FAKE NEWS PROJECT

Submitted by:

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ACKNOWLEDGMENT

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INTRODUCTION

- Business Problem Framing

Everyone is extremely concerned about the proliferation of fake news in light of the recent social media growth. It has been used to sway public opinion, influence elections, including the US Presidential Election of 2016, instigate hatred and rioting, and carry out atrocities like the genocide of the Rohingya people. According to a 2018 MIT study, fake news spreads on Twitter six times more quickly than legitimate news. The level of confidence and trustworthiness in the news media has never been lower. It is getting harder and harder to tell what news is true and what is fake. There aren't many ways to determine the veracity, and those that are available are all complex and out of the reach of the typical individual. To give us that chance, there is a dire need for a web-based fact-checking tool that makes use of machine learning.

- Conceptual Background of the Domain Problem

On social media, it might be difficult to spot fake news. First of all, gathering data on fake news is challenging. Furthermore, it is challenging to manually identify bogus news. It is challenging to identify them solely based on news content because they are purposefully created to deceive people. Twitter, Facebook, and WhatsApp are all closed messaging platforms. Therefore, it is challenging to declare false information spread by reliable news sources or their friends and family. Since they are not enough to train the application dataset, it is difficult to assess the validity of recently published and time-bound news. Important methods to distinguish trustworthy individuals, extract useful news aspects, and create genuine information dissemination systems are some beneficial research areas that require further study.

- ## Review of Literature

Researchers have looked at a variety of facets of online information credibility from an NLP perspective. To address the credibility of a tweet in various circumstances, [1] used the time-sensitive supervised approach by depending on the content of tweets. In an analogous challenge of early rumour detection, [2] employed LSTM. In a different study, [3] used convolution neural networks to recognise the tone of tweets and assess the truth of a given rumour. The creation of a bag-of-words autoencoder and its training on tokenized tweets are the main goals of a submission [4] to the SemEval 2016 Twitter Stance Detection assignment. A deep convolutional neural network and a gradient-boosted decision tree were integrated in a 50/50 weighted average by a different team, [5], using many models combined in an ensemble. A group of researchers [6] combined different feature vectors and then ran them through an NLP model. A margin-based online learning system for binary classification is called the passive aggressive algorithm. Additionally, it uses a soft margin-based algorithm and is noise-resistant. It can be utilised to identify fake news [7]. Another technique for representing text in a way that machine learning algorithms can quickly digest is term frequency-inverse document frequency. It is a quantitative statistic that illustrates how significant a word is to news in a dataset of news. The frequency of a word in the news (both fake and real) is inversely correlated with its importance, but the frequency of the word in the news dataset is directly correlated with its relevance (fake or real) [8]

- ## Motivation for the Problem Undertaken

Using computer-mediated technology, social media makes it easier to create and share information. This media altered how individuals engage and communicate with one another. It enables quick, easy, and inexpensive information dissemination to them. These days, social media is where most people search for and consume news, not traditional news sources. While social media has

become a potent tool for spreading knowledge and uniting people, it has also had a negative impact on society.

Take a look at the following samples; WhatsApp, a well-known messaging app owned by Facebook Inc., was used as a political battleground in Brazil's election. False rumours, altered images, context-free films, and audio jokes were all employed during the campaign. These things spread quickly online without their source or audience being checked. After numerous terrorist attacks in Sri Lanka in 2019, major social media and messaging platforms like Facebook and Instagram were blocked nationally. Online "fake news reports" were allegedly circulated, according to the administration.

The difficulties the most influential digital corporations in the world have in slowing the spread of false information are evidence of this. These instances demonstrate how "false news" is also widely used on social media. The news that is shared on social media sites could be of poor quality and purposefully contain false information. The trustworthiness of the information is compromised in this way. How can one tell which news stories on the Internet are authentic and which are fraudulent when there are millions of them being shared every day? Thus, one of the major problems in our digitally connected world is unbelievable or bogus news. Recently, the study of fake news identification on social media has gained momentum. The domain focuses on handling the delicate problem of halting the spread of false information on social media.

Analytical Problem Framing

- Mathematical/ Analytical Modelling of the Problem

Firstly, we We use accuracy score, classification report, and confusion matrix as our evaluation metrics because the case study calls for the classification of news whether it is fake or genuine. Labels "1" and "0," where "1" denotes a fake news and "0" denotes a genuine news.

- Data Sources and their formats

There are 2 datasets in csv format, one which is consisting True news and other has Fake news, after concatenating both the datasets the dimensions are 44919 rows and 5 columns. Out of the 5 columns- Title, Text, Subject, date and label, the columns utilised for the model development are text and label.

- Data Pre-processing Done

After loading the data and performing the necessary analysis, it is observed that except label column, all the other columns are of object type and there are null values in subject and date columns which are removed. The columns- title, subject and date are removed since they won't be helpful in identification of the news. Further, the news message is cleaned by removing numbers, punctuation and stop words.

- Hardware and Software Requirements and Tools Used

List of libraries used along with their functions-

1) Pandas- In pandas library the functions used are-
    - Pd.read function is used to load the data
    - The DataFrame's information is printed via the info() method. The data includes the total number of columns, their labels, data kinds, memory use, range index, and the number of cells in each column (non-null values)
    - The DataFrame's data is described via the describe() method. If the DataFrame includes numerical data, each column's description will provide the following details, count is the total amount of non-empty values, mean – a measure of average value, the standard deviation, or std, min is the lowest value, 25 percent – the 25 percentile*, the fifty percentile is 50%, the 75% percentile* is at 75%, max is the highest value.

- The isnull() method returns a DataFrame object where all the values are replaced with a Boolean value True for NULL values, and otherwise False.
- Pandas DataFrame.dtypes attribute return the dtypes in the DataFrame. It returns a Series with the data type of each column.
- DataFrame from Pandas. The DataFrame's dtypes are returned via the dtypes attribute. A Series with the data types of each column is what is returned.

2) Python scripts can be used to create 2D graphs and plots using the Matplotlib module. With features to control line styles, font attributes, formatting axes, and other features, it offers a module called pyplot that makes things simple for plotting.
3) A package called Seaborn uses Matplotlib as its foundation to plot graphs. In order to see random distributions, it will be used.
4) A free machine learning library for Python is called Scikit-learn. It supports Python's NumPy and SciPy libraries as well as a number of methods, including support vector machines, random forests, and k-neighbors.

Model/s Development and Evaluation

- Testing of Identified Approaches (Algorithms)

TFid vectorizer is implemented on the text column to convert the text into vectors. The feature which is the text column and target i.e label column are split and a loop is defined to analyse the results of models for different values of random state and test size of train_test_split function. The algorithms used for model training and testing are-

1. Logistic Regression
2. Random Forest Classifier

3. K Neighbors Classifier
4. Decision Tree Classifier
5. Passive Aggressive Classifier

- Run and evaluate selected models

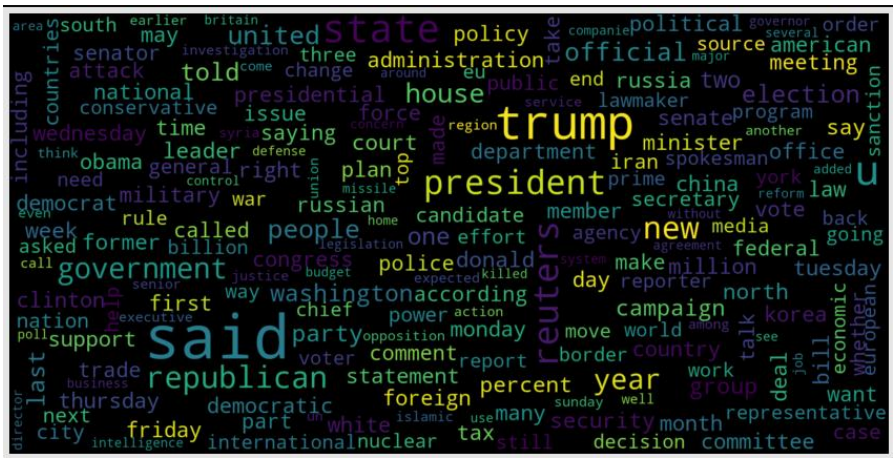
When the features and target were split using the train_test_split function and results were analysed for different random state values, it was observed that except K Neighbours Classifier every model had a good accuracy score of 0.9 for both training and test data, but K Neighbours Classifier had an accuracy score of 0.79 for training data and 0.71 for test data.

- Key Metrics for success in solving problem under consideration

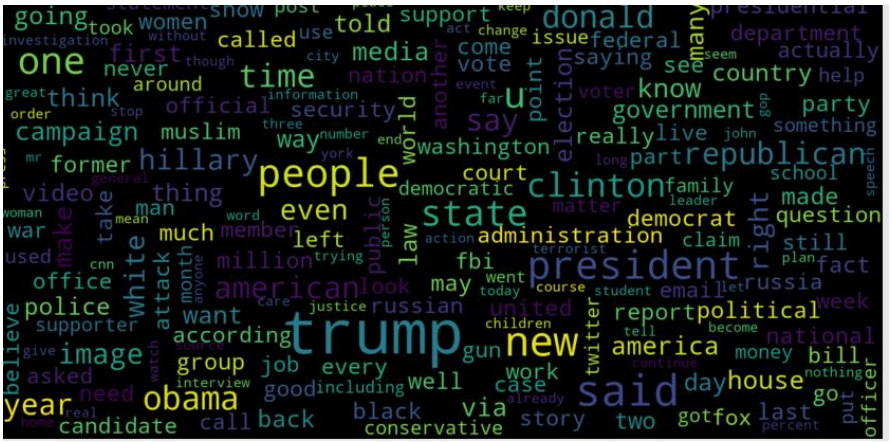
Models for classification are used to predict the veracity of a particular sort of news. The classification model predicts the possibility that each news is real or fraudulent. It is crucial to evaluate the effectiveness of classification models before using them in production to solve practical problems. Performance metrics for machine learning classification models are used to assess how well they function in a certain circumstance. Among these performance markers are F1-score, recall, accuracy, and precision. In order to understand these models' benefits and drawbacks when making predictions in fresh situations, model performance is essential to machine learning.

- Visualizations

When the news text is cleaned, the words which majorly make up the true news and the fake news are analysed using the Word Cloud and is shown below,

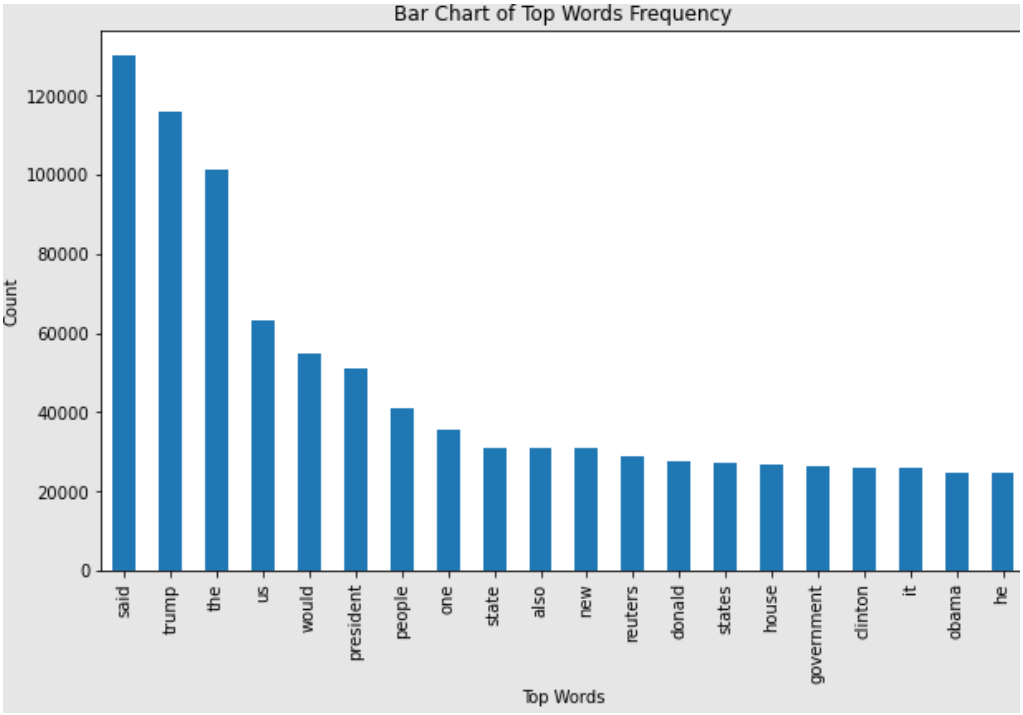


Words in Genuine News



Words in Fake News

A bar graph shown below, is plotted to analyse the top 20 used words in the news message.



- Interpretation of the Results

The number of fake news and genuine news in the given dataset is almost equal. The two words which are frequently used in the dataset are “said” and “trump”. While employing the machine learning algorithms, the Logistic Regression Model, Random Forest Model, Decision Tree Model and Passive Aggressive Model have very good accuracy score for both training and test data. The Random Forest Model is an efficient model with False Negative 11 and True Negative 4259 which is efficient compared to the other models, hence random forest model is considered for Hyperparameter tuning.

CONCLUSION

- Model for detecting Fake news has been successfully trained and tested using Machine Learning Algorithms.
- Random Forest Model is an efficient model for this project based on the result of False Negative and True Negative.
- After performing hyperparameter tuning on the developed model the False Negative has reduced from 11 to 9 and False Positive has reduced from 14 to 12 and both True Positive and True Negative have improved.