Major Project Report on

Fake News Detection

Submitted in partial fulfilment for the
degree of Bachelor of Technology in
Artificial Intelligence

Submitted by
Ashwini Chemte (08)
Jyoti Indore (18)

Under the guidance of
Dr. Anita Morey

Usha Mittal Institute of Technology
Juhu-Tara Road, Sir Vitthaldas Vidyavihar,
Santacruz(W),Mumbai,Maharashtra 400049

2024

Approval Sheet

This is to certify that Jyoti Indore, Ashwini Chemte has completed the Major Project report on the topic " **Fake News Detection** " satisfactorily in partial fulfillment for the Bachelor's Degree in Artificial Intelligence under the guidance of Dr. Anita Morey during the year 2024-2025 as prescribed by SNDT Women's University.

Guide

Dr.Anita Morey

Head Of Department

Dr.Anita Morey

Principal
Dr. Yogesh Nerkar

Examiner 1

Examiner 2

Declaration

1.Jyoti Indore, Ashwini Chemte hereby declare that the work pre-sentenced in this project entitled "Usha Mittal Institute of Technology Project Fake News Detection" is entirely my own. The control of this project has been generated through our independent efforts, research, and scholarly contributions.I further declare that:

1. Orignality:

The ideas, concepts, and contributions presented in this work are solely the result of my own intellectual endeavours.

2.Authencity:

All data, figures, tables, and findings presented in this project are genuine and have not been fabricated or manipulated.

3. No Use of AI Tools:

I have not used any AI-based tools to generate significate portions of this project including but not limited to content, research objectives, hypothesis and analysis.

4. No Plagarism:

I have properly cited and refernced all external sources and works consulted during the prepartion of this project.

5. Independent Work:

This work has been conducted independently, without any collaboration or assistance that would compromise the originality of the content.

I understand the consequences of academic dishonesty and affirm that this declaration accurately reflects the nature and authencity of my work.

(Signature)

(Ashwini Chemte (08))

(Jyoti Indore (18))

Date

Abstract

In recent years, due to the booming development of online social networks, fake news for various commercial and political purposes has been appearing in large numbers and widespread in the online world. With deceptive words, online social network users can get infected by these online fake news easily, which has brought about tremendous effects on the offline society already. An important goal in improving the trustworthiness of information in online social networks is to identify the fake news timely. This paper aims at investigating the principles, methodologies and algorithms for detecting fake news articles, creators and subjects from online social networks and evaluating the corresponding performance. Information preciseness on Internet, especially on social media, is an increasingly important concern, but web-scale data hampers, ability to identify, evaluate and correct such data, or so called "Fake News," present in these platforms. In this project, we propose a method for "Fake News" detection and ways to apply it on Facebook, one of the most popular online social media platforms. This method uses Naive Bayes classification model to predict whether a post on Facebook will be labeled as real or fake. The results may be improved by applying several techniques that are discussed in this project. Received results suggest, that fake news detection problem can be addressed with machine learning methods.

Keywords: *NLP,DL,ML,TF-IDF,...*

Contents

List of Tables

List of Figures

Nomenclature

NLP	Natural Language Processing
DL	Deep Learning
ML	Machine Learning
TFIDF	Term Frequency-Inverse Document Frequency
F1-Score	Performance Matrix
BOW	bag-of-words model

Chapter 1

Introduction

Machine learning (ML) is the study of the statistical models and methods used by computers to do certain tasks devoid of explicit instructions and in favour of patterns and inference. As part of artificial intelligence, it is viewed. Without explicit instructions, machine learning algorithms construct a mathematical model using sample data, or "training data," in order to provide predictions or judgements. Computational statistics, which focuses on computer-aided prediction, and machine learning have a lot in common. Machine learning may benefit from the ideas, practises, and fields of application that come from the study of mathematical optimisations. The quantity of modifications that the data goes through is referred to as "Deep Learning" in this context.

Fake news, to put it simply, is information that is untrue. whether or whether it is accurate. Fake news contains verifiable erroneous information.

Many significant companies, even government agencies, are working to address issues related to false news. However, given that millions of articles are produced or purged every minute in this age, they are neither responsible nor humanely feasible because they rely on manual human detection. A machine learning algorithm that creates a trustworthy automated index score or rating for the authenticity of various publications and can assess whether the news is true or misleading may provide a solution to this problem.

1.1 Objectives of the Study

Our project's primary goal is to determine the veracity of news in order to determine if it is real or fake. The development of a machine learning model that would allow us to recognise bogus information. It can be difficult to identify fake news only based on its content since it is intentionally produced to influence readers to believe false information. By applying a range of methods and models, machine learning makes it easy to detect fake news. Additionally, to examine the relationship between two words, we will apply deep learning-based NLP(Natural Language Processing). You may eliminate stop words using this method as well.

1.2 Problem Statement

Both Benefits and drawbacks come with reading the news. On the other hand, news is actively sought for and consumed since it is easily available, inexpensive, and quickly spread. It makes it possible for "Fake News," or negative news with blatantly inaccurate material, to be widely disseminated. As a result, research into the detection of bogus news has recently made significant strides. First off, identifying fake news just on the basis of the content is challenging and nontrivial since it is purposefully designed to lead people to accept incorrect information.

Chapter 2

Literature Survey

This survey is an analysis of distinctly assorted systems or techniques that are being used previously for Fake News detection. The primary objective of this paper is to observe and determine most efficient and non-biased techniques for stated problem statement. Also, following survey explores every methodology implemented among mentioned Literatures.The prominent causes and prevalence of fake news are perplexing issues. There are numerous approaches that can and had been embraced by individuals as well as organizations . However in our survey, it is observed that Prominence regarding this approaches are given to : 1

(1) Fact Checking

(2) Rumor detection

(3) Content-Based Detection

(4) Sentiment Analysis

In,A sentiment analysis is done to detect Fake News with the help of Neural Networks. More-less this procedure is followed in other surveyed literatures irrespective of approaches, tools and resources utilised. Hence it is observed that Machine Learning in python is a common domain for text analysis. Therefore it seems, a fake news detector is an informally titled data science implementing model which is capable of detecting and classifying fake and true news from provided data. Neural networks are incapable of estimating text driven data and hence requires word embedding . " **TF-IDF frequently appeared across this survey**". The Problem of news detection is classification oriented specifically binary

classification, so machine learning algorithms such as " **Logistic Regression, Passive Agressive Classifier, Decision Tree Classifier, Gradient Boost Classifier,Random Forest Classifier**" are utilized more often. However in following survey it can be noted these algorithms are not very lenient on varying data and hence do not seems to provide required accuracy. New methods such as Deep Learning and Natural language processing are explored to provide solution.

1.Datasets

Any Machine Learning Model's main concern is the nature of data that need to be fed into the system. This concern is amplified in fake news detection model as the relevance of this model depends on the authenticity of its data sources. Along with authenticity, mode of data is also crucial. Data sets and real time data are two modes which are often visible through out this survey.The first dataset is true:Genuine news articles dataset and the second one is fake 2 which was published in 2017 .Social media platforms like face book, twitter,instagram, buzz feed, etc. are more prone to rumor as most of them claims rather than facts. Through out literatures, Data sets are much more accepted than real time data. Fact-Checking can be reason for preference towards datasets. As real time data cannot be consider as reliable; because not all real time data is verified even if it is from reliable sources and hence can create an in accurately trained model. On the flipped side, data sets from reliable sources are checked for facts and thus are relevant.

2.Text Pre-processing

A corpus consists of several texts in which, only few keywords are the object of analysis. Corpuses also have various unwanted words and characters such as conjunctions, punctuations, abbreviations (short-forms), incomplete words, etc. Collectively, these texts are known as stop words and are redundant in classifications. Firstly we will remove all the stopwords, punctuations and any irrelevant spaces from the text. For that SKlearn Library is required and some of it's module need to be downloaded.

3.Machine Learning (ML)Algorithms

The classification of fake news is considered as a binary classification issue and a predictive analysis approach. It is important for a system to satisfy above conditions to build non-biased and accurate fake news detector. In recent years,

ML has established a revolutionary field for predictive analysis, also ML consist of several traditional ML models (non-neural network models)and new ML models (neural network models)which are capable of classification .

4.Traditional Machine Learning Algorithms (Non-Neural network Algorithms)

Nowdays it is been often noticed that for binary classification, Support Vector Machine (SVM) and Logistic Regression are often preferred. If classification is to be combine with predictions then Naive bayes model have better outcomes. It should also be considered that accuracy rely on models with chosen word embedding methods. SVM and naïve bayes are frequently preferred over others due to their higher accuracy score for text analysis. Accuracy depends upon models with word embedding approaches. Hence models must be cross-validate before training. However despite their capabilities, the highest accuracy achieve is no more than 80 percent comparison among prior models. 3

Author	Technique Used	Algorithm	Accuracy
Horne (2017)	Linguistic	SVM	71
Ruchansky (2017)	TriFN	DNN	86
Wang (2017)	LIAR	Hybrid	82
Shu (2018)	Content	Graph	89
Pérez (2018)	LIWC	Logistic	76
BERT (2019)	Contextualized	Pretrained	90
Fake News (2017)	BOG	Gradient Boosting	88
Volkova (2017)	Stylometric	Random Forest	78
Gupta (2018)	Image-based	CNN	87
Hanselowski (2018)	FEVER dataset	Multi	82
Zhang (2020)	Multi-modal	Attention	91

Table 2.1: Comparison among prior models

Chapter 3

System Developments

3.1 Existing System

1. Pre-processing

Load the dataset of news items with their labels, whether they are true or false. Clean the text by eliminating punctuation and stopwords. Divide the dataset into training and testing sets.

2. Count Vectorization

Count Vectorizer from the Sklearn toolkit may be used to transform text data into numerical data.Produce a document-term matrix showing the frequency of each word used in each document.Fit the Count Vectorizer using the training set, then convert the data.Utilise the testing set to change the data.

3. TFIDF Vectorization

Utilise the Tfidf Vectorizer in the Sklearn package to turn the text data into numerical data.Use the training set to fit the Tfidf Vectorizer and convert the data.Create a document-term matrix that depicts the significance of each word in each document.Utilise the testing set to change the data.

4. Training the Models

Utilise the data that has been modified by Count Vectorizer and Tfidf Vectorizer to train a variety of models, including Logistic Regression, Random Forest, etc.Fit the models using the training set.Use the testing set to predict the news article labels.Determine each model's accuracy score using the actual and projected

labels.

5. Confusion Matrix

The confusion matrix displays the amount of true positives, true negatives, false positives, and false negatives for each model, allowing you to assess each one's performance.Measurements like accuracy, recall may be calculated using the confusion matrix.

6. Accuracy

Determine each model's accuracy by comparing its predicted labels to its actual labels.The accuracy measures the proportion of news stories that were accurately identified as being true or false.Evaluate the accuracy of various models to find which one is most effective at spotting fake news.

7. Representing the Output in Web Browser using Flask

Flask is a small and lightweight Python web framework that provides useful tools and features that make creating web applications in Python easier. It gives developers flexibility and is a more accessible framework for new developers since you can build a web application quickly using only a single Python file. Flask is also extensible and doesn't force a particular directory structure or require complicated boilerplate code before getting started.

3.2 Proposed System

The proposed system for fake news detection leverages advanced machine learning and natural language processing (NLP) techniques to combat the spread of misinformation. This system integrates a multi-layered approach that includes data collection from various online sources, preprocessing for text normalization, and feature extraction to identify linguistic and stylistic patterns often associated with fake news. A supervised learning model, trained on a labeled dataset of verified and fake news articles, classifies content based on attributes like sentiment, reliability of sources, and semantic coherence. Additionally, the system employs real-time fact-checking by cross-referencing information with trusted databases. The output provides users with a confidence score indicating the likelihood of the news being fake, empowering them to make informed decisions. This solution aims to curb the societal and informational harm caused by fake news while promoting

media literacy and critical thinking.

3.3 Hardware Requirements

System	Pentium
Speed	2.4GHZ
Hard Disk	40GB
Monitor	15VGA Color
RAM	512MB

Table 3.1: Hardware Requirements

3.4 Software Requirements

- **Operating System** - Windows
  - **Programming Language**– Python
  - **Platform**– VSCode

3.5 Architectural Overview

3.5.1 Design of Project

1. Dataset

The first step is to collect or obtain a dataset of news articles, labeled as "**Fake**" or "**Real**". This dataset will be used to train and evaluate the performance of different fake news detection models.

2. Preprocessing

The dataset must now be cleaned up by eliminating any extraneous or irrelevant data, including stop words, punctuation, and digits. Additionally, the text may need to be normalised by making all characters lowercase and eliminating any special characters or symbols.

3. Count Vectorizer

The format can be used to transform textual data into numerical characteristics after preprocessing the text. This entails building a matrix where each row represents a news item and each column represents a distinct term from the dataset. The value in each cell indicates how often the term appears in the related art.

4. Train-Test Split

Once we have the Confusion matrix, we can split the data into training and testing sets. The training set will be used to train the fake news detection model, while the testing set will be used to evaluate the model's performance on new, unseen data.

5. Text-to-vectors (TF-IDF)

In addition to BOW, we can also express the textual data using the Term Frequency-Inverse Document Frequency (TF-IDF) representation. The frequency of the terms in each article as well as their frequency throughout the whole dataset is taken into consideration in this representation. This helps to downplay terms that are prevalent across the whole dataset and to emphasise words that are exclusive to a certain article.

6. Models

After obtaining the numerical features from the text data, several machine learning methods such as Passive Agressive Classifier can be employed to train a fake news detection model. The objective of the model is to learn a function that can accurately classify news stories as either "**Real**" or "**Fake**" based on the derived attributes from the text.

7. Accuracy and Confusion Matrix

It's crucial to assess the false news detection model's performance on the testing set after we've trained it. By assessing its accuracy, precision, we may do this. To see how many true positives, true negatives, false positives, and false negatives the model produces, we may also develop a confusion matrix.

8. Testing

We may use the model to categorise fresh and previously unheard news pieces as "real" or "fake" after assessing the model's performance. This entails applying the same feature extraction and preprocessing operations to the fresh data that we did during training. After that, we can apply the trained model to the cleaned-up data to provide a categorization label.

9. Result

Flask library of python is used to represent the result in web browser where user input the news and algorithm tell that the news is "**Real**" or "**Fake**".

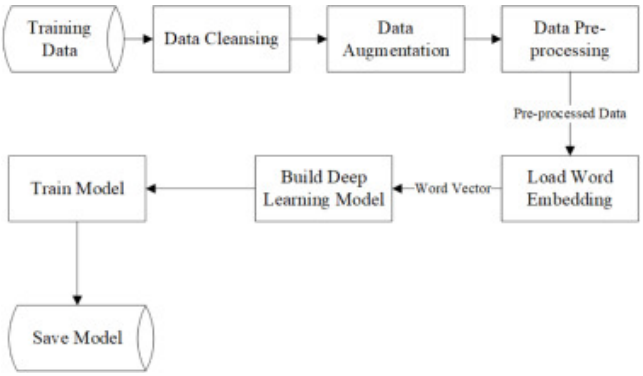

Figure 3.1: Architectural Overview

3.6 Algorithm

Step 1: Import Libraries

import pandas as pd

import numpy as np

import itertools

Step 2: Load Dataset

data = pd.read$_csv('news.csv')$ **Example dataset**

X = data['text'] **News content**

y = data['label'] **'Fake' or 'Real'**

Step 3: Preprocess Text Data

tfidf = TfidfVectorizer(stop$_words =' english', max_features = 5000)$

X$_tfidf = tfidf.fit_transform(X)$

Step 4: Split Data

X$_train, X_test, y_train, y_test = train_test_split(X_tfidf, y, test_size = 0.2, random_state =$ 42)

Step 5: Train Model

model = Passive Aggressive Classifier()

model.fit(X$_t rain, y_t rain$)

Step 6: Evaluate Model

y$_p red = model.predict(X_t est)$

print(classification$_r eport(y_t est, y_p red)$)

3.7 Workflow of Proposed Model

Fake news has become a significant issue in today's digital age, where information spreads rapidly through various online platforms. This project leverages machine learning algorithms to automatically determine the authenticity of news articles, providing a valuable tool to combat misinformation.

1. Importing Libraries and Datasets

The libraries used are : • Pandas: For importing the dataset. • Numpy: Numerical Python.

2. Preprocessing and analysis of News column

Firstly we will remove all the stopwords, punctuations and any irrelevant spaces from the text. For that NLTK Library is required and some of it's module need to be downloaded.

3. Converting text into Vectors

Before converting the data into vectors, split it into train and test from sklearn.model$_s electionimp$

from sklearn.metrics import accuracy$_s core$

from sklearn.linear$_m odelimportPassiveAgressiveClassifier$

x$_t rain, x_t est, y_t rain, y_t est = train_t est_s plit(data['text'],$

data['class'],

test$_s ize = 0.25$)

Now we can convert the training data into vectors using TfidfVectorizer. from sklearn.feature$_e xtraction.textimportTfidfVectorizer$

vectorization = TfidfVectorizer()

x$_t rain = vectorization.fit_t ransform(x_t rain)$

x$_t est = vectorization.transform(x_t est)$

4. Model training, Evaluation, and Prediction

Now, the dataset is ready to train the model. For training we will use Passive Agressive Classifier and evaluate the prediction accuracy using accuracy$_s core$.

3.8 Result and Experimental Analysis

3.8.1 Models Applied And their Results

Passive Agressive Classifier

This is a high-level overview of the algorithm explaining how it works and when to use it. It does not go deep into the mathematics of how it works. Passive-Aggressive algorithms are generally used for large-scale learning. It is one of the few 'online-learning algorithms'. In online machine learning algorithms, the input data comes in sequential order and the machine learning model is updated step-by-step, as opposed to batch learning, where the entire training dataset is used at once. This is very useful in situations where there is a huge amount of data and it is computationally infeasible to train the entire dataset because of the sheer size of the data.

Passive: If the prediction is correct, keep the model and do not make any changes. i.e., the data in the example is not enough to cause any changes in the model.

Aggressive: If the prediction is incorrect, make changes to the model. i.e., some change to the model may correct it.

Accuracy of Logistic Regression is **94.63 percent**.

Confusion Matrix

A confusion matrix is a matrix that summarizes the performance of a machine learning model on a set of test data. It is a means of displaying the number of accurate and inaccurate instances based on the model's predictions. It is often used to measure the performance of classification models, which aim to predict a categorical label for each input instance.

True Positive (TP): The model correctly predicted a positive outcome (the actual outcome was positive).

True Negative (TN): The model correctly predicted a negative outcome (the actual outcome was negative).

The outcome will be show in **REAL** or **FAKE**.

Chapter 4

Applications of Fake News Detection using Machine Learning

Fake news detection has a wide range of applications across various industries. Let us explore some real-world applications of false news detection-

1.Social Media

Fake news spreads quickly on social media platforms, leading to misinformation and confusion. Many leading social media platforms have implemented false news detection algorithms to combat this issue. For example, Twitter uses machine learning to detect and flag potentially misleading or false information in tweets.

2.News/Journalism

News organizations use machine learning algorithms to verify information and sources. For example, the BBC developed a tool called "Project Origin," which uses natural language processing (NLP) and machine learning techniques to identify the origin of images and videos and determine if they are authentic or have been manipulated. 4

3.Politics

Fake news can significantly impact political campaigns and elections. Several political organizations have developed tools to detect false news and misinformation. For example, the German political party CDU developed a tool called "Augmented Intelligence for Quality Journalism" (AIQ), which uses machine learning to identify and fact-check news articles.

4.Finance

Fake news can also significantly impact financial markets. Hedge funds and investment firms use machine learning algorithms to analyze news sources and detect false news that could impact the stock market. For example, Determine uses machine learning techniques to analyze social media feeds and news sources to provide real-time alerts on events that could impact financial markets.

5.Healthcare

Fake news can also seriously affect the healthcare industry. Several organizations use machine learning to identify false healthcare and medical research news. For example, researchers at the University of Michigan developed an 'IRIS' tool that uses natural language processing and machine learning to identify fake news related to healthcare and medical research. 5

Chapter 5

Conclusion and Future scope

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. In this project, we explored the fake news problem by reviewing existing literature in two phases: characterization and detection. In the characterization phase, we introduced the basic concepts and principles of fake news in both traditional media and social media. In the detection phase, we reviewed existing fake news detection approaches from a data mining perspective,including feature extraction and model construction. We also further discussed the datasets, evaluation metrics, and promising future directions in fake news detection research and expand the field to other applications

5.1 Future Scope

• **Enhanced Algorithms :** Move from basic models (e.g., logistic regression, Naive Bayes) to more sophisticated ones like Transformers (e.g., BERT, RoBERTa).

• **Image Analysis :**Detect fake news that involves doctored images or videos using computer vision techniques.

• **Text-Image Correlation :**Cross-validate the textual content with accompanying images or videos to assess credibility.

• **Audio/Video Deepfakes :**Extend the scope to detect fake audio or video

content using deepfake detection techniques.

• **Cross-Language Detection :**Expand detection to multiple languages, focusing on low-resource languages.

• **Psychological Impact :**Investigate the effects of fake news exposure on mental health and decision-making.

• **Collaboration with Academia :**Collaborate on interdisciplinary research combining technology, psychology, and sociology.

• **Social Media Platforms :**Collaborate with companies like Twitter, Facebook, or Reddit to flag fake news proactively.

References

1. An overview of online fake news: Characterization, detection, and discussion. *Zhang, Xichen and Ghorbani, Ali A Information Processing & Management*, 57 (2):102025.

2. Fake news detection on social media: A data mining perspective. *Shu, Kai and Sliva, Amy and Wang, Suhang and Tang, Jiliang and Liu, Huan, ACM SIGKDD explorations newsletter*, 19(1):22–36.

3. A comprehensive review on fake news detection with deep learning. *Mridha, Muhammad Firoz and Keya, Ashfia Jannat and Hamid, Md Abdul and Monowar, Muhammad Mostafa and Rahman, Md Saifur, IEEE access*, 9: 156151–156170.

4. Fake news detection. In *Jain, Akshay and Kasbe, Amey, 2018 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS)*, pages 1–5. IEEE.

5. Beyond news contents: The role of social context for fake news detection. In *Shu, Kai and Wang, Suhang and Liu, Huan, Proceedings of the twelfth ACM international conference on web search and data mining*, pages 312–320.

Acknowledgement

I have a great pleasure to express my gratitude to all those who have contributed and motivated during my project work. Here you have a liberty to write anything and express your feeling to all those who have helped you.

...

Date:

Name of Candidate