operating systems other than the one in which it was created without requiring major rework.

3. Ease to use: The user interface must be easy to use, so that users can upload documents and check identify correct author.

3.3 Constraints

- The input can only be in the form of link or URL.
- The size of the input.
- The system is being developed to only tackle news inputs in the english language. Inputs in any other language is likely to give an error.

3.4 Hardware & Software Requirements:

- **Hardware Requirements:**

Processor	Intel Pentium 4
RAM	512 MB
Hard disk drive	200 MB

Table 2

- **Software Requirements :**

Operating System	Windows XP SP2 or later
Front End	HTML, CSS, JavaScript
Back End	Python, R, Django
Tools	NLTK library, sklearn.

Table 3

3.5 Selection of the Hardware, Software , Technology and tools

1)Python

We have used python which is an easy to use, versatile, open source software. Python's readability makes it a great programming language, it allows one to think like a programmer and not waste time understanding the mysterious syntax that other programming languages require. The Python Package Index (PyPI) hosts thousands of third-party modules for Python. Both Python's standard library and the community-contributed modules allow for endless possibilities contributing to the ease with which our project can be implemented.

2) R

R is an open source software which is mainly used for data manipulation and pre processing. We have used R mainly to clean and format the data.

3) Web Framework: Python based web framework, Django.

Django is a free and open source web application framework, written in Python. Since our previous implementation was in Python and since Django supports Python, it was our best bet.

4) NLTK

The NLTK module is a massive tool kit, aimed at helping developers with the entire Natural Language Processing (NLP) methodology. NLTK helps with everything from splitting sentences

14

from paragraphs, splitting up words, recognizing the part of speech of those words, highlighting the main subjects, and then even with helping the machine to understand what the text is all about.

Chapter 4: Proposed Design

In this chapter, we propose the design of the system using several diagrams. We have a block diagram and modular design diagram to define the overall modules in our model. Further, we have DFD from level 0 to level 2. Gantt chart shows the timeline of the project.
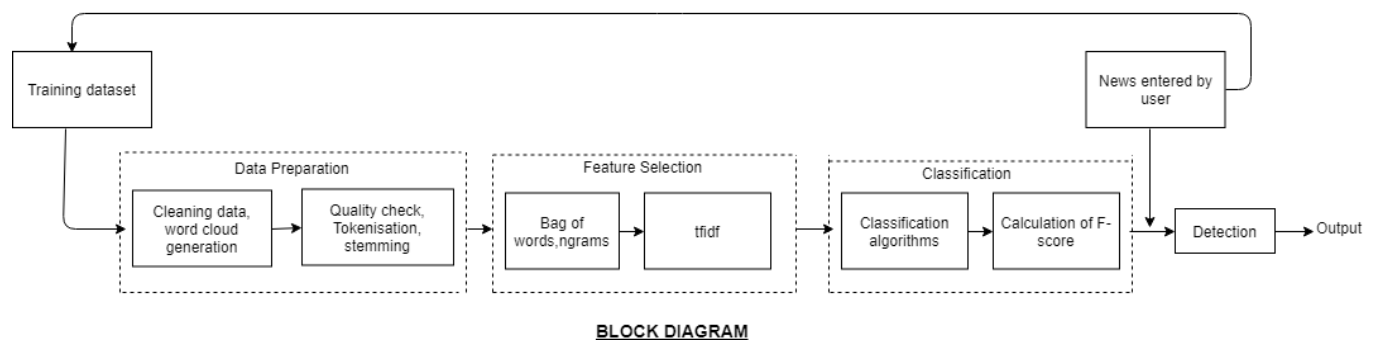
4.1 Block Diagram:

BLOCK DIAGRAM

Fig 4

1. The block diagram can be divided into 4 blocks-Data Preparation, Feature Selection Classification and Detection.

2. In the Data preparation stage, the training data was first cleaned(removing special characters,blank spaces,etc.) and a word cloud of the fake news was generated. Next, before tokenising the text of the news in training set, it was checked for missing or null values. The tokenised words are then stemmed using Porter's algorithm.

3. Next, features are extracted from the tokenised and stemmed data using ngrams and tf-idf vectors.

4. In the classification stage, classification algorithms- Logistic Regression, Random Forest, Support Vector Machines, Stochastic Gradient Descent, Naive Bayes are used to train the model. The classification model is saved using pickle and loaded in the Detection stage.

5. The user enters the news he needs to verify. The saved model is loaded and run on the news which displays whether the input news is TRUE or FALSE. Every time the user enters a news the text and predicted label is appended to the dataset and the model is retrained.

4.2 Modular Design:
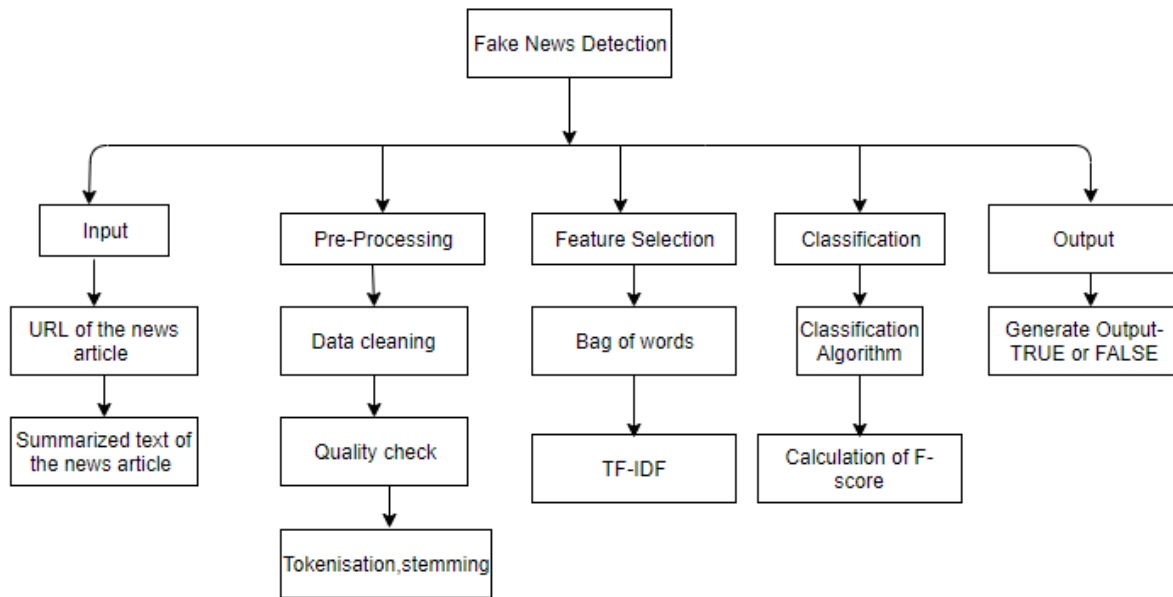
MODULAR DESIGN

Fig 5

1. The system can be divided into different modules- Input, Data Preparation, Feature Selection, Classification and Detection.

2. The input module takes the URL of the news the user wishes to verify. The summary of the scrapped news is then fed to the next module.

3. In the Data preparation module, the training data was first cleaned(removing special characters,blank spaces,etc.) and a word cloud of the fake news was generated. Next, before tokenising the text of the news in training set, it was checked for missing or null values. The tokenised words are then stemmed using Porter's algorithm.

4. In the Feature Selection module, features are extracted from the tokenised and stemmed data using ngrams and tf-idf vectors.

5. In the classification module, classification algorithms- Logistic Regression, Random Forest, Support Vector Machines, Stochastic Gradient Descent, Naive Bayes are used to train the model. The classification model is saved using pickle and loaded in the Detection stage.

17

6. The user enters the news he needs to verify. The saved model is loaded and run on the news which displays whether the input news is TRUE or FALSE. Every time the user enters a news the text and predicted label is appended to the dataset and the model is retrained.

4.3 Detailed Design

1. DFD Level 0:

- DFD Level 0 is a basic overview of the whole system or process being analyzed or modeled.
- In our system, the input is given in text form.
- Output is classified in two classes-TRUE OR FALSE.
- The main process for level 0 DFD is application of the fake news detection system.

DFD LEVEL 0

Fig 6

2. DFD Level 1:

- DFD level 1 highlights the main functions carried out by the system as we break down higher level process of DFD 0 into subprocesses.
- The four main functions in our DFD Level 1 are: 1.Input 2.Data preparation 3.Feature Selection 4.Classification
- In Level 0, the user will enter the link of a news article as input. A summary of the news in the link will be the input for the next module.
- Level 1 performs the preprocessing of data ie cleaning the data, formation of word cloud, etc.

- Level 2 extracts features and is sent to Level 3 where the final classification algorithms are used to give the desired output.
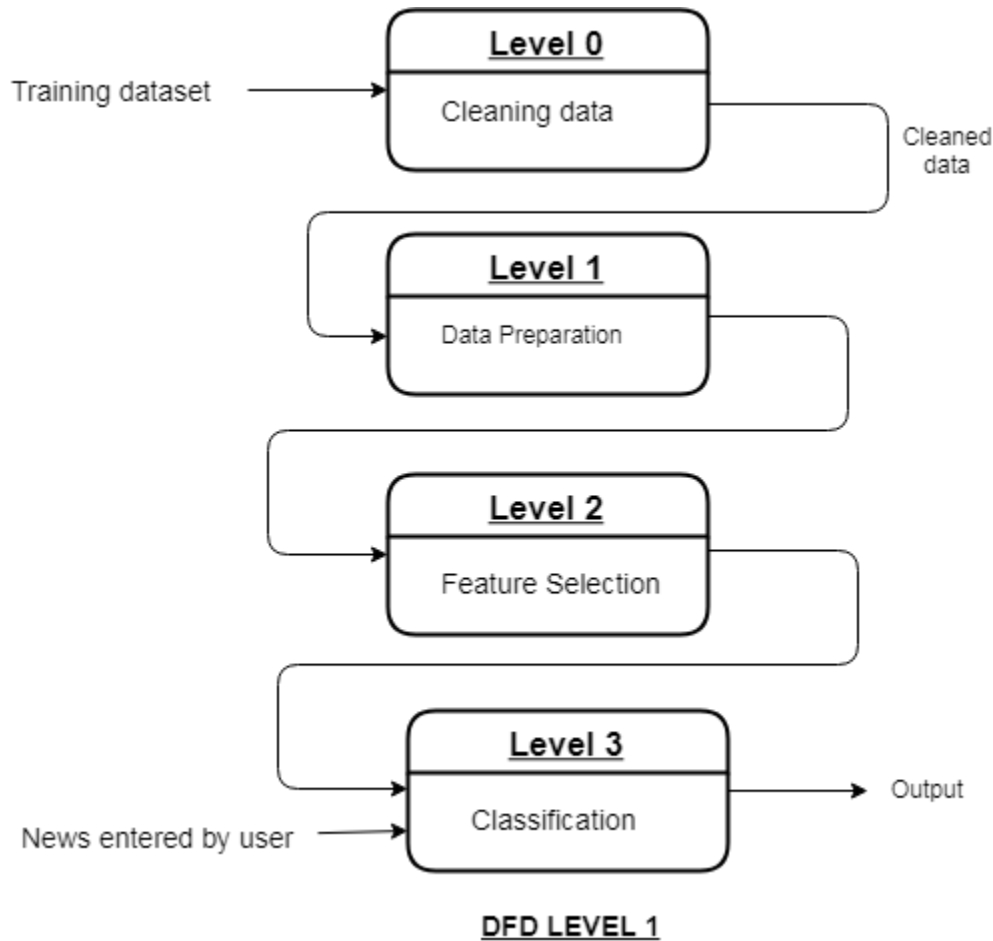
Fig 7

3. DFD Level 2

- DFD Level 2 gives more insights into parts of DFD Level 1.
- In our system, preparation of data includes steps like Tokenisation and Generation of word cloud.
- After the text is properly broken up, a word cloud of the same is formed which helps us in identifying the relations between them and relationship or degree of similarity with respect to a particular word. Feature Selection is performed using count and tf-idf vectors.
- In Level 3, we use classification algorithms like Random Forest, Logistic Regression, Support Vector Machines,etc.
- We then calculate the F-score which will decide whether news if False or True.

Level 0

Training dataset

Extraction of data

Level 1

Data Preparation

Level 1.1

Generation of word cloud

Level 1.2

Tokenisation,stemming, ngrams

Level 2

Feature Selection

Level 2.1

Bag of words

Level 2.2

TF-IDF

Level 3

Classification

News entered by user

Level 3.1

Classification algorithms

Level 3.2

Calcuation of F-score

Output

DFD LEVEL 2

Fig 8

4.4 Project Scheduling & Tracking using Gnatt Chart

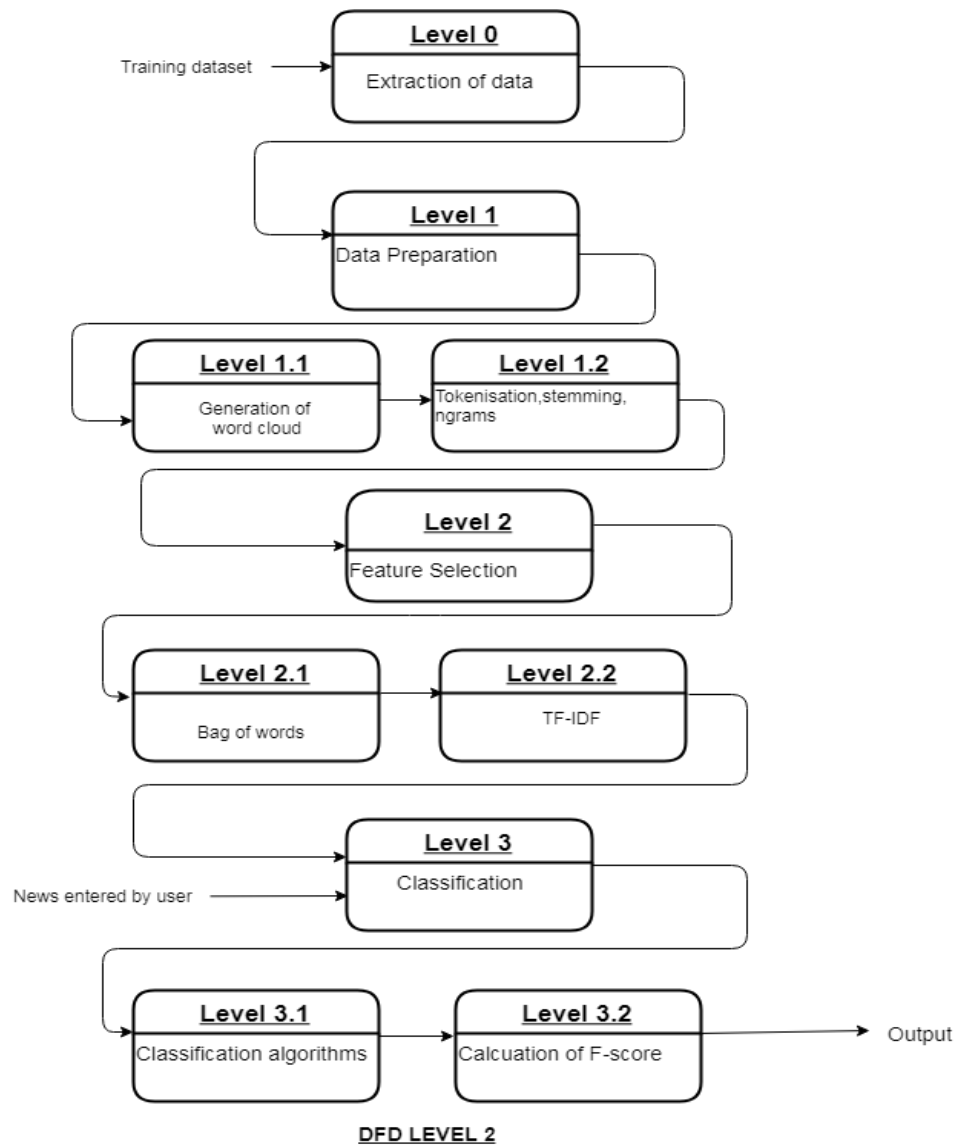|	Task Name	Start Date	End Date	Duration	Predecessors	% Complete	Status
1	Defining Problem Statement	03/21/17	03/23/17	3d		100%	Completed
2	Analysis of requirements	03/24/17	03/28/17	3d		100%	Completed
3	Preparation of synopsis	03/29/17	04/11/17	10d		100%	Completed
4	Reviewing of synopsis	04/12/17	04/14/17	3d		100%	Completed
5	Approval of synopsis	04/15/17	04/15/17	1d		100%	Completed
6	Planning	04/16/17	04/25/17	8d		100%	Completed
7	Feasibility analysis	08/30/17	09/07/17	7d		100%	Completed
8	Preparation of modules	09/08/17	09/14/17	5d		100%	Completed
9	UML diagrams	09/15/17	09/25/17	7d		100%	Completed
10	Project Review 1	09/26/17	09/26/17	1d		100%	Completed
11	Feedback	09/27/17	09/29/17	3d		100%	Completed
12	Implementing changes	10/01/17	10/11/17	9d		100%	Completed
13	UML diagrams	10/12/17	10/24/17	9d		100%	Completed
14	Project Review 2	10/28/17	10/28/17	1d		100%	Completed
15	Brainstorming	01/03/18	01/24/18	16d		100%	Completed
16	Devising Algorithm	01/25/18	02/08/18	11d		100%	Completed
17	Implementing Algorithm	02/09/18	02/16/18	6d		100%	Completed
18	Front end & Back end coding	02/17/18	02/28/18	9d		100%	Completed
19	Code review	03/01/18	03/05/18	3d		100%	Completed
20	Implement changes	03/06/18	03/09/18	4d		100%	Completed
21	Executable code	03/10/18	03/10/18	1d		100%	Completed
22	Preparation of test cases	03/11/18	03/11/18	1d		100%	Completed
23	Preparation of test scripts	03/12/18	03/12/18	1d		100%	Completed
24	Executing test scripts	03/13/18	03/15/18	3d		100%	Completed
25	System integration	03/16/18	03/21/18	4d		100%	Completed
26	Test system	03/22/18	03/27/18	4d		100%	Completed
27	Deployment	03/28/18	03/28/18	1d		100%	Completed
28	Review	03/29/18	03/29/18	1d		100%	Completed
29	Implement changes	03/30/18	04/04/18	4d		100%	Completed

Fig 9

	2017			2018			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Defining Problem Statement						
	Analysis of requirements						
	Preparation of synopsis						
	Reviewing of synopsis						
	Approval of synopsis						
	Planning						
			Feasibility analysis				
			Preparation of modules				
			UML diagrams				
			Project Review 1				
			Feedback				
			Implementing changes				
			UML diagrams				
			Project Review 2				
			Brainstorming				
			Devising Algorithm				
			Implementing Algor				
			Front end & Back				
			Code review				
			Implement change				
			Executable code				
			Preparation of tes				
			Preparation of tes				
			Executing test scr				
			System integratio				
			Test system				
			Deployment				
			Review				
			Implement chan				

Fig 9

Chapter 5: Implementation Details

5.1 Algorithms for the respective modules developed

Algorithm

Training

1. Read the training, testing and validation (CSV) files.

2. Pre-process data by removing null values, special characters.

3. Select best features using ngrams and TF-IDF vectors.

4. Apply classification algorithms-Logistic Regression, Naive Bayes, Support Vector

Machines, Stochastic Gradient Descent, Random Forest classifier.

5. Calculate for each classification algorithm-

○ Confusion matrix

○ F-score

6. Select algorithm with minimum number

of False Positive and False Negative

from the confusion matrices.

7. Save/dump the model as a .sav file.

Testing

1. Read input URL of news article.

2. Scrape the text of the news article from the URL.

3. Generate a summary of the news article.

4. The summarized text is provided as input for the saved model.

5. Load the saved model and classify the text into classes- FALSE or TRUE.

6. Append the text and predicted output class into the training set.

1) Porter's algorithm

The Porter Stemming algorithm is a process for removing suffixes from words in English. Removing suffixes by automatic means is an operation which is especially useful in the field of information retrieval.Terms with a common stem will usually have similar meanings, for example:

CONNECT

CONNECTED

CONNECTING

CONNECTION

CONNECTIONS

Frequently, the performance of an IR system will be improved if term groups such as this are conflated into a single term. The program is given an explicit list of suffixes, and, with each suffix, the criterion under which it may be removed from a word to leave a valid stem.

2) Ngrams

In the fields of computational linguistics and probability, an n-gram is a contiguous sequence of n items from a given sample of text or speech. The items can be phonemes, syllables, letters, words or base pairs according to the application. The n-grams typically are collected from a text or speech corpus.

Two benefits of n-gram models (and algorithms that use them) are simplicity and scalability – with larger n, a model can store more context with a well-understood space–time tradeoff, enabling small experiments to scale up efficiently. We have used unigrams, bigrams and trigrams in the data preparation module.

3) Tf-Idf

Tf-idf stands for *term frequency-inverse document frequency*, and the tf-idf weight is a weight often used in information retrieval and text mining. This weight is a statistical measure used to evaluate how important a word is to a document in a collection or corpus. The importance

increases proportionally to the number of times a word appears in the document but is offset by the frequency of the word in the corpus. Variations of the tf-idf weighting scheme are often used by search engines as a central tool in scoring and ranking a document's relevance given a user query.

Tf-Idf weight is composed by two terms: the first computes the normalized Term Frequency (TF), aka. the number of times a word appears in a document, divided by the total number of words in that document; the second term is the Inverse Document Frequency (IDF), computed as the logarithm of the number of the documents in the corpus divided by the number of documents where the specific term appears.

TF: Term Frequency, which measures how frequently a term occurs in a document. Since every document is different in length, it is possible that a term would appear much more times in long documents than shorter ones. Thus, the term frequency is often divided by the document length (aka. the total number of terms in the document) as a way of normalization:

TF(t) = (Number of times term t appears in a document) / (Total number of terms in the document).

IDF: Inverse Document Frequency, which measures how important a term is. While computing TF, all terms are considered equally important. However it is known that certain terms, such as "is", "of", and "that", may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following:

IDF(t) = log_e(Total number of documents / Number of documents with term t in it).

4) Word2Vec

Word2vec is a two-layer neural net that processes text. Its input is a text corpus and its output is a set of vectors: feature vectors for words in that corpus. While Word2vec is not a deep neural network, it turns text into a numerical form that deep nets can understand.

Word2vec takes as its input a large corpus of text and produces a vector space, typically of several hundred dimensions, with each unique word in the corpus being assigned a corresponding vector in the space. Word vectors are positioned in the vector space such that words that share common contexts in the corpus are located in close proximity to one another in the space.

We have used Word2vec to group the vectors of similar words together in vector space. That is, it detects similarities mathematically. Word2vec creates vectors that are distributed numerical representations of word features, features such as the context of individual words. It does so without human intervention.

5) K-Fold

Cross Validation is a very useful technique for assessing the performance of machine learning models. It helps in knowing how the machine learning model would generalize to an independent data set.

In our system , we are using two type of data sets — known data (training data set) and unknown data (test data set). By using cross validation, we are testing our machine learning model in the training phase to check for overfitting and to get an idea about how our machine learning model will generalize to independent data, which is the test data set given in the problem.

In one round of cross validation, we are dividing our original training data set into two parts:

1) Cross validation training set
2) Cross validation testing set or Validation set

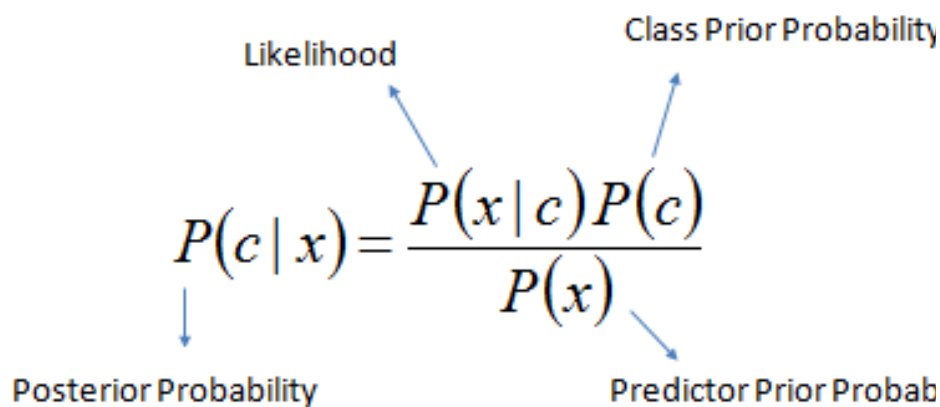K-fold cross validation is performed as per the following steps:

1. Partition the original training data set into k equal subsets. Each subset is called a fold. Let the folds be named as f1, f2, …, fk .
2. For i = 1 to i = k
   - Keep the fold fi as Validation set and keep all the remaining *k-1* folds in the Cross validation training set.
   - Train the model using the cross validation training set and calculate the accuracy of your model by validating the predicted results against the validation set.
3. Estimate the accuracy of the machine learning model by averaging the accuracies derived in all the *k* cases of cross validation.

In the k-fold cross validation method, all the entries in the original training data set are used for both training as well as validation. Also, each entry is used for validation just once.

6) Naive Bayes

The Naive Bayesian classifier is based on Bayes' theorem with the independence assumptions between predictors. A Naive Bayesian model is easy to build, with no complicated iterative parameter estimation which makes it particularly useful for very large datasets.

Bayes theorem provides a way of calculating the posterior probability, $P(c/x)$, from $P(c)$, $P(x)$, and $P(x/c)$. Naive Bayes classifier assume that the effect of the value of a predictor (x) on a given class (c) is independent of the values of other predictors. This assumption is called class conditional independence.

$$\underset{\text{Posterior Probability}}{P(c \mid x)} = \frac{\overset{\text{Likelihood}}{P(x \mid c)} \overset{\text{Class Prior Probability}}{P(c)}}{\underset{\text{Predictor Prior Probab}}{P(x)}}$$

$$P(c \mid X) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times I$$

- $P(c/x)$ is the posterior probability of *class* (*target*) given *predictor* (*attribute*).
- $P(c)$ is the prior probability of *class*.
- $P(x/c)$ is the likelihood which is the probability of *predictor* given *class*.
- $P(x)$ is the prior probability of *predictor*.

It is not a single algorithm for training such classifiers, but a family of algorithms based on a common principle: all naive Bayes classifiers assume that the value of a particular feature is independent of the value of any other feature, given the class variable.

7) Logistic Regression

Logistic regression is a statistical method for analyzing a dataset in which there are one or more independent variables that determine an outcome. The outcome is measured with a dichotomous variable (in which there are only two possible outcomes).

In logistic regression, the dependent variable is binary or dichotomous, i.e. it only contains data coded as 1 (TRUE, success, pregnant, etc.) or 0 (FALSE, failure, non-pregnant, etc.). The goal of logistic regression is to find the best fitting (yet biologically reasonable) model to describe the relationship between the dichotomous characteristic of interest (dependent variable = response or outcome variable) and a set of independent (predictor or explanatory) variables. Logistic regression generates the coefficients (and its standard errors and significance levels) of a formula to predict a *logit transformation* of the probability of presence of the characteristic of interest:

$$logit(p) = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \ldots + b_k X_k$$

where p is the probability of presence of the characteristic of interest. The logit transformation is defined as the logged odds:

$$odds = \frac{p}{1-p} = \frac{probability\ of\ presence\ of\ characteristic}{probability\ of\ absence\ of\ characteristic}$$

and

$$logit(p) = \ln\left(\frac{p}{1-p}\right)$$

Rather than choosing parameters that minimize the sum of squared errors (like in ordinary regression), estimation in logistic regression chooses parameters that maximize the likelihood of observing the sample values.

8) SVM

Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall.

In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

When data are not labeled, supervised learning is not possible, and an unsupervised learning approach is required, which attempts to find natural clustering of the data to groups, and then map new data to these formed groups.

We have used SVM as a classifier since it is helpful in text and hypertext categorization as its application can significantly reduce the need for labeled training instances in both the standard inductive and transductive settings.

9) SGD

Stochastic gradient descent (SGD), also known as incremental gradient descent, is a stochastic approximation of the gradient descent optimization and iterative method for minimizing an objective function that is written as a sum of differentiable functions. In other words, SGD tries to find minima or maxima by iteration. Stochastic Gradient Descent (SGD) is a simple yet very efficient approach to discriminative learning of linear classifiers under convex loss functions such as (linear) Support Vector Machines and Logistic Regression.

SGD Classifier supports multi-class classification by combining multiple binary classifiers in a "one versus all" (OVA) scheme. For each of the K classes, a binary classifier is learned that discriminates between that and all other $K-1$ classes. At testing time, we compute the confidence score (i.e. the signed distances to the hyperplane) for each classifier and choose the class with the highest confidence.

10)　　　Random Forest

Random forests or random decision forests are an ensemble learning method for classification, regression and other tasks, that operate by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. Random decision forests correct for decision trees' habit of overfitting to their training set.

Random forests are a way of averaging multiple deep decision trees, trained on different parts of the same training set, with the goal of reducing the variance. This comes at the expense of a small increase in the bias and some loss of interpretability, but generally greatly boosts the performance in the final model. In random forests, there is no need for cross-validation or a separate test set to get an unbiased estimate of the test set error. It is estimated internally, during the run. Random forests can be used to rank the importance of variables in a regression or classification problem in a natural way.

5.2. Comparative Analysis with the existing systems

Features	Our System	BS Detector	Politifact
1)Methodology	Various natural language processing techniques and machine learning	Using the shortest path between concept nodes under properly defined semantic	Traditional fact checking by expert journalists to evaluate the veracity of

	algorithms to classify fake news articles using sci-kit libraries from python.	proximity metrics on knowledge graphs.	dubious information.
2) Accuracy(F-Score)	84%	77%	90%
3) Scope	International and national news.	International and national news.	US Politics
4) Limitations	The type of news the user can check is limited to political,social and factual news.	Limited to identifying fake news sources and maintaining list of unreliable or otherwise questionable sources.	Takes 7-10 days to manually verify the authenticity of the news by the political pundits.

Table 4

5.3. Evaluation of the developed system

Following are the confusion matrices and F-scores of the algorithms:

Naive Bayes:

```
Total statements classified: 2551
Score: 0.7034906032263439
score length 5
Confusion matrix:
[[ 112 1096]
 [  11 1332]]
```

Logistic Regression:
0.81 5

```
Total statements classified: 2551
Score: 0.808025156354099
score length 5
Confusion matrix:
[[ 722  486]
 [ 100 1243]]
```

SVM Classifier:

```
Total statements classified: 2551
Score: 0.819961422003462
score length 5
Confusion matrix:
[[ 768  440]
 [  97 1246]]
```

SGD Classifier:

```
Total statements classified: 2551
Score: 0.8270116039650318
score length 5
Confusion matrix:
[[ 843  365]
 [ 134 1209]]
```

Random Forest:

```
Total statements classified: 2551
Score: 0.8131931864783362
score length 5
Confusion matrix:
[[1008  200]
 [ 273 1070]]
```

Chapter 6: Testing

Testing:

Software testing is the process of evaluation a software item to detect differences between given input and expected output.Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

Basic types of testing:

There are two basics of software testing: blackbox testing and whitebox testing.

1.**Blackbox Testing**

Black box testing is a testing technique that ignores the internal mechanism of the system and focuses on the output generated against any input and execution of the system. It is also called functional testing.

2.**Whitebox Testing**

White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and glass box testing.

Black box testing is often used for validation and white box testing is often used for verification.

Types:

1.Integration Testing:

Integration tests verify that different modules or services used by your application work well together. For example, it can be testing the interaction with the database or making sure that microservices work together as expected.

In our website, the basic service provided is to give user information whether the news is true or false. That is accurately provided by our system. Also, the text given to the user is added to the training data in the database which comes into future use.

Functional Testing:

Functional testing is a type of testing which verifies that each function of the software application operates in conformance with the requirement specification. This testing mainly involves black box testing and it is not concerned about the source code of the application. Each and every functionality of the system is tested by providing appropriate input, verifying the output and comparing the actual results with the expected results.

Sr no.	Test Cases	Expected	Actual	Comments
1.	GUI-Input	Text should be given by the user.	Text input is provided.	By giving URL as an input, following problems are faced: a. All characters from <p> tag were extracted including the unnecessary ones. b . More than one link was getting extracted from the URL.
2.	GUI-Output	Output whether is true or not should be provided.	Ideal output is provided.	Nil

<div align="center">Table 5</div>

Performance Testing

Performance testing is the testing to assess the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements.The focus of Performance Testing is checking a software program's

Speed - Determines whether the application responds quickly

Scalability - Determines maximum user load the software application can handle.

Stability - Determines if the application is stable under varying loads

Our system, Fake News Detector, gives results in fraction of seconds with an accuracy of over 85%. The system gives accurate results for Political as well as Social news.

Our system can be scaled for evaluating for other domains by adding the necessary training data in the system.

Usability Testing

Usability testing is performed to the perspective of the client, to evaluate how the GUI is user-friendly? How easily can the client learn? After learning how to use, how proficiently can the client perform? How pleasing is it to use its design? This falls under the class of black box testing.

Our model delpoys a website which takes text input from the user and gives result of the news being true or false.It website has only two tabs: Homepage and the About us page. The website is properly visible and provides it's functionality properly.

Beta Testing

Beta testing is the testing which is done by end users, a team outside development, or publicly releasing full pre-version of the product which is known as beta version. The aim of beta testing is to cover unexpected errors. It falls under the class of black box testing.

Our system has been checked by other uses and the accuracy and quality of the output detected has been evaluated.

Chapter 7: Result Analysis

7.1 Simulation model

Our website, Fake News Detector runs on Django and is coded in Python using SQLite database. It displays a text box accepting the URL of news from the user. This URL is then summarized to give text format. It is then checked against our database and algorithms giving the best results namely Random Forest and Logistic Regression are applied. After applying the necessary algorithms, output is displayed to the user. The output displays whether the news being entered is 'true' or 'false'. It is added back to the training data and the model thus trains itself over every input given.The 'About us' page displays motivation for this project and names of all the developers.
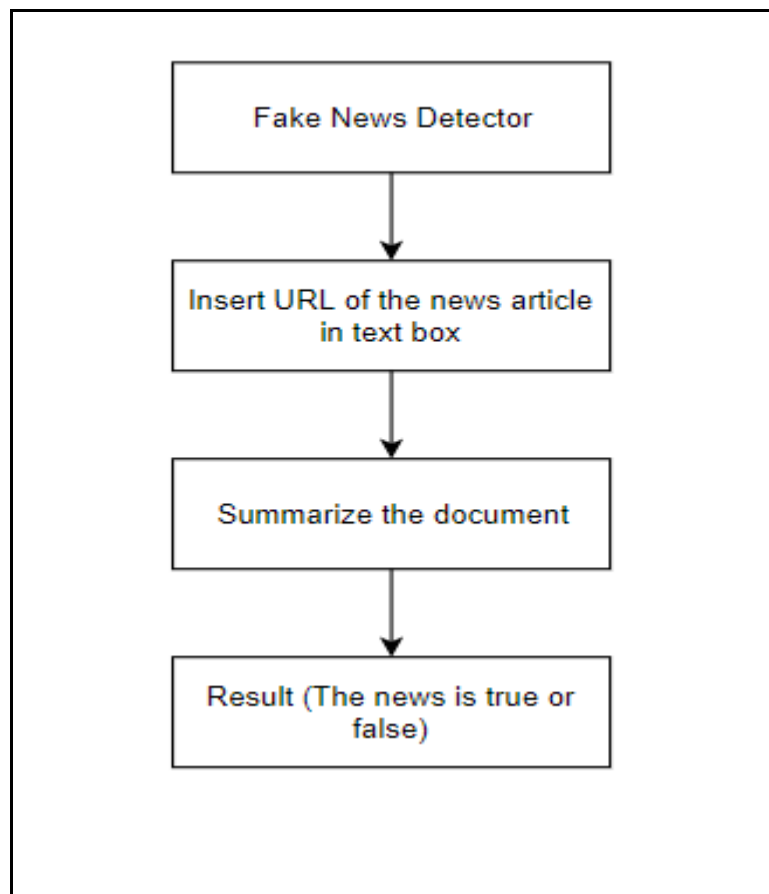

Fig 11

7.2 Screenshots of User Interface (UI)

News Detector   Home   About us

Put your URL of the news here :

[ ]

[Submit]

Entered URL:

https://us.toluna.com/opinions/2969759/Pope-Franci%C2%ADs-Shocks-World,-Endors%C2%ADe%C2%ADs-Donald-Trump-for

Summary of the news from URL

Result:

The given summary is: False

Entered URL:

https://www.firstpost.com/india/rajnath-singh-says-government-is-serious-about-taking-action-against-economic-offenders-who-flee-country-4441055.html

Summary of the news from URL

Diu: Home Minister Rajnath Singh on Saturday said the government is serious in taking strong action against the economic offenders who flee the country, and a bill to this effect would be bought in the Monsoon Session of Parliament.He made the remarks at a meeting, before the Union Cabinet gave its nod for promulgation of the Fugitive Economic Offenders Ordinance that provides for confiscating properties of escapees."The Opposition levels allegations that some Nirav (Modi) and (Mehul) Choksi fled abroad.We will present a fugitive economic offenders bill before the Parliament soon," he said.Singh said earlier economic offenders used to flee abroad and their properties were not seized, but now their assets will be confiscated under the bill.File image of home minister Rajnath Singh.The bill was first introduced in the Lok Sabha on 12 March, but could not be passed due to continuous disruptions and adjournments in Parliament during the second half of the Budget Session.The Fugitive Economic Offenders Ordinance empowers the government to seize the domestic assets of those deemed by a relevant court to be belonging to fugitive economic offenders."The ordinance would lay down the measures to empower Indian authorities to attach and confiscate proceeds of crime associated with economic offenders and the properties of the economic offenders and thereby deter economic offenders from evading the process of Indian law by remaining outside the jurisdiction of Indian courts," the government said in a statement on Saturday.The ordinance is expected to re-establish the rule of law with respect to the fugitive economic offenders as they would be forced to return to India to face trial for scheduled offences.A fugitive economic offender is a person against whom an arrest warrant has been issued in respect of a scheduled offence and who has left India to avoid criminal prosecution, or being abroad, refuses to return to India to face criminal prosecution, the statement said.Jeweller Nirav Modi and his uncle and business partner, Mehul Choksi are the prime accused in the multi-crore scam that hit Punjab National Bank.Liquor baron Vijay Mallya and former IPL chief Lalit Modi are two other such persons who are in foreign land and avoiding the law.During his two-day visit to Dadra and Nagar Haveli, Singh inaugurated a number of development projects and laid foundation stones of some others.Nirav Modi fraud is bank's issue; will not seek govt support, says PNB MD Sunil Mehta

Result:

The given summary is: True

Fig 12

Entered URL:

https://www.firstpost.com/world/facebook-data-scandal-uk-regulators-search-cambridge-analytica-offices-ruling-on-case-tuesday-4404233.html

Summary of the news from URL

Around 18 enforcement agents from the office of Information Commissioner Elizabeth Denham entered the company's London headquarters at around 8:00 pm local time to execute the warrant.The High Court granted the raid request less than an hour earlier, as Denham investigates claims that Cambridge Analytica may have illegally harvested Facebook data for political ends.A full explanation of the legal ruling by Judge Anthony James Leonard will be issued on Tuesday, according to the court.Fresh allegations also emerged Friday night about the firm's involvement in the 2016 Brexit referendum campaign.Brittany Kaiser, CA's business development director until two weeks ago, revealed it conducted data research for Leave.EU, one of the leading campaign groups, via the UK Independence Party (UKIP), according to The Guardian .Nix was suspended this week following the Facebook revelations and a further media sting in which he boasts about entrapping politicians and secretly operating in elections around the world through shadowy front companies.He has already been called to reappear before British lawmakers to explain "inconsistencies" in past testimony about the firm's use of the data.Meanwhile, Facebook founder Mark Zuckerberg has been forced to issue a statement outlining his firm's role in the scandal and apologised Wednesday to its billions of users for the breach.The company has seen its stock market value plunge by around $75 million amid the crisis, as shares closed the week down 13 percent — their worst seven days since July 2012.Cambridge Analytica denies any wrongdoing and said Friday it was undertaking an independent third-party audit to verify that it no longer holds any of the mined data."As anyone who is familiar with our staff and work can testify, we in no way resemble the politically-motivated and unethical company that some have sought to portray," acting CEO Alexander Tayler said in a statement.He apologised for the firm's involvement, but said it had licensed the data from a research company, led by an academic, that "had not received consent from most respondents".Aleksandr Kogan, a University of Cambridge psychologist, created a personality prediction app that harvested the data of 2,70,000 people who downloaded it — as well as scooping up the information of their friends.However, Cambridge University announced Friday it was "undertaking a wide-ranging review" of the episode and had written to Facebook "to request all relevant evidence in their possession"."Should anything emerge from this review, or from our request to Facebook, the University will take any action necessary in accordance with our policies and procedures," it said in a statement.

Result:

The given summary is: True

Fig 13

Submit

Entered URL:

http://www.fakingnews.firstpost.com/buzzpoop/bigg-boss-take-global-stage-soon-see-going-participants-24380

Summary of the news from URL

Indian television reality show Bigg Boss is getting murkier day by day.Even though it's not heading anywhere, a lot of dirt is coming out.It has become so aimless and dirty that people have started calling it world level politics.Seeing the potential of the format, famous English film director, screenwriter, and producer Christopher Nolan is coming up with a bigger version of the show "World Bigg Boss".Reportedly Nolan has approached seven most discussed personalities worldwide.Here is the list of the seven personalities who have been approached by the show producer, Nolan.The most powerful yet the most immature person of the world – Donald TrumpDonald Trump not only makes stupid comments but also provokes leaders of other countries, both of these qualities are required in Bigg Boss.He is totally irrational and takes strict action against people who oppose him.Rahul Gandhi – Politician turned standup comedian, Rahul Gandhi will ensure entertainment in the show.Arnab Goswami – Arnab Goswami is a person who can add spice to any news to make it the topic of debate, his presence in the show will improve the TRP of the show.Edward Sheeran, – English singer-songwriter, guitarist, and record producer, Edward Sheeran has gained much popularity among Indians and other Asian countries after he performed in India and sang the famous Dabur song.Justin Bieber – Recently charged for assaulting a limousine driver and drag-racing his yellow Lamborghini whilst under the influence of drugs, Justin Bieber wll be a good substitute of Salman KhanAbu Bakr al-Baghdadi – Leader of the Salafi jihadist militant terrorist organisation known as ISIS, Bagdadi is most likely alive.His presence will not make the show more entertaining but also smoother.

Result:

The given summary is: False

Fig 14

7.3 Reports Obtained

7.3.1 Classification Report:

1. Naive Bayes:

	precision	recall	f1-score	support
False	0.46	1.00	0.63	1169
True	0.85	0.02	0.03	1382
avg / total	0.67	0.47	0.31	2551

2. Logistic Regression:

	precision	recall	f1-score	support
False	0.46	1.00	0.63	1169
True	1.00	0.00	0.00	1382
avg / total	0.75	0.46	0.29	2551

3. SVM Classifier:

	precision	recall	f1-score	support
False	0.46	0.98	0.63	1169
True	0.63	0.03	0.05	1382
avg / total	0.55	0.46	0.31	2551

4. SGD Classifer:

	precision	recall	f1-score	support
False	0.46	1.00	0.63	1169
True	1.00	0.00	0.00	1382
avg / total	0.75	0.46	0.29	2551

5.Random Forest :

```
'precision', 'predicted', average, warn_for)
          precision    recall  f1-score   support

    False       0.46      1.00      0.63      1169
     True       0.00      0.00      0.00      1382

avg / total       0.21      0.46      0.29      2551
```

Chapter 8: Conclusion

8.1 Limitations

1. The size of the input news article should be more than 50 characters.
2. It cannot accurately predict local news or news which contain personal opinions. The type of news the user can check is limited to political,social and factual news.

8.2 Conclusion

In the 21st century, majority of the tasks are done online. Newspapers who were earlier preferred as hard-copies are now being substituted by applications like Facebook, Twitter and news articles to be read online. The growing problem of fake news only makes things more complicated and tries to change or hamper the opinion and attitude of people towards use of digital technology. When a person is deceived of the real news two possible things happen.People start believing that their perceptions about a particular topic are true as assumed. Another problem is that even if there is any news article available which contradicts a supposedly fake one, people believe in the words which just support their thinking without taking in measure the facts involved.

Thus,in order to curb the phenomenon, Google and Facebook are taking their steps towards preventing the spread of fake news. Our system takes input from the user and classifies it to be true or fake.To implement this, various NLP and Machine Learning Techniques have to be used.The website can be used by any user having a browser and an internet connection to check the veracity of the new article.

8.3 Future Scope

The current model displays the summary of the URL entered and tells us about the correctness of the news.A feature can be added where the user can check the details of all the previous searched news. Also, this model can be scaled to determine output of local news and news from other disciplines like sports,sarcasm etc. which are not currently covered.

Chapter 9: References

Proceeding Paper,

[1] Conroy, Niall & Rubin, Victoria & Chen, Yimin. (2015). Automatic Deception Detection: Methods for Finding Fake News. . USA

Journal Paper,

[2] Ball, L. & Elworthy, J. J Market Anal (2014) 2: 187. https://doi.org/10.1057/jma.2014.15

[3] Lu TC., Yu T., Chen SH. (2018) Information Manipulation and Web Credibility. In: Bucciarelli E., Chen SH., Corchado J. (eds) Decision Economics: In the Tradition of Herbert A. Simon's Heritage. DCAI 2017. Advances in Intelligent Systems and Computing, vol 618. Springer, Cham

Conference Paper,

[4] Rubin, Victoria & Conroy, Niall & Chen, Yimin & Cornwell, Sarah. (2016). Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News. . 10.18653/v1/W16-0802.

[5] Fake News Challenge 1 (FNC-1), fakenewschallenge.org

[6]Hunt Allcott & Matthew Gentzkow, 2017. "Social Media and Fake News in the 2016 Election," Journal of Economic Perspectives, vol 31(2), pages 211-236

[7]Lu TC., Yu T., Chen SH. (2018) Information Manipulation and Web Credibility. In: Bucciarelli E., Chen SH., Corchado J. (eds) Decision Economics: In the Tradition of Herbert A. Simon's Heritage. DCAI 2017. Advances in Intelligent Systems and Computing, vol 618. Springer, Cham

[8]Daniel Jurafsky & James H. Martin(2016).N-Grams:Speech and Language Processing

[9]Eesha Goel , Er. Abhilasha(2017). Random Forest:A Review

[10]Saahil Chopra,Saachi Jain().Towards Automatic Identification of Fake News: Stance Detection with LSTM Attention Models

Chapter 10:Project Review Sheets

10.1: Review 1

Project Evaluation Sheet 2017 - 18

Class: D17 A/B/C

Group No.: 35

Title of Project: Fake News Detection

Group Members: Jayesh Bhatia (08), Devansh Khakhar (31), Tanvi Kulkarni (36), sanjana Moghe (43)

	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environ . ment Friendly (2)	Ethics (2)	Team work (2)	Presentati on Skills (3)	Applied Engg &Mgmt principles (3)	Life - long learning (3)	Profess ional Skills (5)	Innov ative Appr oach (5)	Total Marks (50)
Review of Project Stage 1	4	3	3	2	2	2	1	1	2	2	1	2	2	3	30

Comments: Existing systems q algorithms need to be analysed.

Gesha Bhatia
Name & Signature Reviewer1

	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environ ment Friendly (2)	Ethics (2)	Team work (2)	Presentati on Skills (3)	Applied Engg &Mgmt principles (3)	Life - long learning (3)	Profess ional Skills (5)	Innov ative Appr oach (5)	Total Marks (50)
Review of Project Stage 1	3	4	4	2	2	2	1	1	2	2	1	2	2	3	31

Comments:

Date: 26th September 2017

09/10/17

Sonali B
Name & Signature Reviewer2

Fig 15

43

10.2: Review 2

Inhouse/ Industry:

Project Evaluation Sheet 2017 - 18

Class: D17 A/B/C

Group No.: 35

Title of Project: Fake News Detection

Group Members: Tayesh Bhatia (08), Devansh Khakhar(31), Tanvi Kulkarni (36), Sanjana Moghe(43)

	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (3)	Applied Engg &Mgmt principles (3)	Life - long learning (3)	Profess ional Skills (5)	Innov ative Appr oach (5)	Total Marks (50)
Review of Project Stage 1	2	3	3	2	3	2	1	1	1	¥	1	1	3	2	27
Comments:															

Dr. Gresha Bhatia

Name & Signature Reviewer1

	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environ ment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (3)	Applied Engg &Mgmt principles (3)	Life - long learning (3)	Profess ional Skills (5)	Innov ative Appr oach (5)	Total Marks (50)
Review of Project Stage 1	03	03	04	02	04	02	01	01	01	01	02	02	03	03	32
Comments:	Graphical o/p needs to add														

Date: 15th March,2018

Name & Signature Reviewer2

Fig 16

Chapter 11:Appendix

11.1 List of Figures

11.2 List of tables

Fake News Detection

Manisha Gahirwal
manisha.gahirwal@ves.ac.in
Vivekanand Education Society's Institute of Technology, Mumbai, Maharashtra

Sanjana Moghe
sanjana.moghe@ves.ac.in
Vivekanand Education Society's Institute of Technology, Mumbai, Maharashtra

Tanvi Kulkarni
tanvi.kulkarni@ves.ac.in
Vivekanand Education Society's Institute of Technology, Mumbai, Maharashtra

Devansh Khakhar
devansh.khakhar@ves.ac.in
Vivekanand Education Society's Institute of Technology, Mumbai, Maharashtra

Jayesh Bhatia
jayesh.bhatia@ves.ac.in
Vivekanand Education Society's Institute of Technology, Mumbai, Maharashtra

ABSTRACT

Fake news, one of the biggest new-age problems has the potential to mould opinions and influence decisions. The proliferation of fake news on social media and Internet is deceiving people to an extent which needs to be stopped. The existing systems are inefficient in giving a precise statistical rating for any given news claim. Also, the restrictions on input and category of news make it less varied. This paper proposes a system that classifies unreliable news into different categories after computing an F-score. This system aims to use various NLP and classification techniques to help achieve maximum accuracy.

Keywords: *Stance Detection, Natural Language Processing (NLP), Random Forest.*

1. INTRODUCTION

Fake news has been around for decades and is not a new concept. However, the dawn of the social media age which can be approximated by the start of the 20th century has aggravated the generation and circulation of fake news many folds. Fake news can be simply explained as a piece of article which is usually written for economic, personal or political gains. Detection of such bogus news articles is possible by using various NLP techniques, Machine learning, and Artificial intelligence.

In 2016, the Prime Minister of India, Mr. Narendra Modi declared that most of the cash that people possessed had become worthless and in the span of one month all this old currency had to be deposited in the banks. This led to a chain reaction of a series of fake news being published used mainly for click bait and political gains. News about the new paper bills having a GPS tracker or the daily limit of the amount that can be deposited in banks has increased, were spreading like wildfire. Now, this may not seem like a huge thing but the impact of such articles was so much that there was a point where the Ministry of the Finance had to officially release statements assuring citizens that what they were reading was false information. This is just a small instance of how the spread of false news can impact a much greater audience than it may seem.

This paper provides an insight into the procedure of detecting fake news, it's implementation and its results. In order to reach a conclusion on the authenticity of the news article we first take the text article, analyze the data and then use various classification algorithms to classify the news as legitimate or fake.

2. LACUNA IN THE EXISTING SYSTEM

I. BS Detector

BS Detector is a plug-in used by Mozilla and Chrome browsers to detect the presence of fake news sources and to alert the user accordingly.It works by searching through web pages references of links which have already been flagged unreliable in their database. BS Detector has been used by Facebook to solve their proliferation of fake news problem.But lately, they blocked the extension stating that they have been working on their own technique to curb the problem. BS Detector just states a warning message if the article is found to

be fake.It does not specify the percentage of error and neither does it classify news into levels of "truthfulness" or "fakeness".

II. Politi Fact

PolitiFact is a fact-checking US-based website used by editors and writers which gives the credibility of claims by US officials involved American politics.This system places judgment in the form of Truth-O-Meter which is a measure of the accuracy of a statement.These people first decide on which news to evaluate depending upon some characteristics like significance and worthiness of the claim.After that, the Truth-O-Meter is generated and a panel of more than two people thoroughly go through it to evaluate final rating of the claim.

The drawback of this system is that human intervention is required.Secondly, it works only for US politics.Also, every claim is not being fact-checked by them. The choice of evaluation depends upon them.

III. Flock Fake News Detector

Fake News Detector was a feature added by Flock-a new generation messaging and collaborative platform. Whenever links are being sent to each while chatting, FND algorithm gets activated.It checks the content of links to their databases of websites computed according to rankings. It gives a statistic rating and generates a warning message if the source is not found to be reliable.Flocks database has more than 600 news URL'S that are fact-checked.The drawback of this system is that their database for fact checking is less in number and chances of hoaxes still not being determined are high.

3. LITERATURE SURVEY

While there are some existing applications like BS Detector and Politifact which to some extent help users to identify misleading news but it requires human intervention and also the domain is limited in case of BS Detector which does not give the user the extent of any article to be fake.

In [1], they are using linguistic cues approaches and network analysis approaches to design a basic fake news detector which provides high accuracy in terms of classification tasks. They propose a hybrid system whose features like multi-layer linguistic processing, the addition of network behavior are included.In [2], they propose a method to detect online deceptive test by using a logistic regression classifier which is based on POS tags extracted from a corpus deceptive and truthful texts and achieves an accuracy of 72% which could be further improved by performing cross-corpus analysis of classification models and reducing the size of the input feature vector.
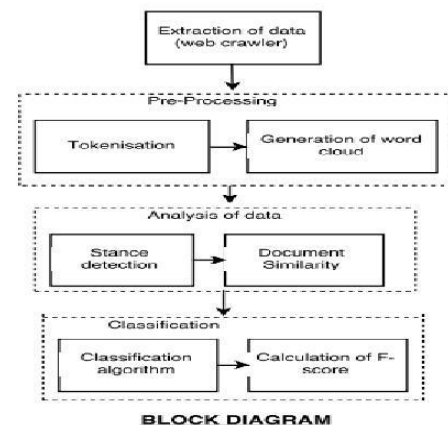
To detect fake news on social media, [3] presents a data mining perspective which includes fake news characterization on psychology and social theories. This article discusses two major factors responsible for widespread acceptance of fake news by the user which are Naive Realism and Confirmation Bias. Further, it proposes a two-phase general data mining framework which includes 1) Feature Extraction and 2) Model Construction and discusses the datasets and evaluation metrics for the fake news detection research. In [4], they propose an SVM-based algorithm with 5 predictive features i.e. Absurdity, Humour, and Grammar, Negative Affect, and Punctuation and uses satirical cues to detect misleading news. The paper

translates theories of humor, irony, and satire into a predictive model for satire detection with 87% accuracy.
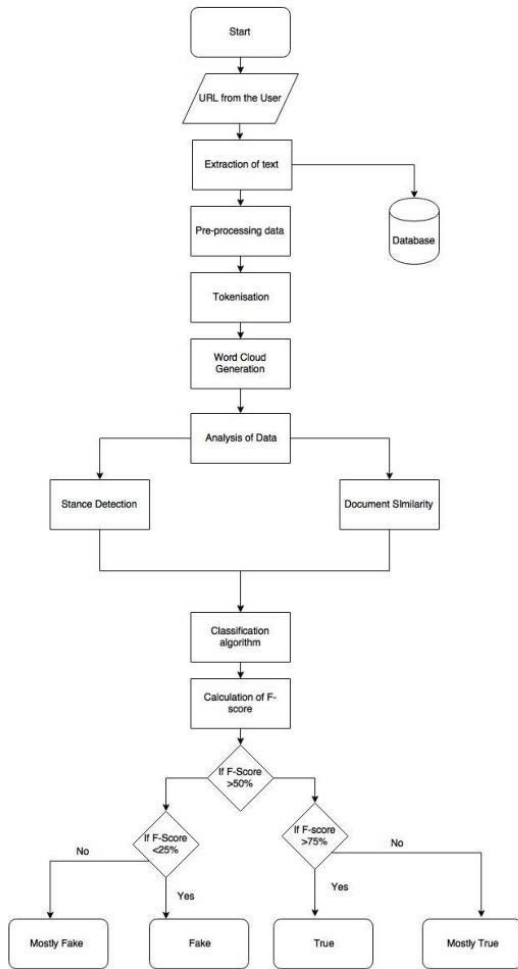
The purpose of this paper is to propose a new model for fake news detection which is using Stance Detection and IF-TDF method for analyzing the data which is taken from various datasets of fake and legitimate news and Random Forest classifier for classifying the output into four classes namely: True, Fake, Mostly True, and Mostly Fake. Using Random Forest gives us an advantage of handling binary features and moreover, they do not expect linear features.

4. METHODOLOGY

The aim of this project is to accurately determine the authenticity of the contents of a particular news article. For this purpose, we have devised a procedure which is intended to fetch favorable results. We first take the URL of the article that the user wants to authenticate, after which the text is extracted from the URL. The extracted text is then passed on to the data pre-processing unit. The data preprocessing unit consists of various processes like the Tokenization and Generation of the word cloud. The outputs from these processes play an important role in further analyzing the data. The core deciding factors that we use to determine the output of our project ie if a particular news article is fake or not are the stance of the article and comparison of the article with top google search results. The first method is by using stance detection to in order to analyze the stance of the author. Stance is a mental or an emotional position adopted by the author with respect to something. Stance detection is an important part if NLP and has wide applications.The stance of the author can be divided into various categories like Agree, Disagree, Neutral or Unrelated with respect to the title. Giving each of these categories weights can help us in the final conclusion of whether a news article is fake or not. The second method is to use document similarity or if-idf to know how similar a document is to top search results. This too can give us an insight into the authenticity of a news article. Next, we need to classify the output into various output classes for which we can use classification algorithms or regression models. The output classes can be true, mostly true, false, and mostly false or we can just present it with a number. For example, 68% true or the score is 7 out of 10 where 1 is completely true and 10 is completely false.

BLOCK DIAGRAM

Flowchart

are taking their steps towards preventing the spread of fake news. Our systems take input from an URL or an existing database and classify it to be true or fake.To implement this, various NLP and Machine Learning Techniques have to be used.The website can be used by any user having a browser and an internet connection to check the veracity of the new article.

6. REFERENCES

[1] Conroy, Niall & Rubin, Victoria & Chen, Yimin. (2015). Automatic Deception Detection: Methods for Finding Fake News. . USA

[2] Ball, L. & Elworthy, J. J Market Anal (2014) 2: 187. https://doi.org/10.1057/jma.2014.15

[3] Lu TC. Yu T., Chen SH. (2018) Information Manipulation and Web Credibility. In: Bucciarelli E., Chen SH., Corchado J. (eds) Decision Economics: In the Tradition of Herbert A. Simon's Heritage. DCAI 2017. Advances in Intelligent Systems and Computing, vol 618. Springer, Cham

[4] Rubin, Victoria & Conroy, Niall & Chen, Yimin & Cornwell, Sarah. (2016). Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News. . 10.18653/v1/W16-0802.

5. CONCLUSION

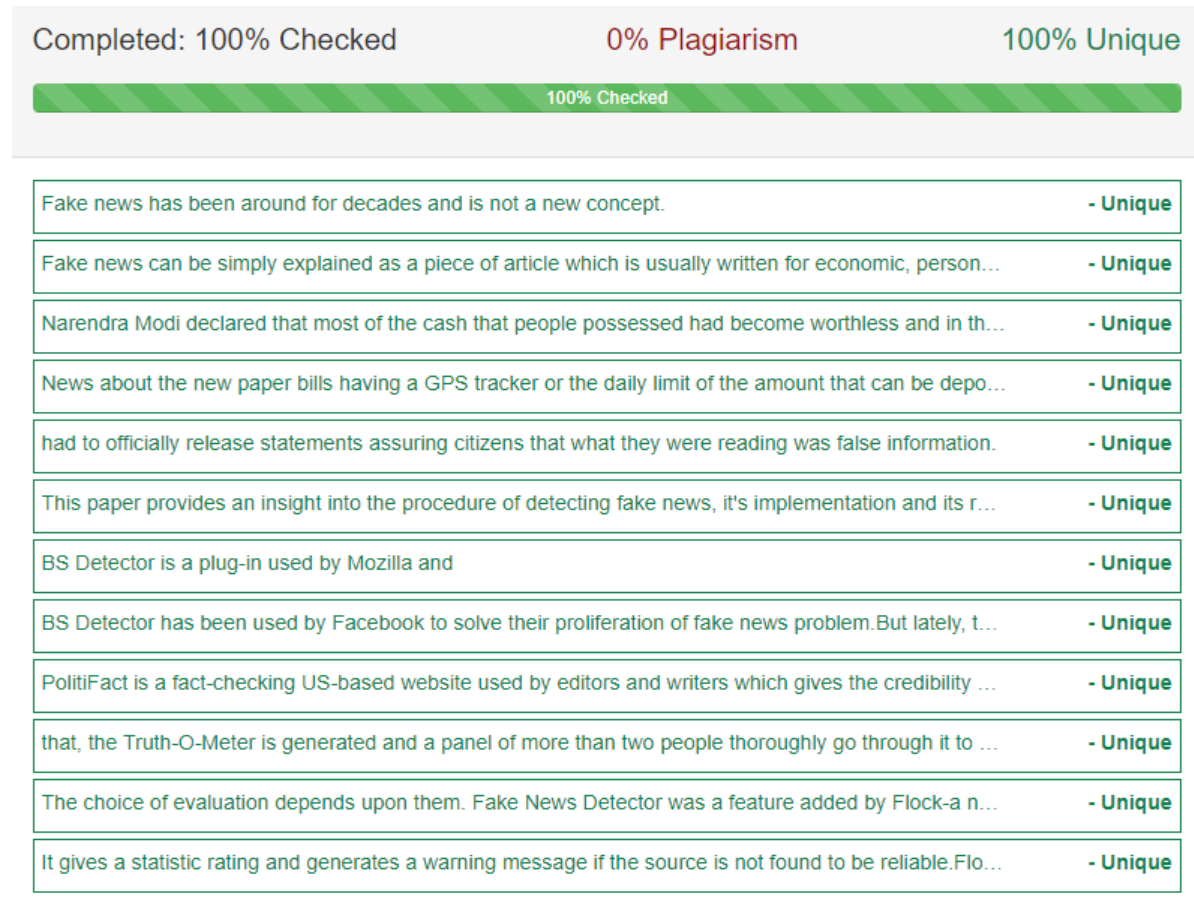In the 21st century, the majority of the tasks are done online. Newspapers who were earlier preferred as hard-copies are now being substituted by applications like Facebook, Twitter, and news articles to be read online. The growing problem of fake news only makes things more complicated and tries to change or hamper the opinion and attitude of people towards use of digital technology. When a person is deceived by the real news two possible things happen.People start believing that their perceptions about a particular topic are true as assumed. Another problem is that even if there is any news article available which contradicts a supposedly fake one, people believe in the words which just support their thinking without taking in the measure the facts involved.

Thus, in order to curb the phenomenon, Google and Facebook

11.3.2 Plagiarism Report

Completed: 100% Checked	0% Plagiarism	100% Unique

100% Checked

Fake news has been around for decades and is not a new concept.	- Unique
Fake news can be simply explained as a piece of article which is usually written for economic, person...	- Unique
Narendra Modi declared that most of the cash that people possessed had become worthless and in th...	- Unique
News about the new paper bills having a GPS tracker or the daily limit of the amount that can be depo...	- Unique
had to officially release statements assuring citizens that what they were reading was false information.	- Unique
This paper provides an insight into the procedure of detecting fake news, it's implementation and its r...	- Unique
BS Detector is a plug-in used by Mozilla and	- Unique
BS Detector has been used by Facebook to solve their proliferation of fake news problem.But lately, t...	- Unique
PolitiFact is a fact-checking US-based website used by editors and writers which gives the credibility ...	- Unique
that, the Truth-O-Meter is generated and a panel of more than two people thoroughly go through it to ...	- Unique
The choice of evaluation depends upon them. Fake News Detector was a feature added by Flock-a n...	- Unique
It gives a statistic rating and generates a warning message if the source is not found to be reliable.Flo...	- Unique

Fig 17

The choice of evaluation depends upon them. Fake News Detector was a feature added by Flock-a n...	- Unique
It gives a statistic rating and generates a warning message if the source is not found to be reliable.Flo...	- Unique
While there are some existing applications like BS Detector and Politifact which to some extent help u...	- Unique
In [1], they are using linguistic cues approaches and network analysis approaches to design a basic f...	- Unique
using a logistic regression classifier which is based on POS tags extracted from a corpus deceptive a...	- Unique
To detect fake news on social media, [3] presents a data mining perspective which includes fake new...	- Unique
In [4], they propose an SVM-based algorithm with 5 predictive features i.e. Absurdity, Humour, and Gr...	- Unique
The purpose of this paper is to propose a new model for fake news detection which is using Stance D...	- Unique
Using Random Forest gives us an advantage of handling binary features and moreover, they do not e...	- Unique

Fig 18

Completed: 100% Checked	0% Plagiarism	100% Unique

100% Checked

The aim of this project is to accurately determine the authenticity of the contents of a particular news ...	- Unique
We first take the URL of the article that the user wants to authenticate, after which the text is extracte...	- Unique
The outputs from these processes play an important role in further analyzing the data.	- Unique
article and comparison of the article with top google search results. The first method is by using stanc...	- Unique
Stance detection is an important part if NLP and has wide applications.The stance of the author can b...	- Unique
The second method is to use document similarity or tf-idf to know how similar a document is to top se...	- Unique
Next, we need to classify the output into various output classes for which we can use classification alg...	- Unique
For example, 68% true or the score is 7 out of 10 where 1 is completely true and 10 is completely false.	- Unique
Newspapers who were earlier preferred as hard-copies are now being substituted by applications like ...	- Unique
When a person is deceived of the real news two possible things happen.People start believing that th...	- Unique
Thus, in order to curb the phenomenon, Google and Facebook are taking their steps towards preventi...	- Unique
be used.The website can be used by any user having a browser and an internet connection to check t...	- Unique

Fig 19

11.3.3 Certificates of Paper 1

INTERNATIONAL JOURNAL OF ADVANCE RESEARCH,
IDEAS AND INNOVATIONS IN TECHNOLOGY

CERTIFICATE OF PUBLICATION

This is to certify that

Sanjana Moghe

published a paper entitled

Fake News Detection

Volume-4, Issue-1 - January- February, 2018

ISSN:2454-132X
IMPACT FACTOR 4.295

Ref No. OAP/IJ/181/354

editor@ijariit.com, ijariit@gmail.com

Editor-In-Chief

Google   DRJI   RESEARCHERID   IndiaScience

INTERNATIONAL JOURNAL OF ADVANCE RESEARCH,
IDEAS AND INNOVATIONS IN TECHNOLOGY

CERTIFICATE OF PUBLICATION

This is to certify that

Devansh Khakhar

published a paper entitled

Fake News Detection

Volume-4, Issue-1 - January- February, 2018

ISSN:2454-132X
IMPACT FACTOR 4.295

Ref No. OAP/IJ/181/356

editor@ijariit.com, ijariit@gmail.com

Editor-In-Chief

Google   DRJI   RESEARCHERID   IndiaScience

INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

CERTIFICATE OF PUBLICATION

This is to certify that

Jayesh Bhatia

published a paper entitled

Fake News Detection

Volume-4, Issue-1 - January- February, 2018

ISSN:2454-132X
IMPACT FACTOR 4.295

Ref No. OAP/IJ/181/357

IJARIIT

editor@ijariit.com, ijariit@gmail.com

Editor In Chief

Google
DRJI
RESEARCHERID
IndianScience

Fake News Detection

Mrs. Manisha Gahirwal Assistant Professor,CMPN V.E.S.I.T. Mumbai, India manisha.gahirwal@ves.ac.in	Sanjana Moghe Computer Engg. V.E.S.I.T Mumbai, India sanjana.moghe @ves.ac.in	Tanvi Kulkarni Computer Engg. V.E.S.I.T Mumbai, India tanvi.kulkarni@ ves.ac.in	Devansh Khakhar Computer Engg. V.E.S.I.T Mumbai, India devansh.khakhar @ves.ac.in	Jayesh Bhatia Computer Engg. V.E.S.I.T Mumbai, India jayesh.bhatia@ves.ac.in

Abstract:

Fake news, one of the biggest new-age problems has the potential to mould opinions and influence decisions.The proliferation of fake news on social media and Internet is deceiving people to an extent which needs to be stopped.The existing systems are inefficient in giving a precise statistical rating for any given news claim. Also, the restrictions on input and category of news make it less varied. This paper proposes a system that classifies unreliable news into different categories after computing an F-score. This system aims to use various NLP and classification techniques to help achieve maximum accuracy.

Keywords- Stance Detection, Natural Language Processing(NLP), Random Forest.

1. INTRODUCTION

Fake news has been around for decades and is not a new concept. However, the dawn of the social media age which can be approximated to the start of the 20th century has aggravated the generation and circulation of fake news many folds. Fake news can be simply explained as a piece of article which is usually written for economic, personal or political gains. Detection of such bogus news articles is possible by using various NLP techniques, Machine learning, and Artificial intelligence.

In 2016, the Prime Minister of India, Mr. Narendra Modi declared that most of the cash that people possessed had become worthless and in the span of one month all this old currency had to be deposited in the banks. This led to a chain reaction of a series of fake news being published used mainly for click bait and political gains. News about the new paper bills having a GPS tracker or the daily limit of the amount that can be deposited in banks has increased, were spreading like wildfire. Now, this may not seem like a huge thing but the impact of such articles was so much that there was a point where the Ministry of the Finance had to officially release statements assuring citizens that what they were reading was false information. This is just a small instance of how the spread of false news can impact a much greater audience than it may seem.

This paper provides an insight into the procedure of detecting fake news, it's

implementation and its results. In order to reach a conclusion on the authenticity of the news article we first take the text article, analyze the data and then use various classification algorithms to classify the news as legitimate or fake.

2. LACUNA IN THE EXISTING SYSTEM

I. BS Detector.

BS Detector is a plug-in used by Mozilla and Chrome browsers to detect the presence of fake news sources and to alert the user accordingly.It works by searching through web pages references of links which have already been flagged unreliable in their database. BS Detector has been used by Facebook to solve their proliferation of fake news problem.But lately, they blocked the extension stating that they have been working on their own technique to curb the problem. BS Detector just states a warning message if the article is found to be fake.It does not specify the percentage of error and neither does it classify news into levels of "truthfulness" or "fakeness".

II. PolitiFact.

PolitiFact is a fact-checking US-based website used by editors and writers which gives the credibility of claims by US officials involved American politics.This system places judgement in the form of Truth-O-Meter which is a measure of the accuracy of a statement.These people first decide on which news to evaluate depending upon some characteristics like significance and worthiness of the claim.After that, the Truth-O-Meter is generated and a panel of more

than two people thoroughly go through it to evaluate final rating of the claim.

The drawback of this system is that human intervention is required.Secondly, it works only for US politics.Also, every claim is not being fact-checked by them. The choice of evaluation depends upon them.

III. Flock Fake News Detector.

Fake News Detector was a feature added by Flock-a new generation messaging and collaborative platform. Whenever links are being sent to each while chatting, FND algorithm gets activated.It checks the content of links to their databases of websites computed according to rankings. It gives a statistic rating and generates a warning message if the source is not found to be reliable.Flocks database has more than 600 news URL'S that are fact-checked.The drawback of this system is that their database for fact checking is less in number and chances of hoaxes still not being determined are high.

3. LITERATURE SURVEY

While there are some existing applications like BS Detector and Politifact which to some extent help users to identify misleading news but it requires human intervention and also the domain is limited in case of BS Detector which does not give the user the extent of any article to be fake.

In [1], they are using linguistic cues approaches and network analysis approaches to design a basic fake news detector which provides high accuracy in terms of classification tasks. They propose a hybrid system whose features like multi-layer

linguistic processing, the addition of network behavior are included.In [2], they propose a method to detect online deceptive test by using a logistic regression classifier which is based on POS tags extracted from a corpus deceptive and truthful texts and achieves an accuracy of 72% which could be further improved by performing cross-corpus analysis of classification models and reducing the size of the input feature vector.

To detect fake news on social media, [3] presents a data mining perspective which includes fake news characterization on psychology and social theories. This article discusses two major factors responsible for widespread acceptance of fake news by the user which are Naive Realism and Confirmation Bias. Further, it proposes a two-phase general data mining framework which includes 1) Feature Extraction and 2) Model Construction and discusses the datasets and evaluation metrics for the fake news detection research. In [4], they propose an SVM-based algorithm with 5 predictive features i.e. Absurdity, Humour, and Grammar, Negative Affect, and Punctuation and uses satirical cues to detect misleading news. The paper translates theories of humor, irony, and satire into a predictive model for satire detection with 87% accuracy.

The purpose of this paper is to propose a new model for fake news detection which is using Stance Detection and IF-TDF method for analyzing the data which is taken from various datasets of fake and legitimate news and Random Forest classifier for classifying the output into four classes namely: True, Fake, Mostly True, and Mostly Fake. Using

Random Forest gives us an advantage of handling binary features and moreover, they do not expect linear features.

4.IMPLEMENTATION DETAILS

4.1.Algorithm:

Training
1. Read the training, testing and validation (CSV) files.
2. Pre-process data by removing null values, special characters.
3. Select best features using ngrams and TF-IDF vectors.
4. Apply classification algorithms-Logistic Regression, Naive Bayes, Support Vector Machines, Stochastic Gradient Descent, Random Forest classifier.
5. Calculate for each classification algorithm-
○ Confusion matrix
○ F-score
6. Select algorithm with minimum number of False Positive and False Negative from the confusion matrices.
7. Save/dump the model as a .sav file.

Testing
1. Read input URL of news article.
2. Scrape the text of the news article from the URL.
3. Generate a summary of the news article.
4. The summarized text is provided as input for the saved model.
5. Load the saved model and classify the text into classes- FALSE or TRUE.
6. Append the text and predicted output class into the training set.

4.2: Detailed explanation of the algorithms:

4.2.1.Porter's algorithm

  The Porter Stemming algorithm is a process for removing suffixes from words in English. Removing suffixes by automatic means is an operation which is especially useful in the field of information retrieval.Terms with a common stem will usually have similar meanings, for example:

   CONNECT
   CONNECTED
   CONNECTING
   CONNECTION
   CONNECTIONS

Frequently, the performance of an IR system will be improved if term groups such as this are conflated into a single term. The program is given an explicit list of suffixes, and, with each suffix, the criterion under which it may be removed from a word to leave a valid stem.

4.2.2 Ngrams

  In the fields of computational linguistics and probability, an n-gram is a contiguous sequence of n items from a given sample of text or speech. The items can be phonemes, syllables, letters, words or base pairs according to the application. The n-grams typically are collected from a text or speech corpus.

  Two benefits of n-gram models (and algorithms that use them) are simplicity and scalability – with larger n, a model can store more context with a well-understood space–time tradeoff, enabling small experiments to scale up efficiently. We have used unigrams, bigrams and trigrams in the data preparation module.

4.2.3 Tf-Idf

  Tf-idf stands for term frequency-inverse document frequency, and the tf-idf weight is a weight often used in information retrieval and text mining. This weight is a statistical measure used to evaluate how important a word is to a document in a collection or corpus. The importance increases proportionally to the number of times a word appears in the document but is offset by the frequency of the word in the corpus. Variations of the tf-idf weighting scheme are often used by search engines as a central tool in scoring and ranking a document's relevance given a user query.

  Tf-Idf weight is composed by two terms: the first computes the normalized Term Frequency (TF), aka. the number of times a word appears in a document, divided by the total number of words in that document; the second term is the Inverse Document Frequency (IDF), computed as the logarithm of the number of the documents in the corpus divided by the number of documents where the specific term appears. TF: Term Frequency, which measures how frequently a term occurs in a document. Since every document is different in length, it is possible that a term would appear much more times in long documents than shorter ones. Thus, the term frequency is often divided by the document length (aka. the total number of terms in the document) as a way of normalization:

TF(t) = (Number of times term t appears in a document) / (Total number of terms in the document).

4.2.4 IDF: Inverse Document Frequency, which measures how important a term is. While computing TF, all terms are considered equally important. However it is known that certain terms, such as "is", "of", and "that", may appear a lot of times but have little importance. Thus we need to weigh down the frequent terms while scale up the rare ones, by computing the following: IDF(t) = log_e(Total number of documents / Number of documents with term t in it).

4.2.5   Word2Vec
Word2vec is a two-layer neural net that processes text. Its input is a text corpus and its output is a set of vectors: feature vectors for words in that corpus. While Word2vec is not a deep neural network, it turns text into a numerical form that deep nets can understand.

 Word2vec takes as its input a large corpus of text and produces a vector space, typically of several hundred dimensions, with each unique word in the corpus being assigned a corresponding vector in the space. Word vectors are positioned in the vector space such that words that share common contexts in the corpus are located in close proximity to one another in the space. We have used Word2vec to group the vectors of similar words together in vector space. That is, it detects similarities mathematically. Word2vec creates vectors that are distributed numerical representations of word features, features such as the context of individual words. It does so without human intervention.

4.2.6   K-Fold

Cross Validation is a very useful technique for assessing the performance of machine learning models. It helps in knowing how the machine learning model would generalize to an independent data set.

In our system , we are using two type of data sets — known data (training data set) and unknown data (test data set). By using cross validation, we are testing our machine learning model in the training phase to check for overfitting and to get an idea about how our machine learning model will generalize to independent data, which is the test data set given in the problem.

In one round of cross validation, we are dividing our original training data set into two parts:Cross validation training set Cross validation testing set or Validation set

K-fold cross validation is performed as per the following steps: Partition the original training data set into k equal subsets. Each subset is called a fold. Let the folds be named as f1, f2, …, fk . For i = 1 to i = k Keep the fold fi as Validation set and keep all the remaining k-1 folds in the Cross validation training set. Train the model using the cross validation training set and calculate the accuracy of your model by validating the predicted results against the validation set. Estimate the accuracy of the machine learning model by averaging the accuracies derived in all the k cases of cross validation. In the k-fold cross validation method, all the entries in the original training data set are used for both training as well as validation. Also, each entry is used for validation just once.

4.2.7 Naive Bayes

The Naive Bayesian classifier is based on Bayes' theorem with the independence assumptions between predictors. A Naive Bayesian model is easy to build, with no complicated iterative parameter estimation which makes it particularly useful for very large datasets.

Bayes theorem provides a way of calculating the posterior probability, P(c|x), from P(c), P(x), and P(x|c). Naive Bayes classifier assume that the effect of the value of a predictor (x) on a given class (c) is independent of the values of other predictors. This assumption is called class conditional independence.

4.2.8 Logistic Regression

Logistic regression is a statistical method for analyzing a dataset in which there are one or more independent variables that determine an outcome. The outcome is measured with a dichotomous variable (in which there are only two possible outcomes). In logistic regression, the dependent variable is binary or dichotomous, i.e. it only contains data coded as 1 (TRUE, success, pregnant, etc.) or 0 (FALSE, failure, non-pregnant, etc.). The goal of logistic regression is to find the best fitting (yet biologically reasonable) model to describe the relationship between the dichotomous characteristic of interest (dependent variable = response or outcome variable) and a set of independent (predictor or explanatory) variables.

4.2.9 SVM

Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall.

In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

When data are not labeled, supervised learning is not possible, and an unsupervised learning approach is required, which attempts to find natural clustering of the data to groups, and then map new data to these formed groups.

We have used SVM as a classifier since it is helpful in text and hypertext categorization as its application can significantly reduce the need for labeled training instances in both the standard inductive and transductive settings.

4.3.0 SGD

Stochastic gradient descent (SGD), also known as incremental gradient descent, is a stochastic approximation of the gradient descent optimization and iterative method for minimizing an objective function that is written as a sum of differentiable functions. In other words, SGD tries to find minima or maxima by iteration. Stochastic Gradient

Descent (SGD) is a simple yet very efficient approach to discriminative learning of linear classifiers under convex loss functions such as (linear) Support Vector Machines and Logistic Regression.

SGD Classifier supports multi-class classification by combining multiple binary classifiers in a "one versus all" (OVA) scheme. For each of the classes, a binary classifier is learned that discriminates between that and all other classes. At testing time, we compute the confidence score (i.e. the signed distances to the hyperplane) for each classifier and choose the class with the highest confidence.

4.3.1 Random Forest

Random forests or random decision forests are an ensemble learning method for classification, regression and other tasks, that operate by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. Random decision forests correct for decision trees' habit of overfitting to their training set.

Random forests are a way of averaging multiple deep decision trees, trained on different parts of the same training set, with the goal of reducing the variance. This comes at the expense of a small increase in the bias and some loss of interpretability, but generally greatly boosts the performance in the final model. In random forests, there is no need for cross-validation or a separate test set to get an unbiased estimate of the test set error. It is estimated internally, during the run. Random forests can be used to rank the importance of variables in a regression or classification problem in a natural way.

Following are the confusion matrices and F-scores of the algorithms:
Naive Bayes:

```
Total statements classified: 2551
Score: 0.7034906032263439
score length 5
Confusion matrix:
[[ 112 1096]
 [  11 1332]]
```

Logistic Regression:
0.81 5

```
Total statements classified: 2551
Score: 0.808025156354099
score length 5
Confusion matrix:
[[ 722  486]
 [ 100 1243]]
```

SVM Classifier:

```
Total statements classified: 2551
Score: 0.819961422003462
score length 5
Confusion matrix:
[[ 768  440]
 [  97 1246]]
```

SGD Classifier:

```
Total statements classified: 2551
Score: 0.8270116039650318
score length 5
Confusion matrix:
[[ 843  365]
 [ 134 1209]]
```

Random Forest:

Total statements classified: 2551
Score: 0.8131931864783362
score length 5
Confusion matrix:
[[1008 200]
 [273 1070]]

earlier preferred as hard-copies are now being substituted by applications like Facebook, Twitter, and news articles to be read online. The growing problem of fake news only makes things more complicated and tries to change or hamper the opinion and attitude of people towards use of digital technology. When a person is deceived of the real news two possible things happen.People start believing that their perceptions about a particular topic are true as assumed. Another problem is that even if there is any news article available which contradicts a supposedly fake one, people believe in the words which just support their thinking without taking in the measure the facts involved.

Thus, in order to curb the phenomenon, Google and Facebook are taking their steps towards preventing the spread of fake news. Our systems take input from an URL or an existing database and classify it to be true or fake.To implement this, various NLP and Machine Learning Techniques have to be used.The website can be used by any user having a browser and an internet connection to check the veracity of the new article.

5.   FUTURE SCOPE

The current model displays the summary of the URL entered and tells us about the correctness of the news.A feature can be added where the user can check the details of all the previous searched news. Also, this model can be scaled to determine output of local news and news from other disciplines like sports,sarcasm etc. which are not currently covered.

6.   CONCLUSION

In the 21st century, the majority of the tasks are done online. Newspapers who were

7.   REFERENCES

[1] Conroy, Niall & Rubin, Victoria & Chen, Yimin. (2015). Automatic Deception Detection: Methods for Finding Fake News. . USA

[2] Ball, L. & Elworthy, J. J Market Anal (2014) 2: 187. https://doi.org/10.1057/jma.2014.15

[3] Lu TC., Yu T., Chen SH. (2018) Information Manipulation and Web Credibility. In: Bucciarelli E., Chen SH., Corchado J. (eds) Decision Economics: In the Tradition of Herbert A. Simon's Heritage. DCAI 2017. Advances in Intelligent Systems and Computing, vol 618. Springer, Cham

[4] Rubin, Victoria & Conroy, Niall & Chen, Yimin & Cornwell, Sarah. (2016). Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News. . 10.18653/v1/W16-0802.

11.3.5 Plagiarism report

Fig 20