

Fake News Detection using Machine Learning

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Abstract

Fake news refers to news stories that aren't true: the story is made up, with no verifiable evidence, sources, or quotes. It is written solely for the purpose of deceiving the public. The story that is made up with the intent to mislead or deceive the reader is referred to as fake news. The ease with which knowledge can be shared has contributed to the exponential growth of its falsification. As a result, existing news can be easily manipulated, resulting in false news. Fake news can be a powerful weapon for portraying people in a negative light. It has the potential to spread hatred among people, causing more damage to society. As a result, spotting fake news has become a global issue. Machine learning has played an important role in data classification, despite some problems.

In this research article we will be using various Machine Learning algorithms like Logistic Regression, Random Forest Classifier and Decision Tree Classifier on our dataset for fake news prediction. The accuracy scores and the confusion matrix will conclude which model is most efficient for detecting Fake News.

Keywords: Malicious, Fake news, Misleading, Machine Learning, Social Media

I. Introduction

The Internet has an abundance of information that is extremely valuable for a variety of purposes. Because of the vast amount of knowledge available on the internet, one must exercise caution when it comes to originality. Social networking is the primary means of communication with relatives, friends, and co-workers. Any consumer expresses their emotions or knowledge in a variety of ways, including audio, video, and text.

The classification of any news story, tweet, or blog as real or fake has created a great deal of interest from researchers around the world. Several research studies have been conducted to determine the impact of false news in general and people's response to such issues [1].

Fake information is intentionally generated and shared all over the internet, either knowingly or unwittingly. Whether false or factual, the creation and use of online information has increased over time. As a result, community groups that are heavy-duty and visually impaired Internet users will be affected. According to a survey, 77% of Americans prefer to read news online rather than using print media [2]. For this reason, it is important to keep these records safe. This paper discusses the weaknesses of the individuals and the culture as a result of false news, as well as the degree at which it spreads. In addition, there is a need for systems to detect false news and keep the public secure.

The purpose of this paper is to analyse the most efficient machine learning approach available for detecting fake news and finding the accuracy of the proposed model. The result of this

research should be able to decide which machine learning algorithm is most suitable for detecting fake news.

This paper is further discussed in the following sections; section II explains the Related Work existing in the field of fake news detection, Section III explains the Proposed Methodology, Section IV explains the Experimental Analysis and Section V explains the Conclusion and Future Work .

II. Related Work

Social networking sites have changed the way information is exchanged. The author has used a data with 15,500 Facebook posts. These were divided into two types, one based on logistic regression and the other based on crowdsourcing algorithm and obtained 99% accuracy [4].

Using an SVM-based model, the author looked at 360 news articles and found 90% accuracy, 84% recall rate, and 87% F1 Score. The author proposed another model with a bilateral-weighted fuzzy support vector machine and their effectiveness and exploitation were discussed. [5].

Until the content can be applied to speculation models, it should be very well prepared. Before giving you a machine learning algorithm, the content should be transferred to find the words, and the words should be grouped as whole value or floating values. Discovering methods such as word bag and word embedding are also being explored. [6].

The author talked about the various methods of supervised mechanical classification, as well as comparing and describing the various attributes that can be used to compare and evaluate the output of different methods. The study uses a database from the National Institute of Diabetes, Digestive and Kidney Diseases. [7].

The author has developed an ML model that deals with social media and social aspects and gained high accuracy, as well as installing the app in real-time applications using Facebook Messenger, Chat-bot, and gained 81.7% accuracy. [8].

III. Proposed Methodology

Machine learning algorithms that use various forms of training data stocks to refine the algorithms, can be used to recognise fake news. Datasets help computer scientists create new machine learning methods and techniques, and they're also used to train algorithms that find stories that don't exist.

This section of our paper is discussed in 5 subparts: (1) Data Collection; (2) Data Cleaning and Pre-processing; (3) Data Exploration; (4) Machine learning Algorithms; and (5) Performance measures.

A. Dataset Collection:

The data is extracted from Kaggle. The dataset is available in two files, the first one is for real news and second one for fake news with a total of 23481 fake articles and 21417 real articles. First we will load both the datasets and then add a flag to each dataset to label fake and real.

After which we will be concatenating both the data frames and shuffling the data to prevent bias.

B. Data Cleaning and Pre-processing:

Data pre-processing is a process used in data mining to transform raw data into a useful and effective format. The first step in pre-processing is data cleaning, which includes dealing with missing and noisy data.

Data cleaning is the method of deleting or altering data that is inaccurate, incomplete, obsolete, duplicated, or incorrectly formatted in order to prepare it for analysis. When it comes to data analysis, this data is normally not required or beneficial because it can slow down the process or produce incorrect results. Cleaning data can be done in a variety of ways, depending on how it's stored and what answers you're looking for.

In this Stage we will be first removing the fields in the dataset that are not required for the analysis. Then we will be converting the text to lowercase and removing the punctuation for easy analysis of texts. After which we will be removing the stop-words from the texts of our dataset.

C. Data Exploration

Users test the comprehensive data collection in an informal way to determine the initial trends, features, and points of interest which is the first step in data analysis. This process is not intended to expose all part of the data to the database, but rather to help create a broader picture of key patterns and key points that can be further investigated. Data testing can use a combination of power methods and automated tools such as data recognition, charts, and initial reports.

In the stage we will be exploring different aspects of our dataset such as real news articles and fake news articles per subject, how many fake and real news articles are present and word Clouds for both fake and real news. Then we will be visualizing most frequent words in fake as well as real news through bar plots.

D. Machine Learning Algorithms

The machine learning Algorithms used for prediction of fake news are discussed in this part of our research, these algorithms are very popular and used by many researchers.

Logistic Regression analysis is used to look at the relationship between one dependent variant and one or more (different or continuous) independent variables. This is in contrast to the linear regression analysis, which uses continuous variables as variables that rely on it. Logistic Adjustment is a mathematical model in models that may be conditional using the Logistic function. This is read as a conditional probability of $Y = 1$ if an X is given or a conditional probability of $Y = 0$ if an X is given. It will be helpful to find out if the news will be fake or not.

Decision tree Classifier is a prediction analysis. Here is a graphic description of all available resolution solutions made. An introduction to the naming of all possible solutions to the problem is made here. The decision is based on a set of circumstances. Focus points should be included in the focus areas; direct segregation of groups is not required; effective differentiation

treatment is required; and a direct translation of the decision tree is required. However, the decision tree will be extremely balanced when there are many outstanding factors determined, and thus act ineffectively in the experimental data.

Random Forest Classifier is a learning equation based on a troupe tree. It creates and merges several decision trees to make more precise and efficient predictions. It is trained with a bagging process. Using row sampling and function sampling, the obtained high variance in the decision tree was transformed to low variance. Hyper-parameters could be used to calculate the number of decision trees. It's an ensemble algorithm that combines several calculations of the same or different kind in order to characterise objects.

E. Performance Measures

It's important to select the right metrics to test the machine learning model. The metrics used in machine learning algorithms have an effect on how they are evaluated and compared. In this research we will be using two performance measures: (1) Confusion Matrix; and (2) Accuracy

The **confusion matrix** is one of the simplest and most accurate metrics for determining the accuracy and precision of a model. It is used to solve classification problems where the product can be divided into two or more categories [9]. Although the Confusion Matrix and its numbers are not a measure of performance in themselves, they are the basis of almost all performance metrics. The Confusion Matrix is a two-dimensional table ("Real" and "Predicted") and several "classes" for each grade. Columns represent actual divisions, and rows represent predicted divisions.

Accuracy represents the number of accurate predictions made for all types of predictions made in classification problems. When dynamic data classes are almost limited, accuracy is a good metric. The classification of our accurate predictions by all types of algorithmic predictions is called precision. Where dynamic data classes are more than one phase, accuracy has never been used as a performance measure [9].

III. Experimental Analysis

A comparative study has been made using different Machine Learning algorithms for fake news detection. We used different machine learning libraries such as Pandas, Numpy, and Matplotlib. The code was run on an open source web application called Kaggle.

Figure 1 shows the fake and real articles per subject and it is observed that Political news is the subject with the highest number of articles over 10000 in our dataset.

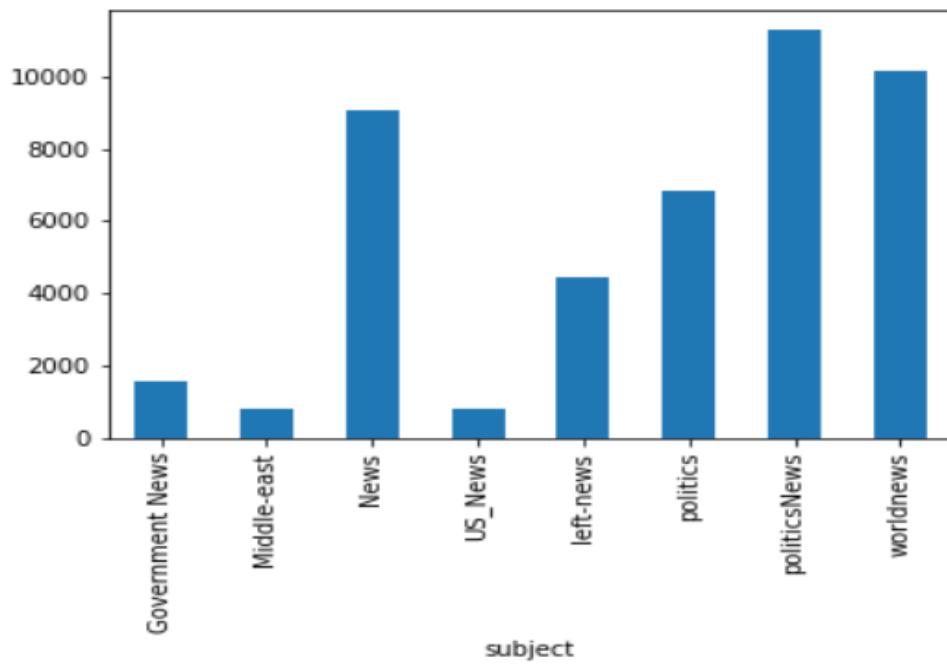


Figure 1: Articles per Subject

The total number of articles in fake and real dataset is shown in figure 2 with the observation of 23481 fake news articles and 21417 real news articles.

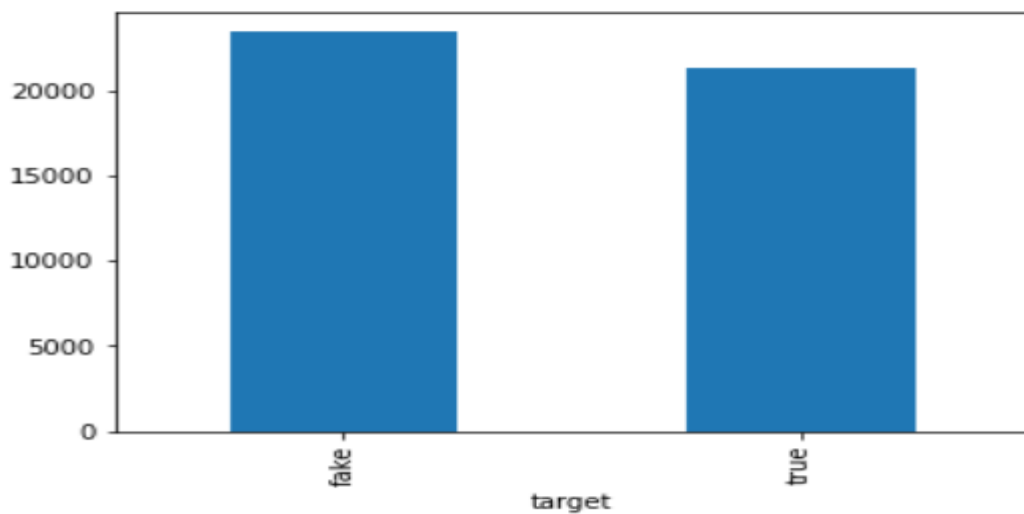


Figure 2: Number of articles

After finding the number of articles, Figure 3 shows the word cloud for real and fake news. It shows the words which are present in our fake and real news articles. Figure a shows the word cloud of Fake news while Figure b shows the word cloud for Real news.

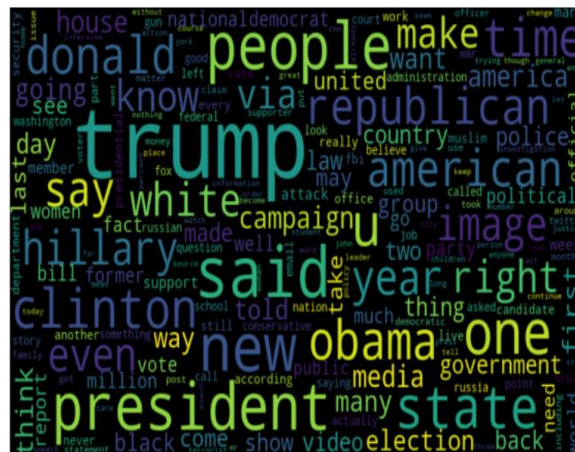
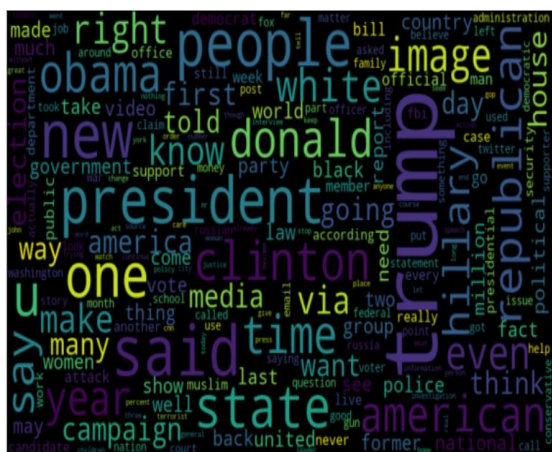
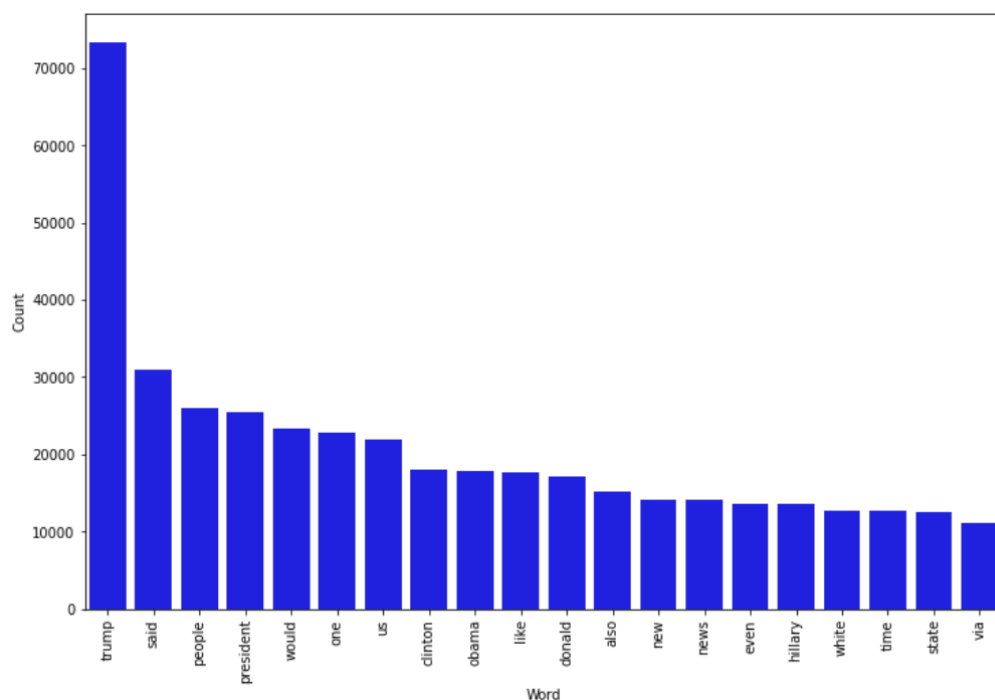
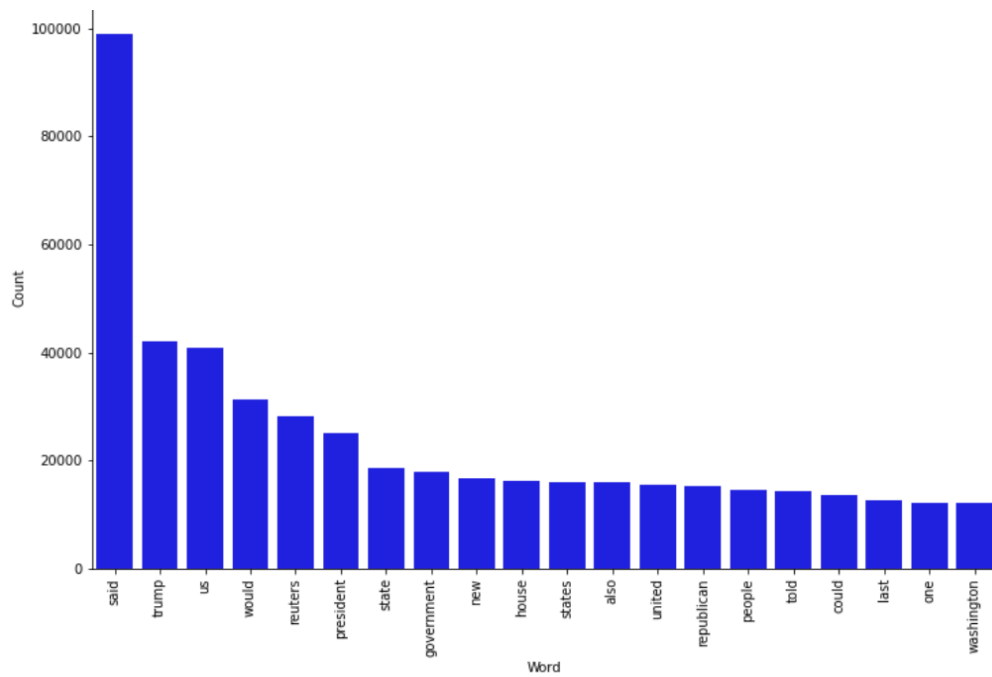


Figure 3: Word Clouds

Figure 4 shows the most common words used in real and fake news. Figure a shows the bar plot of most common words used in Fake news articles and it is observed that the most frequent word was **Trump**. Figure b shows the bar plot of most common words used in Real news articles and it was observed that the most frequent word used was **said**.



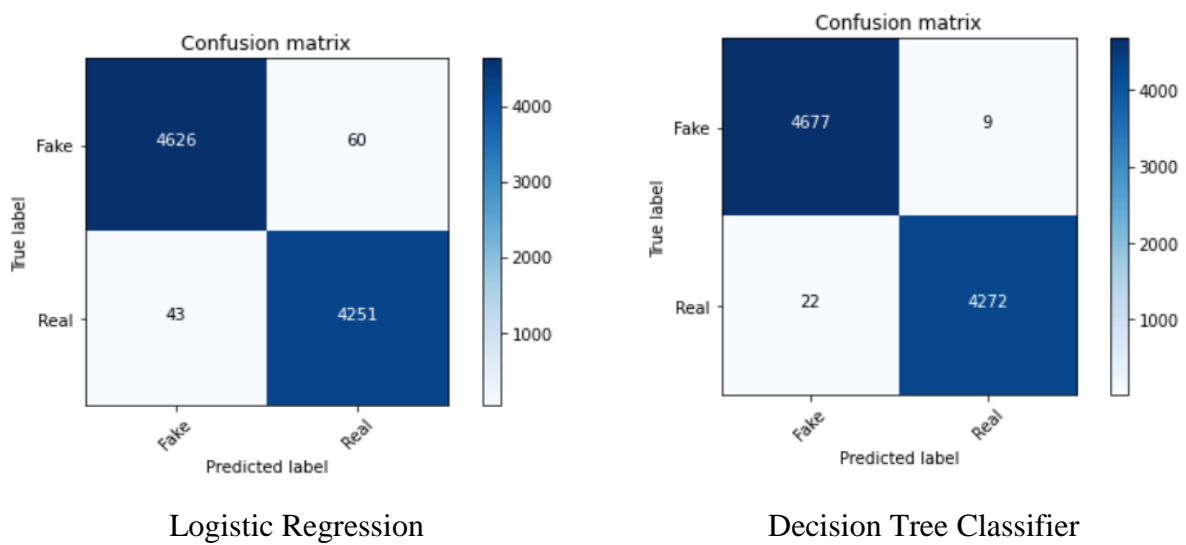
a. Most Common Words used in Fake News

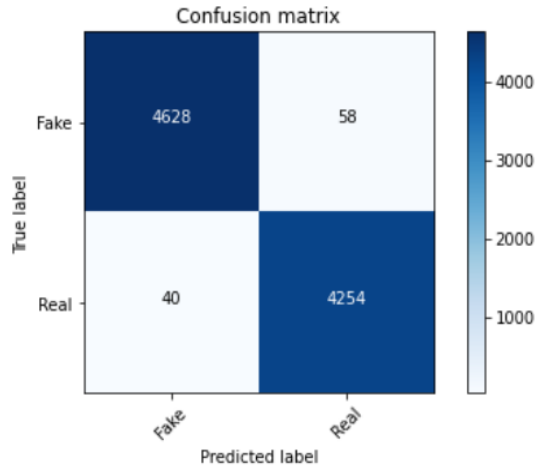


b. Most Common Words used in Real News

Figure 4: Most Common Words

The Confusion matrices for all the three classification algorithms stated in the previous section are shown in figure 5 from which we will be calculating the accuracies for all the three models.





Random Forest Classifier
Figure 5: Confusion Matrices

The accuracies of all the machine learning algorithms used for classification are compared in Table 1. Decision Tree Classifier was found to be the efficient algorithm with an accuracy of 99.71%.

Algorithm	Accuracy
Logistic Regression	98.76%
Decision Tree Classifier	99.71%
Random Forest Classifier	98.98%

Table 1: Comparison of Accuracies

IV. Limitations

We used absolute probability thresholds to test our models, which may not be the most accurate for models with poorly tuned probability scoring. We would re-run the evaluation using relative probabilities for labelling if we had more time for a better comparison. We cannot say that this method will generalise to unseen outlets due to the small number of confirmed sources of false news in our dataset. We cannot be assured that this method will be reliably useful across news cycles because of the short time span and strong dependence on term frequency for classification.

V. Conclusion and Future Work

Any kind of made-up story with the intent to deceive or mislead is classified as fake news. In this paper, we use Machine Learning techniques to present a solution for detecting fake news. It has gained attention and spread as a result of a number of events.

Humans are inconsistent, if not outright bad detectors of false news, as shown by the widespread effects of the massive onset of fake news. While numerous Machine learning methods have demonstrated success in detecting false news and tweets, there is still room for improvement. However, the ever-changing features of false news on social media networks

make the distinction of false news difficult. Literary analysis and use of natural language (NLP) can be used to combat the critical issue of false news. We have seen how false news can affect people's perceptions and the way the world thinks or views this subject.

The three different machine learning algorithms used for Fake news Detection were: Logistics Regression, Decision tree classifier and Random Forest Classifier. Using these algorithms, the highest accuracy obtained was 99.71% in Decision tree classifier as shown in Table 1.

Deep learning approaches and sentiment analysis could be considered in the future to categorise news with high precision, and additional useful text such as the news's publication date, URL domain, and so on could be extracted for the operation. Since it contains more jargon and notes, a dataset with a greater number of news articles from various sources is preferable to get higher accuracy.

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