



Fake News Detection Using Machine Learning.

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Abstract: In the modern era where the internet is ubiquitous, everyone relies on various online resources for news. Together with the increase in the use of social media platforms like Whatsapp, Facebook, Twitter, etc. Rumors spread rapidly among millions of users within a short period. With the Covid-19 spread worldwide, people are using this propaganda, and the citizens desperately need to know the news about the mysterious virus by spreading the fake rumor. The need for an hour is to stop the spread of articles in developing countries like India. To stop this we have implemented with the help of Machine learning models and natural language processing technique, it is tried to aggregate the news and later it will predict whether the news is real or fake. This Project comes up with the three applications of Natural Language Processing techniques for detecting 'fake news, that is, misleading news stories that come from unknown sources. Only by building a model based on a count vectorizer or a TF-IDF matrix, can only get you so far. But these models don't consider the important qualities like word ordering and context. This process will result in feature extraction; we propose using Python sci-kit-learn library to perform extraction of text data because this library contains useful tools like Count Vectorizer, Tf-IDF Vectorizer, and Hashing Vectorizer. Then, we will perform the training model and then classify with the user input then it will obtain the highest accuracy and precision according to confusion matrix results.

Index Terms - Fake News, Passive Aggressive Classifier, Machine Learning, Natural Language Processing.

I. INTRODUCTION

Fake news has become one of the best threats to democracy, journalism, and freedom of expression. With the increase of people using social media, they are exposed to new information and stories every day. Misinformation can be challenging to correct and may have lasting implications. It has also been found that social media now outperforms television because of extensive news sources. Despite the advantages provided by social media, the quality of stories on social media is a smaller amount than traditional news organizations. However, because it's inexpensive to produce news online and far faster and easier to propagate through social media, large volumes of false news, i.e., those news articles with intentionally invalid information, are produced online for a variety of purposes, like financial and political gain. Social and psychological factors play a decisive role in fake news gaining public trust and further facilitate the spread of fake news. For instance, humans have proven to be irrational and vulnerable when differentiating between truth and falsehood while overloaded with false information. Studies in psychology and communications have demonstrated that human ability to detect deception is merely slightly better than chance: typical accuracy rates are in the 55%-58% range, with a mean accuracy of 54% over 1,000 participants in over 100 experiments. However, detecting fake news is a challenging task for humans who tend to believe in false information and lack control of the spread of fake news.

II. LITERATURE REVIEW

In the paper written by Mykhailo Granik et al, they have implemented a fake news detection system using a naïve bayes classifier. Dataset of Facebook news posts was used to test the system. Classification accuracy of 74% was achieved [1].

In the paper by Hadeer Ahmed et al, the intricate examination was done utilizing n-gram while being contrasted with multiple feature extraction strategies. Various feature extraction strategies and many NLP procedures were used in this examination. The paper mirrored the most noteworthy yield while executing unigram as the extraction strategy and Support Vector Machine as the classifier [2].

Poonam Tijare et al, have built a fake news detection system using four different techniques which are Naive Bayes, Support Vector Machine (SVM), neural network, and long short-term memory (LSTM) to obtain the greatest match for the model. The highest accuracy of 94% was achieved using LSTM [3].

III.METHODOLOGY

This technical paper details the implementation of Fake News Detection based on Machine Learning. On social networks, several excellent works and resources support text mining. The available libraries were implemented during this project. The following is the method for extracting real or fake news:

- In this project, we've used a dataset consisting of 13000 fake and real news articles published during the 2016 US election cycle.
- To achieve better results it's necessary to preprocess the data before using it for modeling.
- Remove Stop words that are insignificant organizations language that may create noise when used as features in text classification.
- There is an oversized number of terms, words, and phrases in documents that lead to a high computational burden for the training process.
- So to resolve this, we extract the features by following methods.
- The First method is Term Frequency (TF) where the overall number of times the word has occurred in an exceedingly large document is split by the full number of words within the document.
- The Second method is Term Frequency-Inverse Document Frequency (TF-IDF) which may be a weighting metric often utilized in information retrieval and natural language processing. It is a statistical metric used to measure how important a term is to a document in an exceeding dataset.
- The Third method is the Count vectorizer which creates a matrix during which each unique word is represented by a column of the matrix, and every text sample from the document could be a row within the matrix. The worth of every cell is nothing but the count of the word in that particular text sample.
- The next method is Hash Vectorizer which turns a group of text documents into a SciPy. Sparse matrix holding token occurrence counts.
- After the Feature Extraction, we use Classification algorithms which are as follows.
- The first algorithm is the Passive-Aggressive Classifier Algorithm. The most objective of this algorithm is to make changes that will correct the loss & would cause a small number of changes within the weight vector's standard.
- The next Algorithm is Naïve Bayes Classifier Algorithm. It is a probabilistic classifier that supports the Bayes Theorem with the belief of independence among the features.
- Multinomial Naive Bayes uses the frequency of the words as a feature to classify the data in various classes.
- After Classification, we perform Deployment of the Model using the pickling method. Pickle is employed for serializing and de-serializing Python object structures. Serialization refers to the process of converting an object in memory to a byte stream for serializing and de-serializing Python object structures.
- Then News input is predicted as well as results are displayed on the web application through User Interface.
- Based on the analysis done, the models predict the most effective accuracy and precision.

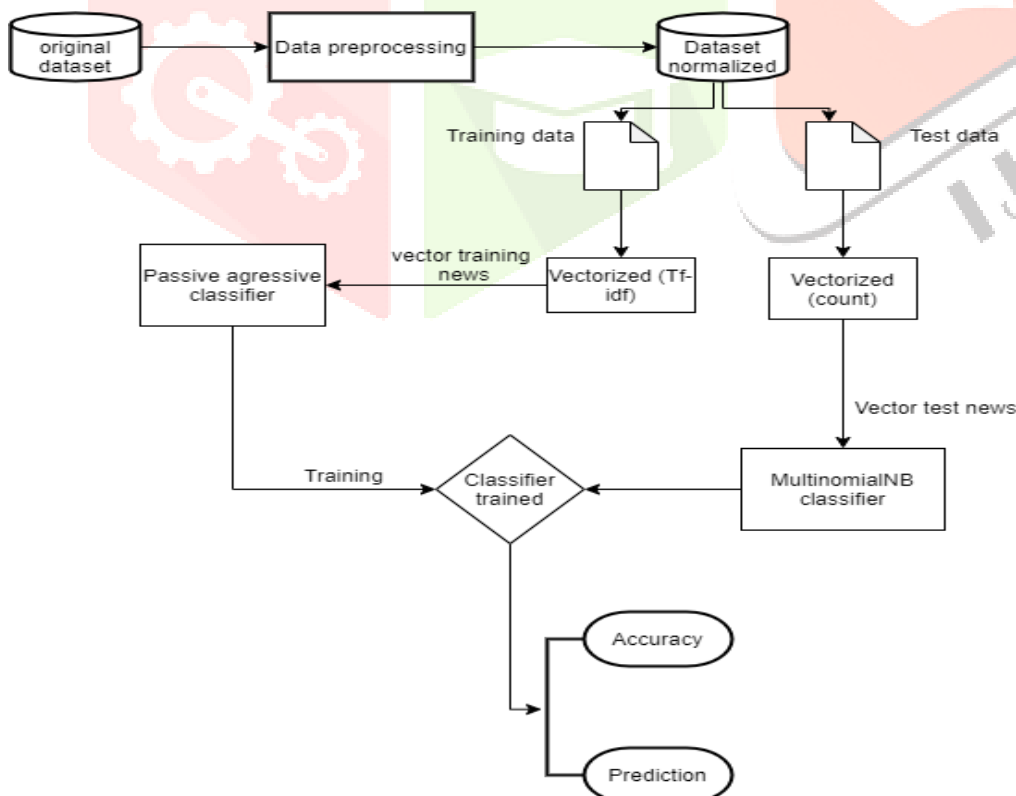


Fig 1: Data Flow Diagram

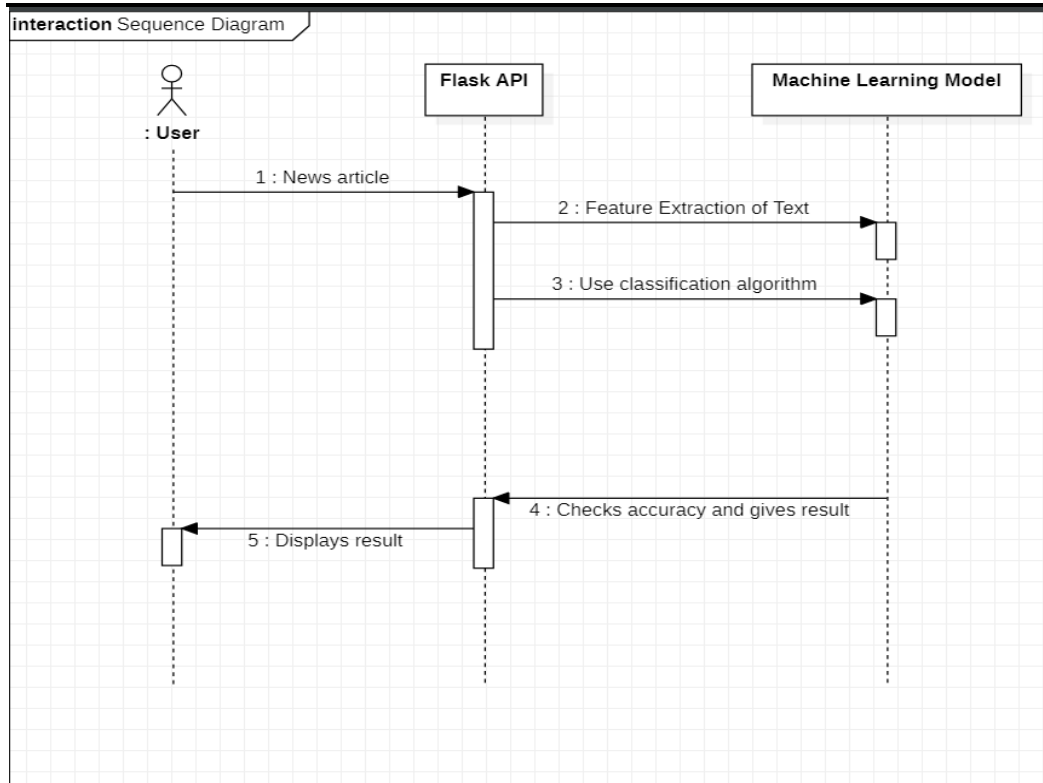


Fig 2: Sequence Diagram



Fig 3: Predicted news article as real news

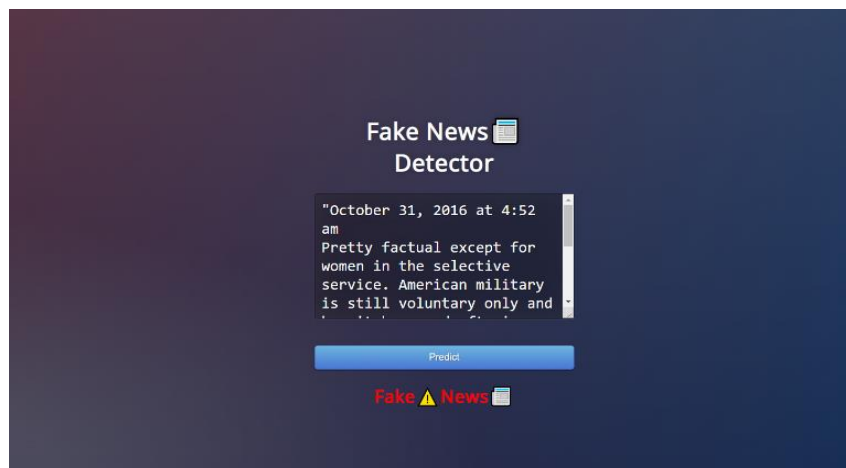


Fig 4: Predicted news article as fake news

IV.RESULTS AND DISCUSSION

Confusion Matrix:

A confusion matrix is a table that is often used to describe the performance of a classification model (or "classifier") on a set of test data for which the true values are known [6]. Essentially a confusion matrix is employed to allow the outline on how well the classification model or classifier has performed on a dataset that we all know various values. A confusion matrix features a tabular structure.

Terms related to the confusion matrix are as follows:

- **True Positive**
predicted Real news and it's true.
- **True Negative**
predicted Fake news and its true.
- **False-positive**
predicted Real news and its false
- **False-negative**
predicted Fake news and its false

Accuracy

Accuracy that gives us knowledge about a fraction of samples that are correctly predicted is the most commonly used metric for classification. Sklearn library is used to predict the accuracy score that will take the input as datasets and the dataset labels & predicted dataset labels are used to display the percentage of accuracy of the model [5].

The following table shows the accuracies of different models calculated with the help of a confusion matrix. For each model confusion matrix was constructed.

Table 1: Accuracy of Models

Models	Accuracy
Multinomial NB using Tf-id	85.7 %
Multinomial NB using count vectorizer	89.3 %
Passive Aggressive Classifier using Tf-IDF	93.6 %
Multinomial NB using hash vectorizer	90.2 %
Passive-aggressive classifier using hash vectorizer	92.2 %

Accuracy

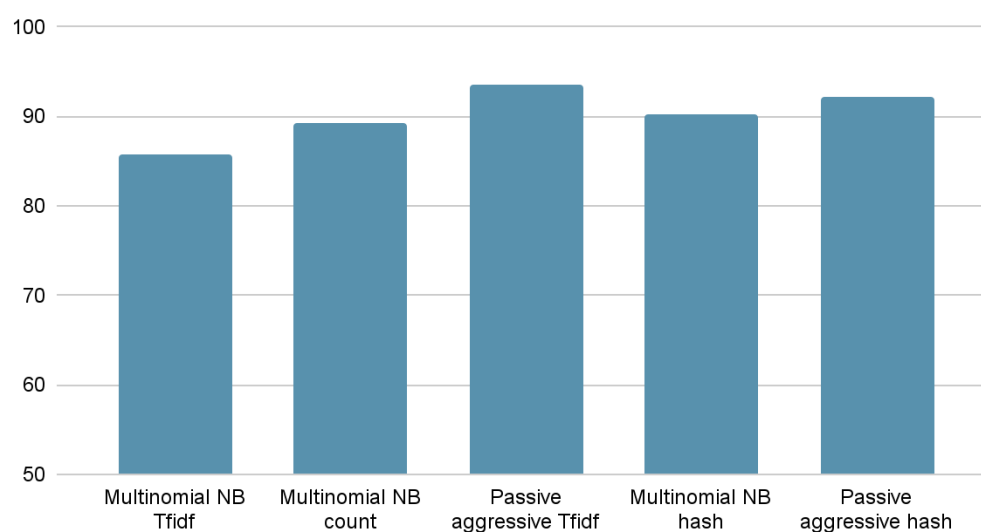


Fig 5: Comparison of different models

The graph is constructed based on the results of the table 1. It was concluded that the Passive-aggressive classifier using TF-IDF vectorizer has obtained the highest accuracy of 93.2%.

V.CONCLUSION

After analyzing the outcomes of the five models, a mix of machine learning techniques and natural language processing methods is chosen. These five models were created by combining all Machine learning algorithms with a variety of NLP techniques. A user interface is built and linked to a machine learning model that has been trained. A Passive Aggressive Classifier with TF-IDF vectorizer is trained and used to predict user-inputted news. Users may submit news into this platform, and it will determine if the article is true or not.

VI.FUTURE SCOPE

In the future, a web-based GUI can be created for the proposed fake news detection system to classify the news as fake or real on real-time social media platforms such as Facebook, Instagram, Twitter, WhatsApp, etc. Also, the annotated dataset in the sequence of images (with textual content written on them) will be collected and maintained from Facebook and Reddit platforms. The annotated dataset is often used for detecting fake images within the future as no such dataset is out there at the present. The proposed system has the potential to provide an impulse to various emerging applications such as controlling the spread of fake news during elections, terrorism, natural calamities, crimes for the betterment of society. In the future, the efficiency and accuracy of the prototype can be enhanced to a certain level, and also enhance the user interface of the proposed model.

VII.ACKNOWLEDGMENT

We have great pleasure in presenting our project on "Fake News Detection using Machine Learning ". We wish to express our sincere thanks and deep sense of gratitude to respected guide Assistant Prof. Allan Lopes, Department of Information Technology, Universal College of Engineering, for their depth and enlightening support with all of their kindness. Their constant guidance and willingness to share their vast knowledge made us understand this topic and its manifestations in great depth. We would also like to thank Prof. Yogita Mane, Head of the Department, Information Technology, Universal College of Engineering, for their support and coordination. We are also grateful to the Campus Director, Dr. Jitendra Patil, for providing us with all the facilities that we required for the successful completion of this project. Finally, our deepest gratitude goes to our family and friends who have given us good support, encouragement, and inspiration to complete my work.

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