Efficient Approach for Fake News Detection using Passive Aggressive Algorithm

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Abstract— social media is a double-edged sword which gives information as well as false information, false information which led to the massive disturbance which is intentionally spread. We are also not able to differentiate the news which is fake and which is real. People immediately start expressing their concern as they came across the post without verifying the authenticity. Now the technology is in growing phase where "internet" plays the main role which separates the "print media" (i.e., television, radio, and news channel) and "social media" (i.e. what's App, Facebook, twitter, Instagram.) The reach and the potential of social media is more for e.g. In a house we have television while mobile everyone having so it makes the extra impact and help for various people for spreading fake news.

Keywords: EDA, TFIDF Vectorizer, IDF

I. INTRODUCTION

In this multimedia world where all the things are depended on the technology while many other using this thing has weapons which affect the social harmony of the society via. Spreading the intentionally false news [2]. False news shows the impacts on:

- Elections
- Society
- Individual also affects
- Covid-19 pandemic (mass no. of false information in social media)
- Vaccination (Due to false information people divided in three groups)
  - Agree for vaccination
  - Agree / Not Agree
  - Not ready for vaccination

Now because of several true information and awareness via. Social media it helps to convince people for vaccination. [1] False news many generate the agitation in people for others. (Regional, political, culture, center - state government) [2] India which is densely populated social media not only keeps in touch with friends but also gather news. Covid-19 pandemic also act as an info-demic which issued numerous data, directives and warnings that spread and circulate in the form of misleading information [4]. It is very challenging to verify the validity, creditability and correctness of shared information, especially when it is related to horrific disease which is thread to humanity [3]. We introduce a model which detects misleading information from various social media handle.

II. METHODOLOGY

The Aim of this review is to gather the various sequence of related information on the area of fake news detection over the social network. So that we precede the survey from various platform or area like Facebook, Twitter, What app etc. In this review, we will be working on the papers in which we have achieved the possible results in detecting of the untruthful news over social media, Post sharing attitude and sentiment analysis on Facebook, identifying fake users and fake news in the Twitter social network. Due to exponential rise in the use of social media nowadays, it has become a very easy platform to spread fake news as the news reaches the social media user in no time. So the main motive behind our work is to find best classification algorithm for detecting or analyzing the fake content and sensitive information over social media and calculating its accuracy.
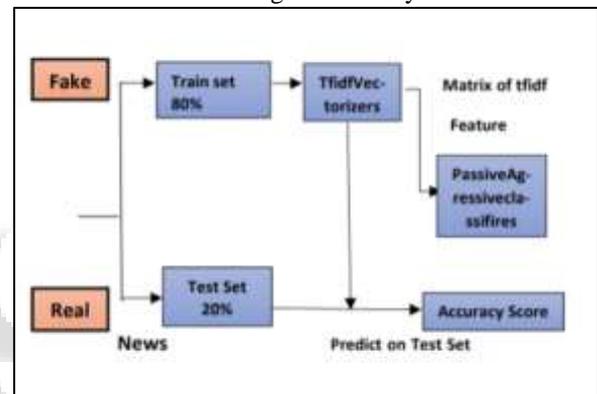

Fig. 1: Detecting Fake News - Data Flair

The purpose of this paper is to categorize approaches used to identify fake news. In order to do this, a systematic literature review was done. This section presents the search terms that were used, the selection criteria and the source selection.

A. Flowchart of Search Process

Figure 1 below gives a flowchart of the search process: the identification of articles, the screening, the selection process and the number of the included articles.

B. Language Approach

This approach focuses on the use of linguistics by a human or software program to detect fake news. Most of the people responsible for the spread of fake news have control over what their story is about, but they can often be exposed through the style of their language.

C. Semantic Analysis

It explains that truthfulness can be determined by comparing personal experience (e.g., restaurant review) with a profile on the topic derived from similar articles. An honest writer will be more likely to make similar remarks about a topic than other truthful writers. Different compatibly scores are used in this approach.

1) EDA

Exploratory data analysis is an approach of analyzing data sets to summarize their main characteristics, often using statistical graphics and other data visualization methods

2) Data Pre-processing

In data pre-processing, we will focus on the text column on this data which actually contains the new part.

3) TFIDF Vectorizer

a)   TF (Term Frequency)

The number of times a word appears in documents is its Term Frequency.

b)   IDF (Inverse Document Frequency)

Words that occur many times a document, but also occur many times in many others, may be irrelevant.

4) Apply Algorithm: -

a)   Passive Aggressive Classifier:

Passive Aggressive algorithms are online learning algorithms. Such as algorithm remains passive for a correct classification outcome, and turns aggressive in the event of a miscalculation, updating and adjusting.

5) Pre-process and transform data point text and try to predict it based on the model: -

The data points we used in this study are open source and freely available online. The data includes both fake and truthful news articles from multiple domains.

6) Saving model and TFIDF Vectorizer: -

TFIDF works to vectorizer it is requires many documents but by creating new vectorizer we can't just pass it a single data structure to then classify it. We clearly need to save this vectorizer.

7) Load model and Vectorizer and predict on   previous pre-processed data point: -

A class prediction is a given the finalized model and one or more data instances, predict the for the pre-processed data point or data instances.

8) Save some data points for text random generation:-

Random text as filler content in your word document, you can use the random content generation formula provided by word, a few notes to make when using this function, depending on how much text you need.

III. VECTORIZING DATA

Vectorizing is the process of encoding text as integers i.e. numeric form to create feature vectors so that machine learning algorithms can understand our data.

A. TF-IDF

It computes "relative frequency" that a word appears in a document compared to its frequency across all documents TF-IDF weight Represents the relative importance of a term in the document and entire corpus.

TF stands for Term Frequency: It calculates how frequently a term appears in a document. Since, every document size varies, a term may

Appear more in a long-sized document that a short one. Thus, the length of the document often divides Term frequency.

Note: Used for search engine scoring, text summarization, document clustering.

$$TF\,(T, D) = \frac{\text{Number of Time T Occurs In Documents}}{\text{Total Word Count of Document}}$$

IDF stands for Inverse Document Frequency: A word is not of much use if it is present in all the documents. Certain terms like "a", "an", "the", "on", "of" etc. appear many times in a document but are of little importance. IDF weighs down the importance of these terms and increase the importance of rare ones. The more the value of IDF, the more unique is the word

$$IDF\,(T, D) = \frac{\text{Total Number of Documents}}{\text{No of Documents with Term in It}}$$

TF-IDF is applied on the body text, so the relative count of each word in the sentences is stored in the document matrix.

TFIDF (t, d) = TF (t, d) * IDF(t)

B. RECALL

Recall represent the total number of positive classification out of true class. In our case, it represent number of article predicted as true out of the total number of true articles.

$$Recell = \frac{TP}{TP + FN}$$

C. PRECISION

Conversely, precision score represents the ratio of true positive to all the events predicted as true. In our case, precision show the number of articles that are marked as true out of all the positively predicted (true) articles:

$$Precision = \frac{TP}{TP + FP}$$

D. ACCURACY

Accuracy is often the most used matrix representation the percentage of correctly predicted o0bservation, either true or false. To calculate accuracy of a model performance, the following equation can be used:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

In most cases, high accuracy value represents a good model, but considering the fact that we are training a classification model in our case, an article that was predicted as true while of was actually false(false positive) can have negative consequences; similarly, if an article was predicted as false while it contain factual data, these can create trust issues. Therefore, we have used three other matrix that take into account the incorrectly classified observation, i.e. precision, recall.

E. F1-SCORE

F1-Score represents the trade-off between precision and recall. It calculates the harmonic mean between each of the two. Thus, it takes both the false positive and the false negative observations into account. F1-Score can be calculated using the following formula:

$$\text{F1} - \text{Score} = \frac{2\ \text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

IV. RESULT AND ANALYSIS

The passive aggressive algorithm are a family of algorithm for large scale learning. They are similar to the perceptron in

that they do not require a learning rate. However, contrary to the perceptron they include regulation parameter.

We used news.csv with passive Aggressive classifier and obtain the following confusion matrix.

Total=1267	Passive aggressive classifier	
	Fake(predicted)	Real(predicted)
Fake (Actual)	588	50
Real (Actual)	42	587

CONFUSION MATRIX

588	50
42	587

Fake   Real

PREDICTED LABEL

Classifier	Precision	Recall	F1-Score	Accuracy
Passive Aggressive Classifier	0.93	0.9216	92.57	92.73

CLASSIFICATION REPORT

	Precision	Recall	F1-Score	Support
0	1.00	1.00	1.00	4
1	1.00	0.75	0.86	4
2	0.88	1.00	0.93	7

Accuracy			0.93	15
Macro Avg	0.96	0.92	0.93	15
Weighted Avg	0.94	0.93	0.93	15

We have achieved a test set accuracy of 93.33%.

A. DATASET

This Dataset has a shape of 7796*4. The first column identifies the news, the second and third are the title and text, and the fourth column has Labels denoting whether the news is REAL or FAKE. There are 4 columns in datasets, which are described below.

1) Id: Unique id for news report.
2) Title: The title of a news report.
3) Text: The text of the report; could be incomplete.
4) Label: A label that marks the report as potentially unreliable.

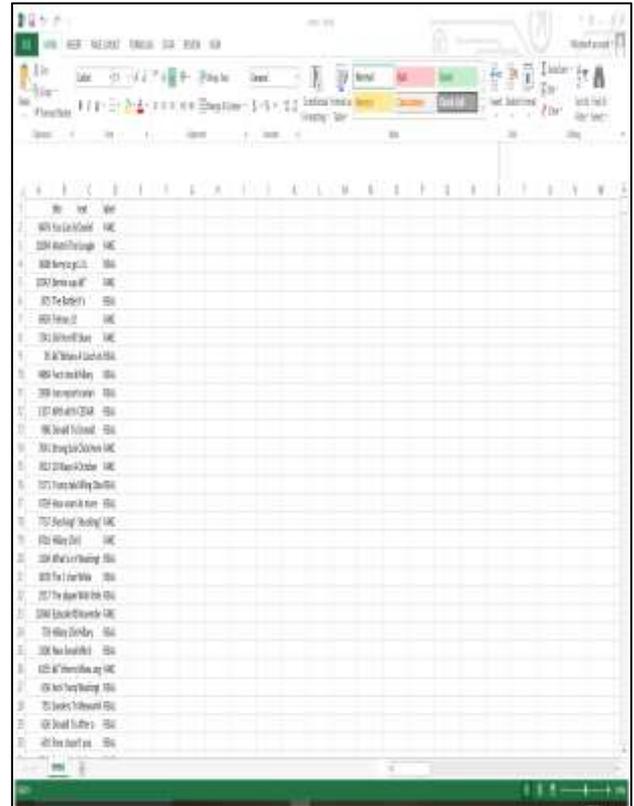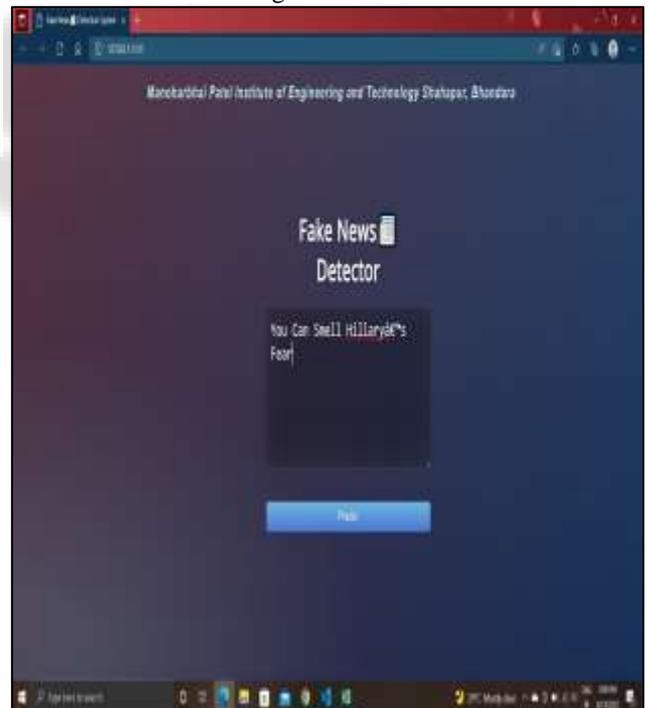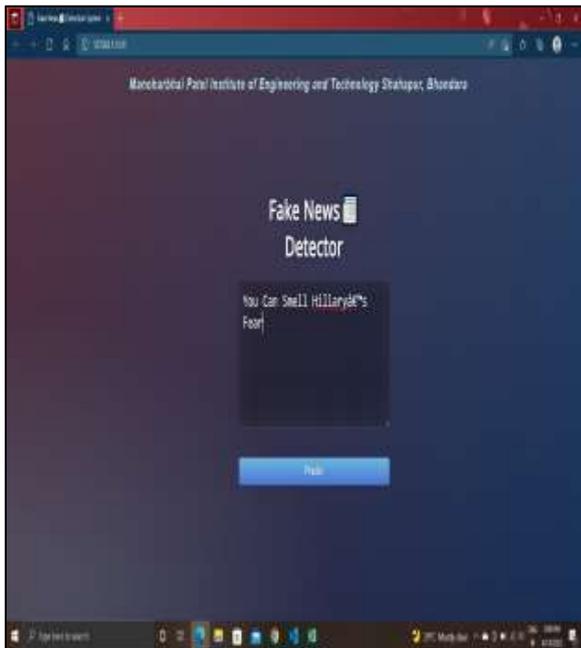Fig. 1: Dataset

Fig. 2: Prediction

Fig. 3: Prediction is real or fake

So finally, news is predicted and result is real.

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