Fake News Detection System

An Exercise in Text Classification

Capstone Project Two
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Fake news can have significant and wide-ranging impacts on society, affecting various aspects of individuals, communities, and the broader public discourse.

Addressing the challenges posed by fake news requires a multi-faceted approach involving media literacy education, technological solutions, responsible journalism, and public awareness campaigns. By fostering a society that values accurate information and critical thinking, it is possible to mitigate the negative effects of fake news on individuals and communities.

Having this concern, I will create a fake news detection system for the Huggingface data set "train" that will help society identify the different texts of fake news.

Audience

Any businesses, financial markets, or economic events would reap the rewards of being able to provide a fake news detection system for their clients.

The businesses, financial markets, or economic events around the world have a large population of customers that would make fit for the fake news detection system.

Data Source

For the data, I choose a Huggingface data set of previous outcomes of news articles. With over 40 thousand different news articles that are either fake or true.

To upload this dataset, I utilized a pandas dataframe to read the train csv file.

About the Data

All this data is online and easy to understand. There wasn't a lot to clean up as the dataset wasn't prone to discrepancies. I removed an unnamed column that had no intriguing data.

Data Wrangling

Below is an overview of the main issue I ran into while cleaning the data:

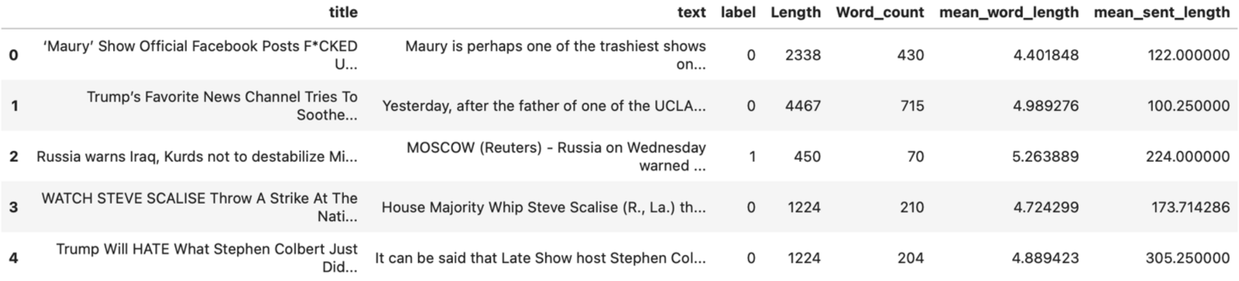
- Problem1: This dataset had an irrelevant column.
  - Solution part 1: normalize the data
    - Removing the column for data cleanness.

Exploratory Data Analysis

In the EDA, I was able to identify that the dataset will be sufficient for the fake news detection system.

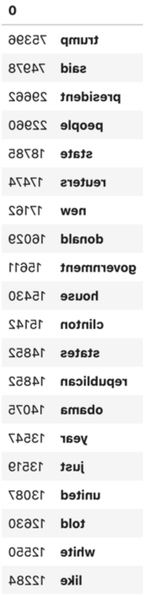
Below are a few couple pertinent findings:

- Counts and length
  - Character count
  - Word count
  - Mean word length
  - Mean sentence length



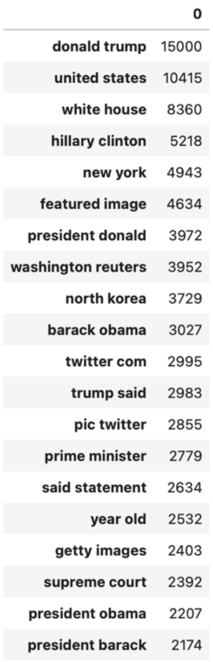
	title	text	label	Length	Word_count	mean_word_length	mean_sent_length
0	‘Maury’ Show Official Facebook Posts F*CKED U...	Maury is perhaps one of the trashiest shows on...	0	2338	430	4.401848	122.000000
1	Trump’s Favorite News Channel Tries To Soothe...	Yesterday, after the father of one of the UCLA...	0	4467	715	4.989276	100.250000
2	Russia warns Iraq, Kurds not to destabilize Mi...	MOSCOW (Reuters) - Russia on Wednesday warned ...	1	450	70	5.263889	224.000000
3	WATCH STEVE SCALISE Throw A Strike At The Nati...	House Majority Whip Steve Scalise (R., La.) th...	0	1224	210	4.724299	173.714286
4	Trump Will HATE What Stephen Colbert Just Did...	It can be said that Late Show host Stephen Col...	0	1224	204	4.889423	305.250000

- Word Frequency Analysis and N-gram support
  - Display top 20 most frequently occurring words in the text data



	0
trump	75396
said	74978
president	29662
people	22960
state	18785
reuters	17474
new	17162
donald	16029
government	15611
house	15430
clinton	15142
states	14852
republican	14852
obama	14075
year	13547
just	13519
united	13087
told	12630
white	12550
like	12284

- Bigram- Shows the top 20 most frequent bigrams in the 'fake_news' text data, along with their respective counts. Provides insights into pairs of consecutive words that frequently appear together in the given text data.

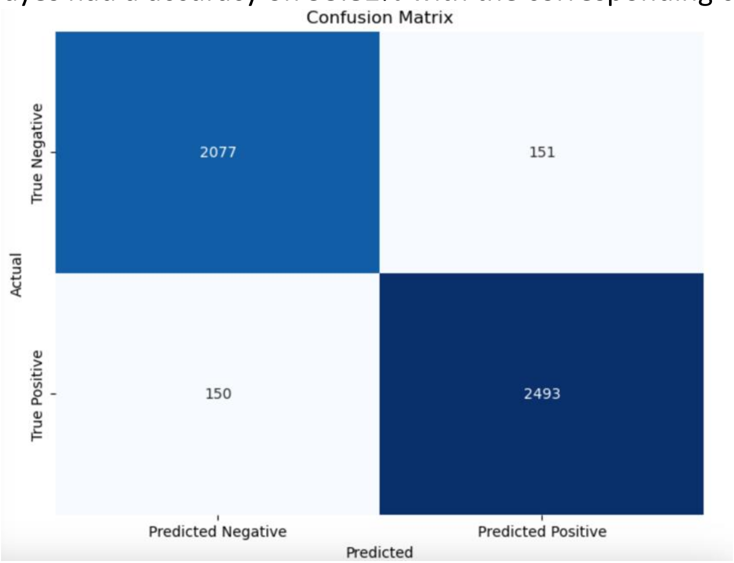


	0
donald trump	15000
united states	10415
white house	8360
hillary clinton	5218
new york	4943
featured image	4634
president donald	3972
washington reuters	3952
north korea	3729
barack obama	3027
twitter com	2995
trump said	2983
pic twitter	2855
prime minister	2779
said statement	2634
year old	2532
getty images	2403
supreme court	2392
president obama	2207
president barack	2174

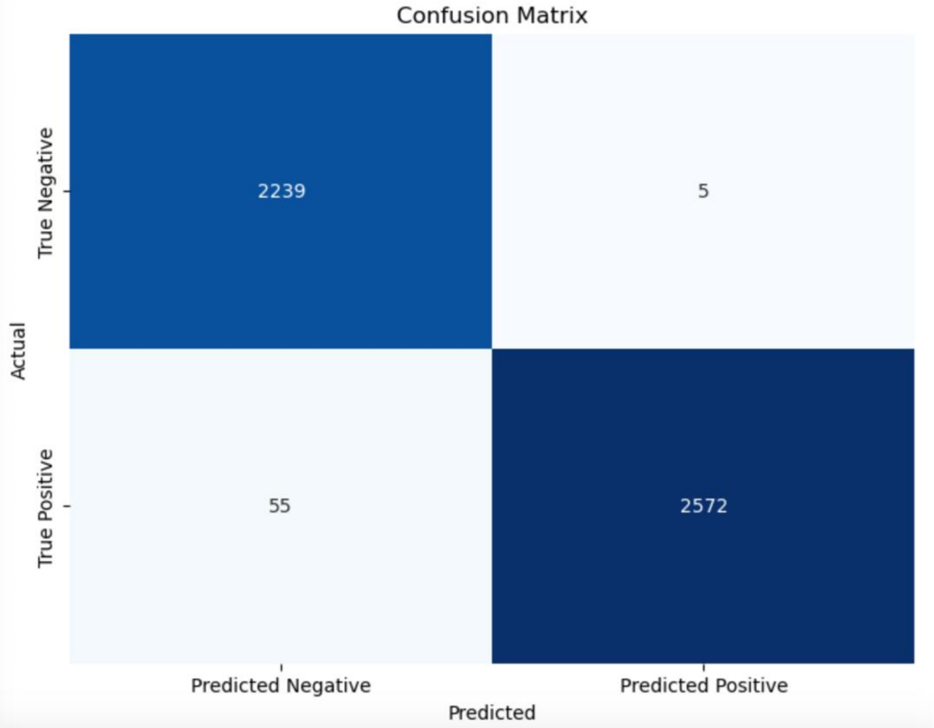
Algorithms

I chose to work with the Python library scikit as well as keras for training my fake news detection system.

I tested the fake news cleaned dataset with one traditional classifier using scikit learn. Naïve Bayes had a accuracy on 93.82% with the corresponding confusion matrix.



I tokenized the text, converting it into sequences of integers, padding the sequences to a consistent length, and splitting the data into training and validation sets. I trained the model using the Keras Sequential API using batch size of 128 on 5 epochs. It should be noted that this neural network, although is 98.77% accurate it's also computationally expensive.

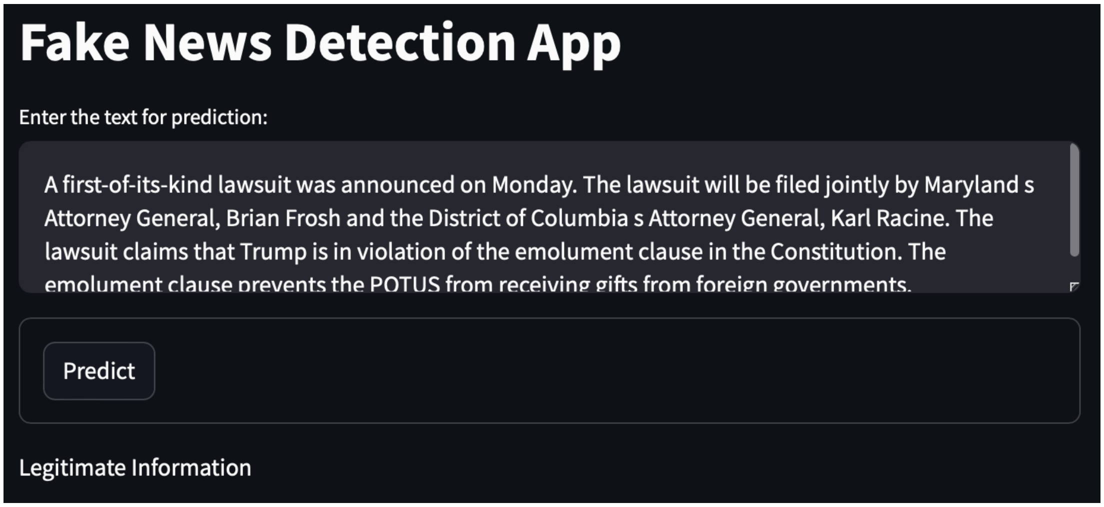


I adopted the F1 metric because I wanted to get the actual positive cases that are correctly identified. However, I chose neural network as it provided great accuracy and F1 score.

$$F_1 = \left(\frac{\mathrm{recall}^{-1} + \mathrm{precision}^{-1}}{2}\right)^{-1} = 2 \cdot \frac{\mathrm{precision} \cdot \mathrm{recall}}{\mathrm{precision} + \mathrm{recall}}.$$

Predictions

In the final prediction application, the user can enter a text. The user can then select the predict button to see if the text is fake or legitimate.

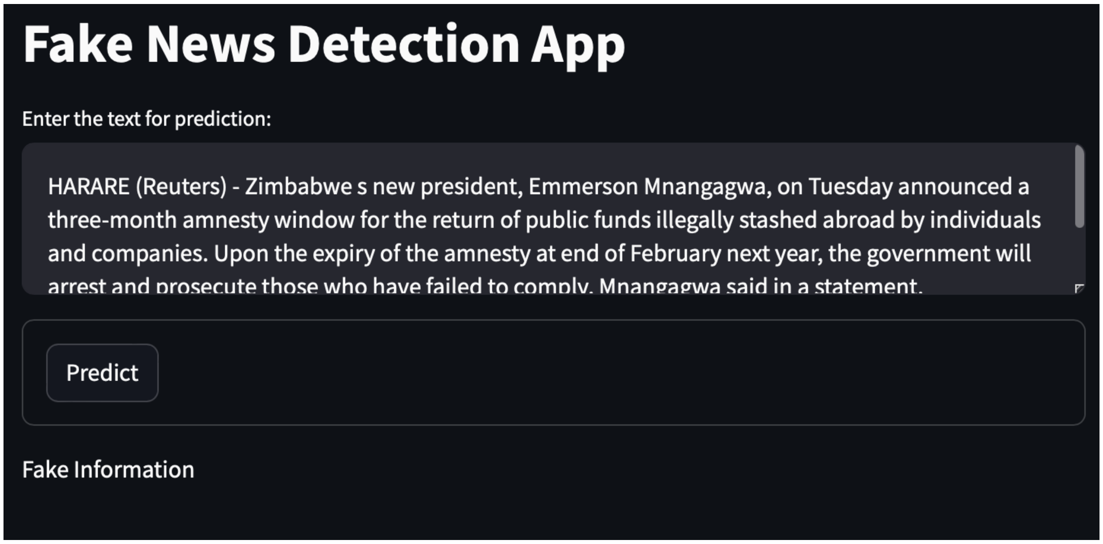


Fake News Detection App

Enter the text for prediction:

A first-of-its-kind lawsuit was announced on Monday. The lawsuit will be filed jointly by Maryland s Attorney General, Brian Frosh and the District of Columbia s Attorney General, Karl Racine. The lawsuit claims that Trump is in violation of the emolument clause in the Constitution. The emolument clause prevents the POTUS from receiving gifts from foreign governments.

Legitimate Information



Fake News Detection App

Enter the text for prediction:

HARARE (Reuters) - Zimbabwe s new president, Emmerson Mnangagwa, on Tuesday announced a three-month amnesty window for the return of public funds illegally stashed abroad by individuals and companies. Upon the expiry of the amnesty at end of February next year, the government will arrest and prosecute those who have failed to comply, Mnangagwa said in a statement.

Fake Information

Future Improvements

In the future, I would love to spend more time creating a batch system, wherein a user could import any text and to predict if the text is legitimate or fake. This fake news detection system would also be improved by connecting to an automation, where a user could receive a report of texts that are fake or legitimate to alert individuals.