

FAKE NEWS DETECTION USING **NLP**

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Phase-1 Document submission



ABSTRACT:

With the recent social media boom, the spread of fake news has become a great concern for everybody. It has been used to manipulate public opinions, influence the election - most notably the US Presidential Election of 2016, incite hatred and riots like the genocide of the Rohingya population. A 2018 MIT study found that fake news spreads six times faster on Twitter than real news. The credibility and trust in the news media are at an all-time low. It is becoming increasingly difficult to determine which news is real and which is fake. Various machine learning methods have been used to separate real news from fake ones. In this study, we tried to accomplish that using Passive Aggressive Classifier, LSTM and natural language processing.

INTRODUCTION:

Fake news is untrue information presented as news. It often has the aim of damaging the reputation of a person or entity or making money through advertising revenue. Once common in print, the prevalence of fake news has increased with the rise of social media, especially the Facebook News Feed. During the 2016 US presidential election, various kinds of fake news about the candidates widely spread in the online social networks, which may have a significant effect on the election results. According to a post-election statistical report, online social networks account for more than 41.8% of the fake news data traffic in the election, which is much greater than the data traffic shares of both traditional TV/radio/print medium and online search engines respectively. Fake news detection is becoming increasingly difficult because people who have ill intentions are writing the fake pieces so convincingly that it is difficult to separate from real news.

Dataset Link: (<https://www.kaggle.com/code/mhmudalipur/fake-news-detection>)

PROBLEM STATEMENT

In this day and age, it is extremely difficult to decide whether the news we come across is real or not. There are very few options to check the authenticity and all of them are sophisticated and not accessible to the average person. There is an acute need for a web-based fact-checking platform that harnesses the power of Machine Learning to provide us with that opportunity.

MOTIVATION

Social media facilitates the creation and sharing of information that uses computer-mediated technologies. This media changed the way groups of people interact and communicate. It allows low cost, simple access and fast dissemination of information to them. The majority of people search and consume news from social media rather than traditional news organizations these

days. On one side, where social media have become a powerful source of information and bringing people together, on the other side it also 1 put a negative impact on society. Look t some examples herewith; Facebook Inc's popular messaging service, WhatsApp became a political battle-platform in Brazil's election. False rumor's, manipulated photos, de-contextualized videos, and audio jokes were used for campaigning. These kinds of stuff went viral on the digital platform without monitoring their origin or reach

LITERATURE REVIEW

1.HANSELOWSKI:

Uses fake news challenge dataset which classifies the news based on four classes namely, agree, disagree, discuss, and unrelated. The model is trained using two stacked LSTM for embedded token sequence and three layered neural network to estimate the probability of which class it belongs to. This paper uses only LSTM based model to get the test predictions.

KIM(2014)

Prominently discusses the idea of sentence classification using CNN and max-over-time-pooling. They have utilized dropout on the penultimate layer with l2-norm constraint of weight vectors for regularization.

WANG(2017)

Proposes a solution that involves convoluted neural network for news statement, and bidirectional LSTM for other features of the news such as speaker, location, etc. CNN, like any other neural network, consists of an input layer

1.2 ISSUES CURRENT

We have numerous features from the dataset on which we train our model. In the deep learning techniques, we are not sure about the weightage given to each of the features. As the size of our dataset is small enough, we plan on using classical machine learning algorithms along with the deep learning techniques. We think this will help us in capturing better temporal behaviour of the sentences and provide us a better control over hyper-parameter tuning and alter the model design accordingly. As the training for machine learning models can be quickly done, we can try on different types of models and pick the best performer

1.1 OUR APPROACH

We plan to train an efficient Machine Learning Model to relations based features and the output labels, and use this as a prior (input) to the deep learning hybrid model mentioned in the Wang(2017). We can do this as our current dataset is small enough to handle computationally intensive Feature Engineering on the data. These similarity-based features (inputs to ML model) could be similarities between the word count, 2-grams and 3-grams; similarities after transforming these counts with TF-IDF, and few other features. ML model we could experiment with includes XGBoost because the model is robust; no normalization is needed and it can be regularized in several different ways to avoid over fitting.

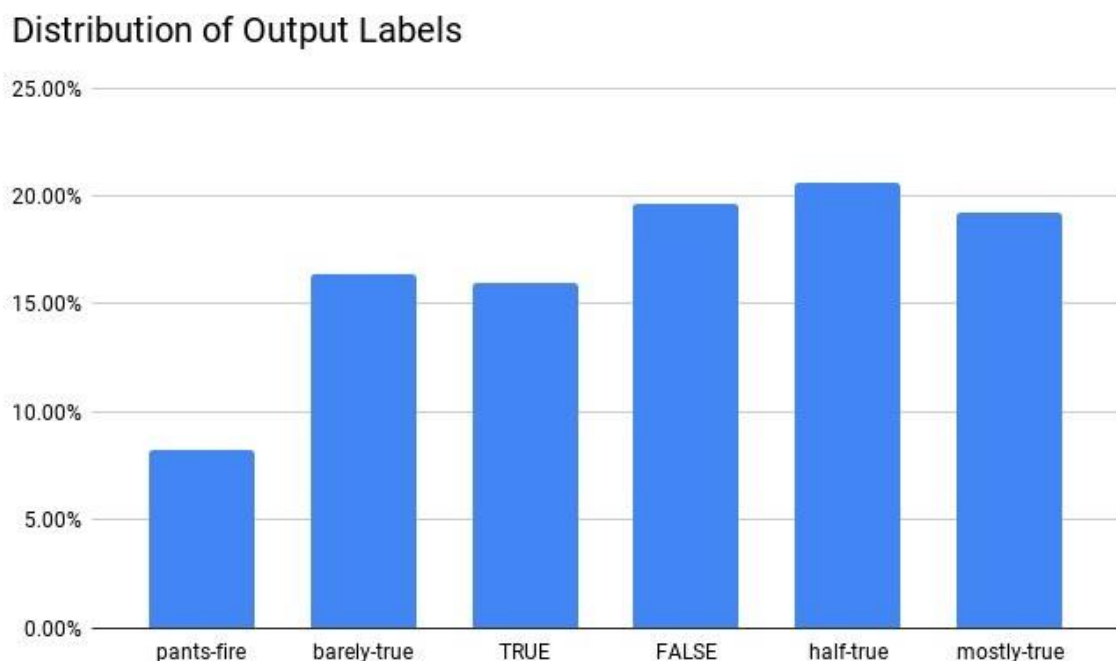
1.4 EVALUATION

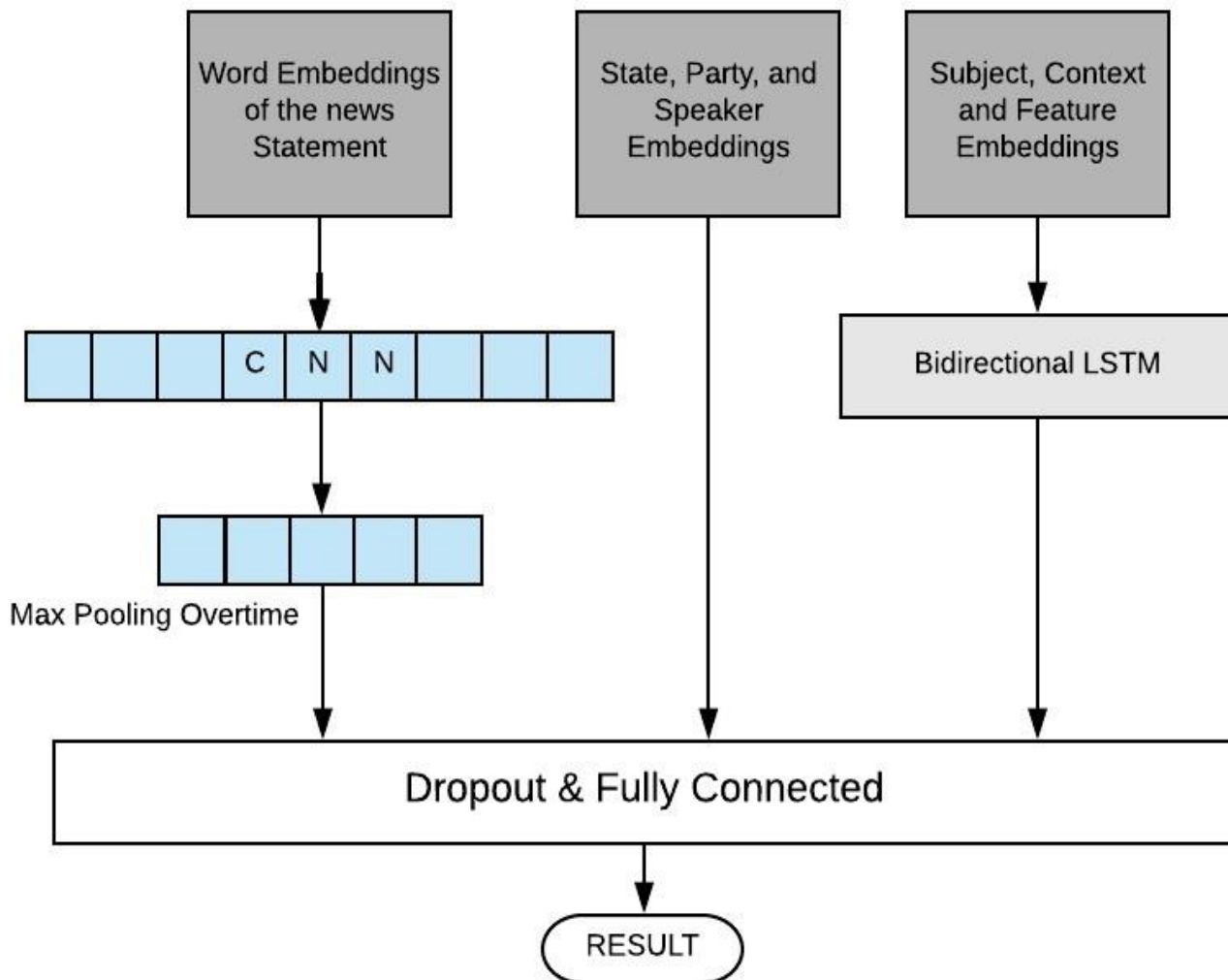
This project we are going to predict the authenticity of news using the Liar Dataset. The dataset contains a decade-long, 12.8K manually labeled short statements in various contexts from PolitiFact.com, which provides detailed analysis report and links to source documents for each case, along with the

statement, subject, speaker, speaker's job title, party affiliation and more. The output is one among the six valid classes that classifies the news content: pants-fire, false, barely-true, halftrue, mostly-true, true. To understand the dataset better, we examined the distribution of the labels. We noted that the labels are uniformly distributed as seen in Figure 2. We will be classifying test data set based on the class under which the news has been predicted upon. Further, we will verify several results by tuning the hyper-parameters and identify the best configuration for the model.

2 CURRENT PROGRESS

We implemented the algorithm mentioned in Wang(2017) which uses a hybrid model of CNNs and bi-LSTMs. We received an accuracy of 20.49% using this baseline implementation. The confusion matrix generated from our code run for the resultant output is shown in Table 1. 3





Future Work:

There are many future improvement aspects of this project. Introducing a cross checking feature on the machine learning model so it compares the news inputs with the reputable news sources is one way to go. It has to be online and done in real time, which will be very challenging. Improving the model accuracy using bigger and better datasets, integrating different machine learning algorithms is also something we hope to do in the future.

SOURCE CODE:

```

import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import tensorflow as tf
import re
from tensorflow.keras.preprocessing.text import Tokenizer
import tensorflow as tf
from sklearn.metrics import accuracy_score
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, confusion_matrix, precision_score, recall_score
import seaborn as sns
plt.style.use('ggplot')
fake_df = pd.read_csv('../input/fake-and-real-news-dataset/Fake.csv')
  
```

```
real_df = pd.read_csv('../input/fake-and-real-news-dataset/True.csv')  
fake_df.head(10)
```

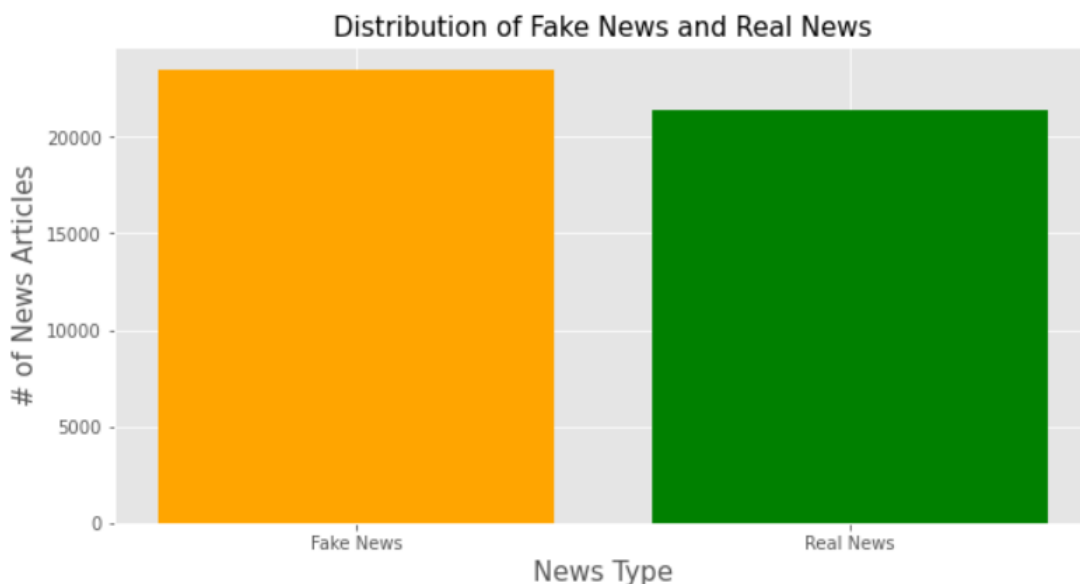
	title	text	subject	date
0	Donald Trump Sends Out Embarrassing New Year'...	Donald Trump just couldn t wish all Americans ...	News	December 31, 2017
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	News	December 31, 2017
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	News	December 30, 2017
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	News	December 29, 2017
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	News	December 25, 2017
5	Racist Alabama Cops Brutalize Black Boy While...	The number of cases of cops brutalizing and ki...	News	December 25, 2017
6	Fresh Off The Golf Course, Trump Lashes Out A...	Donald Trump spent a good portion of his day a...	News	December 23, 2017
7	Trump Said Some INSANELY Racist Stuff Inside ...	In the wake of yet another court decision that...	News	December 23, 2017
8	Former CIA Director Slams Trump Over UN Bully...	Many people have raised the alarm regarding th...	News	December 22, 2017
9	WATCH: Brand-New Pro-Trump Ad Features So Muc...	Just when you might have thought we d get a br...	News	December 21, 2017

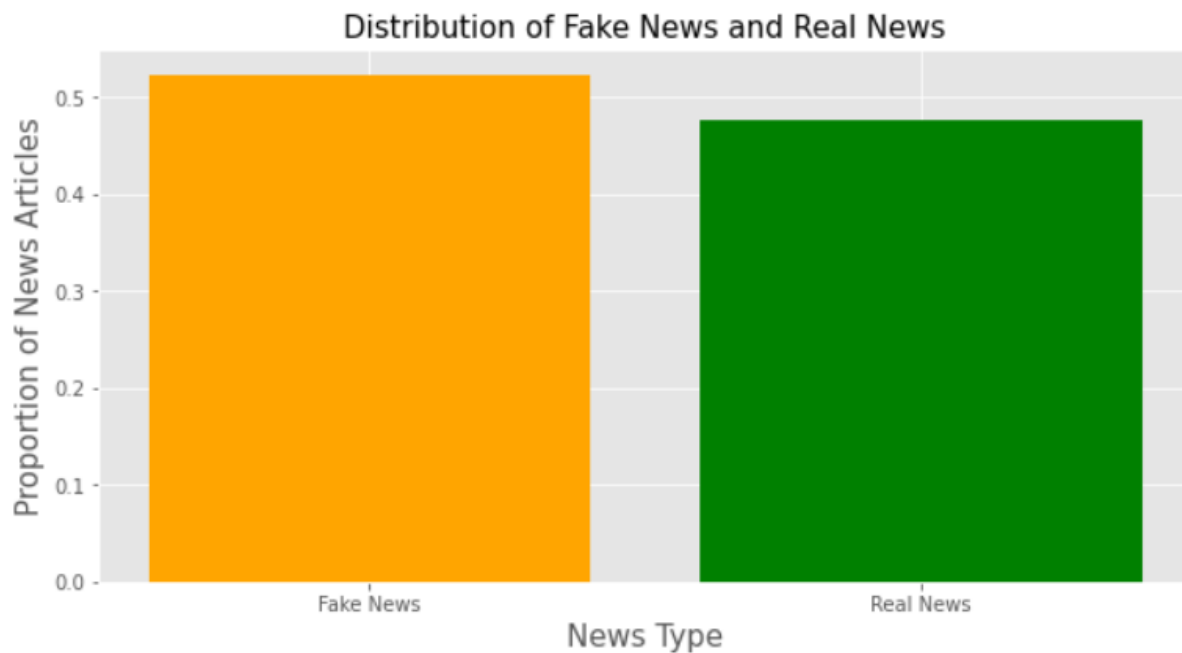
```

fake_df.isnull().sum()
real_df.isnull().sum()
real_df.subject.unique()
fake_df.drop(['date', 'subject'], axis=1, inplace=True)
real_df.drop(['date', 'subject'], axis=1, inplace=True)
fake_df['class'] = 0
real_df['class'] = 1

plt.figure(figsize=(10, 5))
plt.bar('Fake News', len(fake_df), color='orange')
plt.bar('Real News', len(real_df), color='green')
plt.title('Distribution of Fake News and Real News', size=15)
plt.xlabel('News Type', size=15)
plt.ylabel('# of News Articles', size=15)

```





```
print('Difference in news articles:', len(fake_df) - len(real_df))
news_df = pd.concat([fake_df, real_df], ignore_index=True, sort=False)
news_df
```

	title	text	class
0	Donald Trump Sends Out Embarrassing New Year'...	Donald Trump just couldn t wish all Americans ...	0
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	0
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	0
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	0
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	0
...
44893	'Fully committed' NATO backs new U.S. approach...	BRUSSELS (Reuters) - NATO allies on Tuesday we...	1
44894	LexisNexis withdrew two products from Chinese ...	LONDON (Reuters) - LexisNexis, a provider of l...	1
44895	Minsk cultural hub becomes haven from authorities	MINSK (Reuters) - In the shadow of disused Sov...	1
44896	Vatican upbeat on possibility of Pope Francis ...	MOSCOW (Reuters) - Vatican Secretary of State ...	1
44897	Indonesia to buy \$1.14 billion worth of Russia...	JAKARTA (Reuters) - Indonesia will buy 11 Sukh...	1

```
news_df['text'] = news_df['title'] + news_df['text']
news_df.drop('title', axis=1, inplace=True)
```

```
features = news_df['text']
targets = news_df['class']
```

```
X_train, X_test, y_train, y_test = train_test_split(features, targets, test_size=0.20, random_state=18)
```

```
def normalize(data):
    normalized = []
    for i in data:
        i = i.lower()
        # get rid of urls
        i = re.sub('https?://\S+|www\.\S+', '', i)
        # get rid of non words and extra spaces
        i = re.sub('\W', ' ', i)
        i = re.sub('\n', '', i)
        i = re.sub('+', ' ', i)
        i = re.sub('^ ', '', i)
        i = re.sub(' $', '', i)
        normalized.append(i)
    return normalized
```

```
X_train = normalize(X_train)
```

```
X_test = normalize(X_test)
```

```
Model: "sequential"
```

Layer (type)	Output Shape	Param #
embedding (Embedding)	(None, None, 128)	1280000
bidirectional (Bidirectional)	(None, None, 128)	98816
bidirectional_1 (Bidirectional)	(None, 32)	18560
dense (Dense)	(None, 64)	2112
dropout (Dropout)	(None, 64)	0
dense_1 (Dense)	(None, 1)	65

Total params: 1,399,553
 Trainable params: 1,399,553
 Non-trainable params: 0

```
matrix = confusion_matrix(binary_predictions, y_test, normalize='all')
```

```
plt.figure(figsize=(16, 10))
```

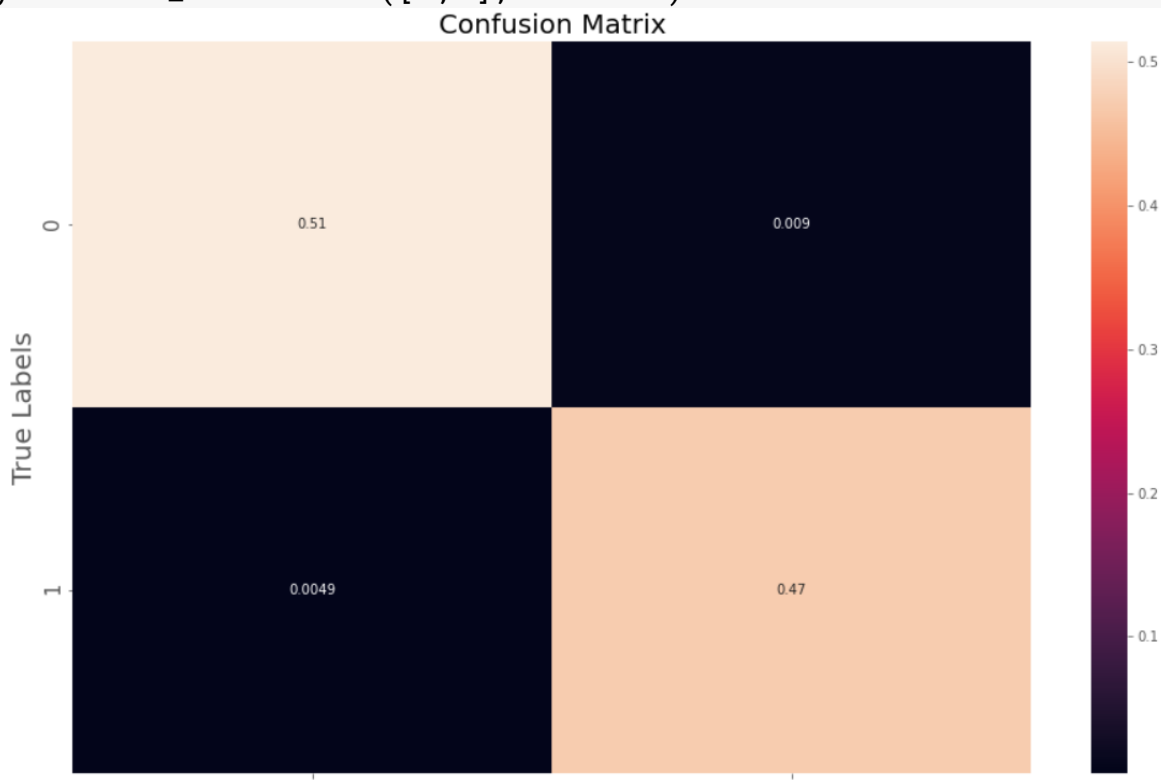
```
ax= plt.subplot()
```

```
sns.heatmap(matrix, annot=True, ax = ax)
```

```
# labels, title and ticks
```

```
ax.set_xlabel('Predicted Labels', size=20)
```

```
ax.set_ylabel('True Labels', size=20)
ax.set_title('Confusion Matrix', size=20)
ax.xaxis.set_ticklabels([0,1], size=15)
ax.yaxis.set_ticklabels([0,1], size=15)
```



Conclusion :

Our project can ring the initial alert for fake news. The model produces worse results if the article is written cleverly, without any sensationalization. This is a very complex problem but we tried to address it as much as we could. We believe the interface provides an easier way for the average person to check the authenticity of a news. Projects like this one with more advanced features should be integrated on social media to prevent the spread of fake news