Fake News Detection

Using Python & Optimization of Machine Learning Models

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Contents:

1. Introduction

- The demand for fake news identification and intervention has escalated as a result of fake news' explosive growth and the damage it does to democracy, justice, and public confidence. This study analyses and assesses strategies for identifying fake news from four angles: the inaccurate information it contains, the writing style, the ways it spreads, and the reliability of its source. Based on the review, the poll also suggests a few interesting study projects. To promote interdisciplinary study on fake news, we specifically identify and describe similar core theories across multiple fields. We believe that this survey will encourage collaboration among specialists in the social sciences, political science, computer and information sciences, and media to study false news, where such efforts can result in fake news detection that is not only efficient but, more importantly, explainable.

2. Problem Statement

- Fake news, a form of yellow journalism, refers to news items that may be hoaxes and is typically disseminated through social media and other online media. This is frequently accomplished with political objectives in order to advance or impose particular beliefs. Such news stories may make misleading or overstated claims, become viralized by algorithms, and trap users in a filter bubble. Therefore, the objective is to create a model that can correctly identify whether a piece of news is real or fake.

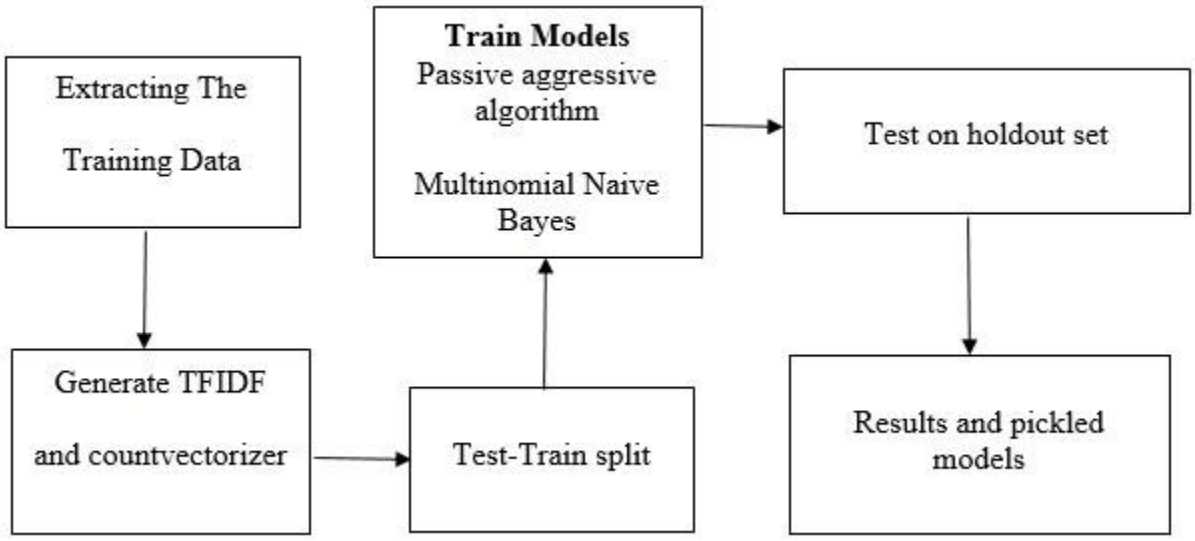
3. Motivation

- There have been numerous instances of people being wounded or dying as a result of online rumors. Typically, during an election season, more fake news is produced in that nation. In 2014, the BBC conducted research on the general elections in India. To understand how bogus news is polarized in India, the researchers [2] viewed roughly 16000 and 3000 profiles and pages from Twitter and Facebook, respectively. According to this research, right-wing ideology is proliferating in a "strong and coherent" manner, whereas left-wing ideology-based fake news networks were found to be less well-organized and successful. According to another study by the BBC, roughly 72% of the Indian population are unable to distinguish between true facts and fiction.

4. Solution Proposed

- A model built using a count vectorizer or a tfidf matrix (which tallies words according to how frequently they appear in other articles in your dataset) can be useful. Implementing a Passive Aggressive classifier will be ideal because such an algorithm remains passive for a correct classification outcome, and turns aggressive in the event of a miscalculation, updating and adjusting. Unlike most other algorithms, it does not converge. Its purpose is to make updates that correct the loss, causing very little change in the norm of the weight vector.

5. Flow Diagram



6. Machine Learning & Dataset

- TFIDF Vectors: The TfidfVectorizer converts a collection of raw documents into a matrix of TF-IDF features.
  - ❖ TERM FREQUENCY: The term frequency of a word refers to how frequently it appears in a document. When a term is part of the search terms, a greater number indicates that it occurs more frequently than others, indicating that the document is a good match.
  - ❖ INVERSE DOCUMENT FREQUENCY: Words that frequently appear in a text but likewise frequently appear in numerous others might not be important. IDF is a metric for gauging a term's importance across the board.
  - ❖ PASSIVE AGGRESSIVE CLASSIFIER: Passive-Aggressive algorithms belong to the family of machine learning algorithms. This is a high-level explanation of the algorithm's operation and appropriate applications. As opposed to batch learning, when the full training dataset is used at once, online machine learning techniques employ sequential input data and update the machine learning model one step at a time.
- The dataset model is a csv file named “news.csv”. 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.

7. Tech Stack, Libraries & Packages

8. Implementation

```
#importing necessary packages

import numpy as np

import pandas as pd

import itertools

from sklearn.model_selection import train_test_split

from sklearn.feature_extraction.text import TfidfVectorizer

from sklearn.linear_model import PassiveAggressiveClassifier
from sklearn.metrics import accuracy_score, confusion_matrix

#Read the data
df=pd.read_csv(r'C:\Users\Acer\Desktop\news.csv')

#Get shape and head
df.shape
df.head()

#Get the labels
labels=df.label
labels.head()
```

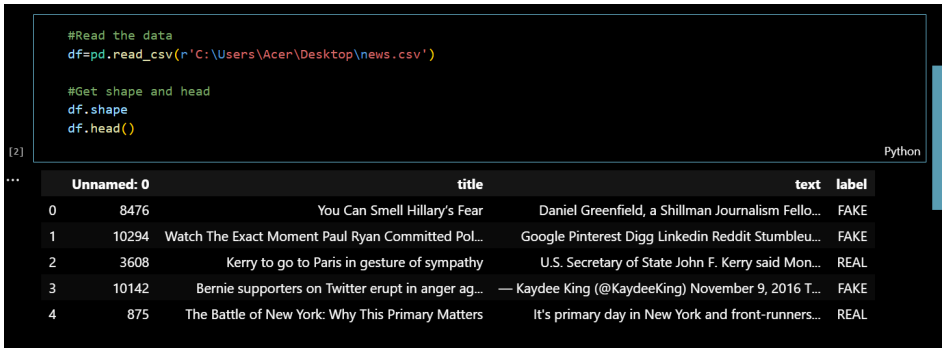
```
#Splitting the dataset into training & testing sets
x_train,x_test,y_train,y_test=train_test_split(df['text'], labels, test_size=0.2, random_state=7)

#Initialize a TfidfVectorizer
tfidf_vectorizer=TfidfVectorizer(stop_words='english', max_df=0.7)

#Fitting and transforming training set & transforming test set
tfidf_train=tfidf_vectorizer.fit_transform(x_train)
tfidf_test=tfidf_vectorizer.transform(x_test)
#Initializing a Passive-Aggressive Classifier
pac=PassiveAggressiveClassifier(max_iter=50)
pac.fit(tfidf_train,y_train)
#Predicting on the test set and calculate accuracy
y_pred=pac.predict(tfidf_test)
score=accuracy_score(y_test,y_pred)
print(f'Accuracy: {round(score*100,2)}%')

#Building confusion matrix
confusion_matrix(y_test,y_pred, labels=['FAKE','REAL'])
```

9. Outputs



```
#Read the data
df=pd.read_csv(r'C:\Users\Acer\Desktop\news.csv')

#Get shape and head
df.shape
df.head()
```

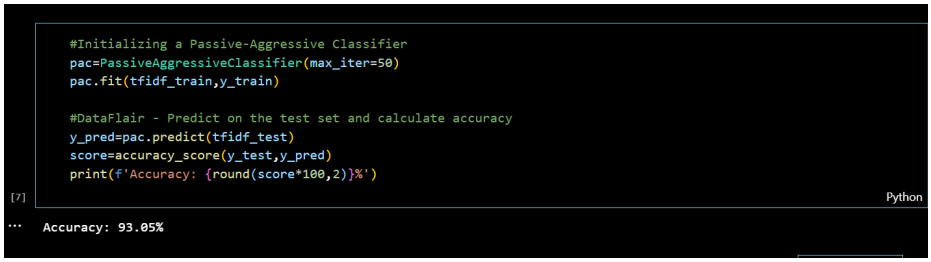
[2] Python

	Unnamed: 0	title	text	label
0	8476	You Can Smell Hillary's Fear	Daniel Greenfield, a Shillman Journalism Fello...	FAKE
1	10294	Watch The Exact Moment Paul Ryan Committed Pol...	Google Pinterest Digg Linkedin Reddit Stumbleu...	FAKE
2	3608	Kerry to go to Paris in gesture of sympathy	U.S. Secretary of State John F. Kerry said Mon...	REAL
3	10142	Bernie supporters on Twitter erupt in anger ag...	— Kaydee King (@KaydeeKing) November 9, 2016 T...	FAKE
4	875	The Battle of New York: Why This Primary Matters	It's primary day in New York and front-runners...	REAL

```
#Get the labels
labels=df.label
labels.head()
```

[4] Python

```
0    FAKE
1    FAKE
2    REAL
3    FAKE
4    REAL
Name: label, dtype: object
```

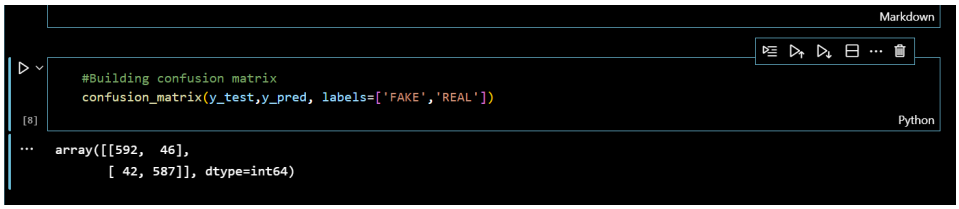


```
#Initializing a Passive-Aggressive Classifier
pac=PassiveAggressiveClassifier(max_iter=50)
pac.fit(tfidf_train,y_train)

#DataFlair - Predict on the test set and calculate accuracy
y_pred=pac.predict(tfidf_test)
score=accuracy_score(y_test,y_pred)
print(f'Accuracy: {round(score*100,2)}%')
```

[7] Python

```
Accuracy: 93.05%
```



Markdown

```
#Building confusion matrix
confusion_matrix(y_test,y_pred, labels=['FAKE','REAL'])
```

[8] Python

```
array([[592,  46],
       [ 42, 587]], dtype=int64)
```

10. References

- Zhang, X., & Ghorbani, A. A. (2020). An overview of online fake news: Characterization, detection, and discussion. *Information Processing & Management*, *57*(2), 102025.
- Shu, K., Wang, S., & Liu, H. (2019, January). Beyond news contents: The role of social context for fake news detection. In *Proceedings of the twelfth ACM international conference on web search and data mining* (pp. 312-320).
- Reis, J. C., Correia, A., Murai, F., Veloso, A., & Benevenuto, F. (2019). Supervised learning for fake news detection. *IEEE Intelligent Systems*, *34*(2), 76-81.
- Shu, K., Sliva, A., Wang, S., Tang, J., & Liu, H. (2017). Fake news detection on social media: A data mining perspective. *ACM SIGKDD explorations newsletter*, *19*(1), 22-36.
- Reis, J. C., Correia, A., Murai, F., Veloso, A., & Benevenuto, F. (2019). Supervised learning for fake news detection. *IEEE Intelligent Systems*, *34*(2), 76-81.
- Singhal, S., Shah, R. R., Chakraborty, T., Kumaraguru, P., & Satoh, S. I. (2019, September). Spotfake: A multi-modal framework for fake news detection. In *2019 IEEE fifth international conference on multimedia big data (BigMM)* (pp. 39-47). IEEE.
- Pérez-Rosas, V., Kleinberg, B., Lefevre, A., & Mihalcea, R. (2017). Automatic detection of fake news. *arXiv preprint arXiv:1708.07104*.