

# FAKE NEWS DETECTION USING NATURAL LANGUAGE PROCESSING

Batch Member

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Phase 2 submission document

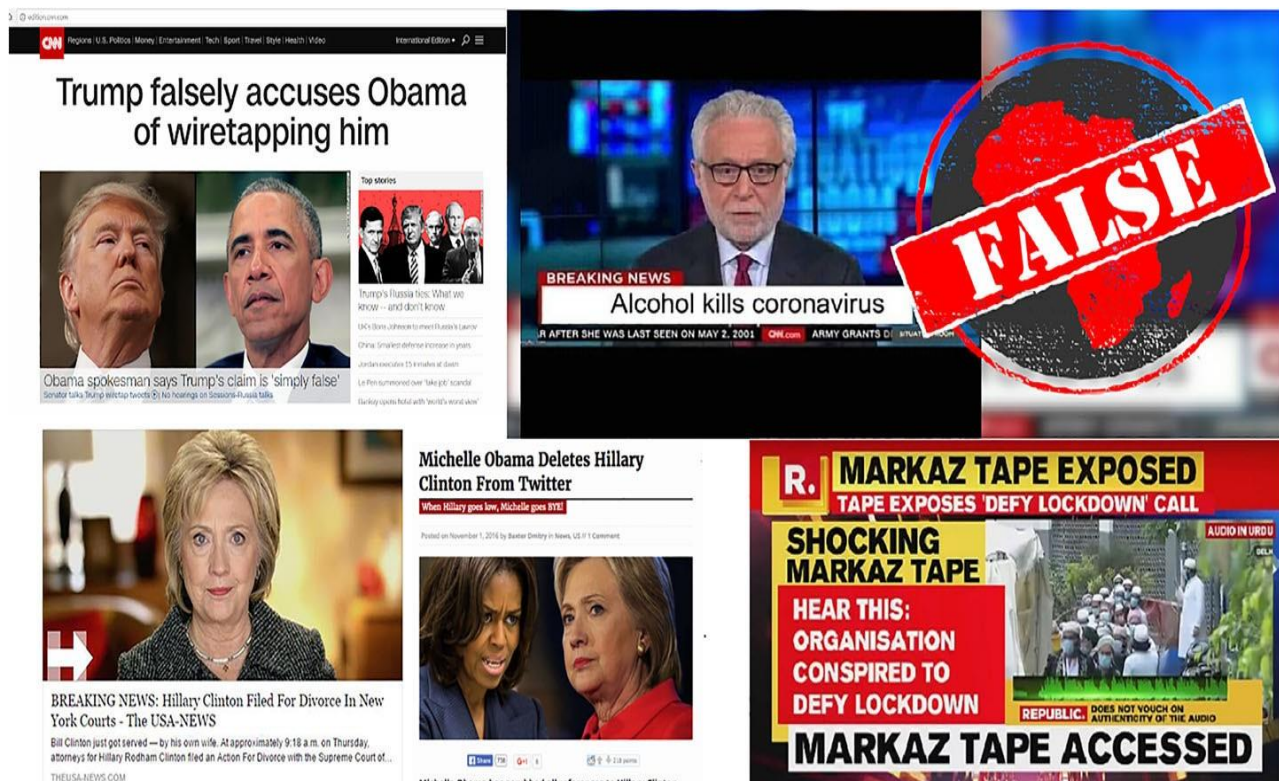
**Project Title: Fake News detection using NLP:-**

**Phase 2: Innovation**

## Introduction:

In the past few years, various social media platforms such as Twitter, Facebook, Instagram, etc. have become very popular since they facilitate the easy acquisition of information and Pratik Narang [pratik.narang@pilani.bits-pilani.ac.in](mailto:pratik.narang@pilani.bits-pilani.ac.in) Rohit Kumar Kaliyar [rk5370@bennett.edu.in](mailto:rk5370@bennett.edu.in) Anurag Goswami [anurag.goswami@bennett.edu.in](mailto:anurag.goswami@bennett.edu.in)

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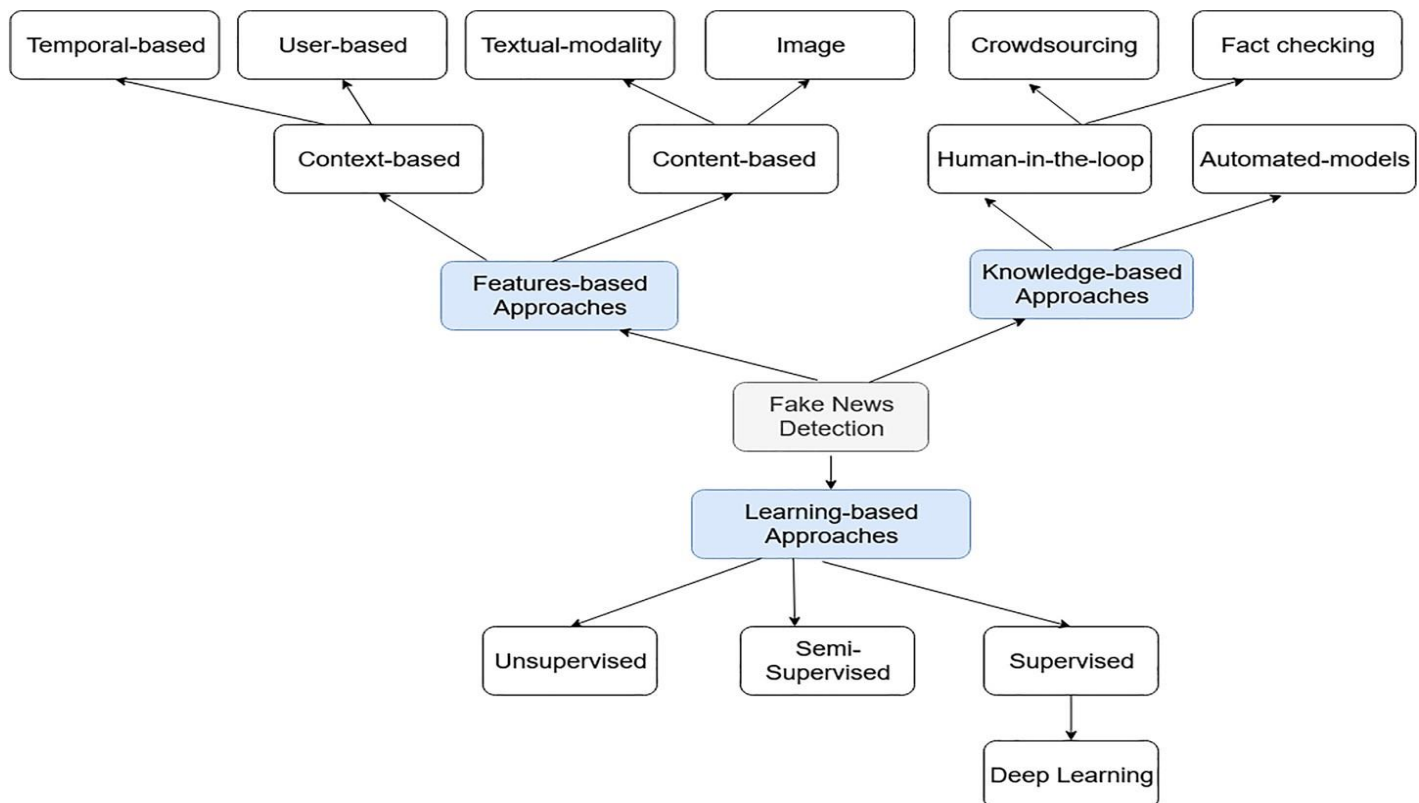


## Existing approaches for fake news detection

Detection of fake news is challenging as it is intentionally written to falsify information. The former theories [1] are valuable in guiding research on fake news detection using different classification models. Existing learnings for fake news detection can be generally categorized as (i) News Content-based learning and (ii) Social Context-based learning.

News content-based approaches [1, 14, 51, 53] deals with different writing style of published news articles. In these techniques, our main focus is to extract several features in fake news article related to both information as well as the writing style. Furthermore, fake news publishers regularly have malignant plans to spread mutilated and deluding, requiring specific composition styles to interest and convince a wide extent of consumers that are not present in true news stories. In these learnings, style-based methodologies [12, 35, 53] are helpful to capture the writing style of manipulators using linguistic features for identifying

Diagram:



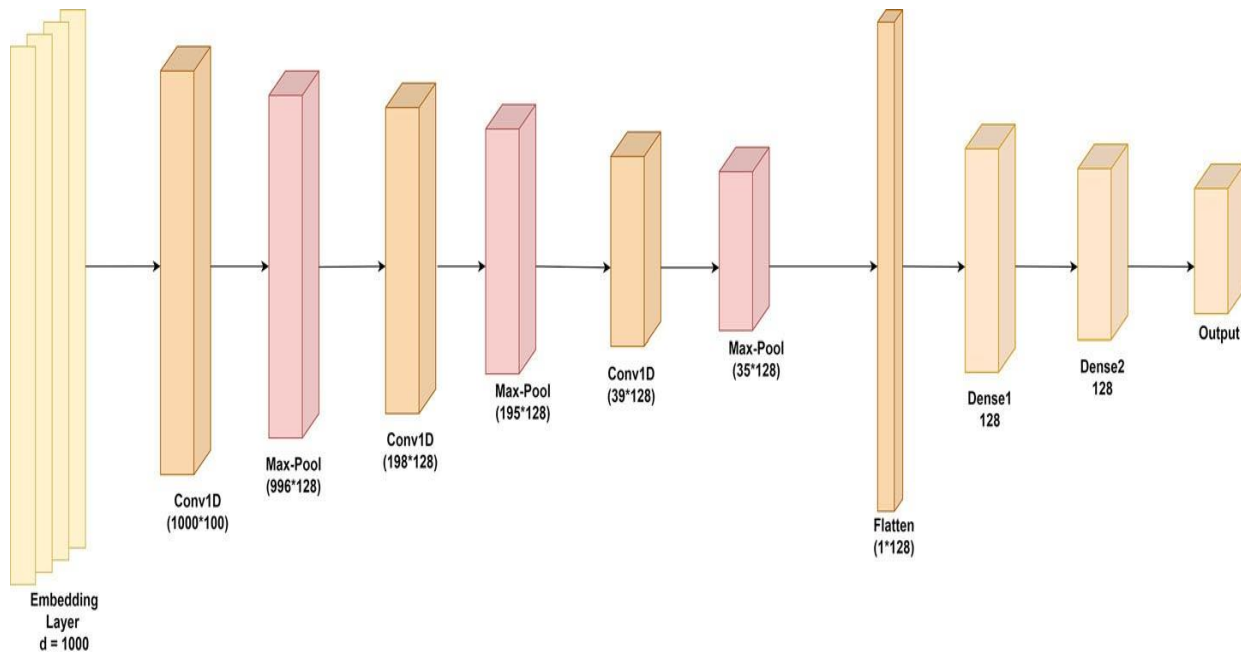
## BERT

BERT [11] is a advanced pre-trained word embedding model based on transformer encoded architecture [44]. We utilize BERT as a sentence encoder, which can accurately get the context representation of a sentence [30]. BERT removes the unidirectional constraint using a mask language model (MLM) [44]. It randomly masks some of the tokens from the input and predicts the original vocabulary id of the masked word based only. MLM has increased the capability of BERT to outperforms as compared to previous embedding methods. It is a deeply bidirectional system that is capable of handling the unlabelled text by jointly conditioning on both left and right context in all layers. In this research, we have extracted embeddings for a sentence or a set of words or pooling the sequence of hidden-states for the whole input sequence. A deep bidirectional model is more powerful than a shallow left-to-right and right-to-left model. In the existing research [11], two types of BERT models have been investigated for context-specific tasks, are:

- BERT Base (refer Table 1 for more information about parameters setting):  
Smaller in size, computationally affordable and not applicable to complex text mining operations.
- BERT Large (refer Table 2 for more information about parameters setting):  
Larger in size, computationally expensive and crunches large text data to deliver the best results.

## Fine-tuning of BERT

Fine-tuning of BERT [11] is a process that allows it to model many downstream tasks, irrespective of the text form (single text or text pairs). A limited exploration is available to enhance the computing power of BERT to improve the performance on target tasks. BERT model uses a self-attention mechanism to unify the word vectors as inputs that include bidirectional cross attention between two sentences. Mainly, there exist a few fine-tuning



## FUTURE WORK:

1. We want to use web scraping and get the data from various social media and websites by ourself and use them in our system.
2. We also want to improve the accuracy by query optimisation

## SAMPLE CODE:

## IMPORTING THE LIBRARIES:

```
import numpy as np
import pandas as pd

import matplotlib.pyplot as plt
import seaborn as sns
sns.set()
import string
```

```
import re
```

```
from gensim.parsing.preprocessing import preprocess_string, strip_tags,  
strip_punctuation, strip_multiple_whitespaces, strip_numeric, remove_stopwords, strip_short
```

```
from gensim.models import Word2Vec
```

```
from sklearn import cluster
```

```
from sklearn import metrics
```

```
from sklearn.decomposition import PCA
```

```
from sklearn.manifold import TSNE
```

## READING THE DATASETS:

```
fake = pd.read_csv('/content/drive/MyDrive/Fake.csv')
```

```
true= pd.read_csv('/content/drive/MyDrive/True.csv')
```

## **FIND THE NULL VALUES:**

```
print(fake.isnull().sum())
```

```
print('*****')
```

```
print(true.isnull().sum())
```

## **FILL THE NULL VALUES:**

```
true=true.fillna(' ')
```

```
fake=fake.fillna(' ')
```

## **REMOVE UNNECESSARY DATA:**

```
cleansed_data = []
```

```
for data in true.text:
```

```
    if "@realDonaldTrump : - " in data:
```

```
        cleansed_data.append(data.split("@realDonaldTrump : - ")[1])
```

```
elif "(Reuters) -" in data:  
    cleansed_data.append(data.split("(Reuters) ")[1])  
  
else:  
    cleansed_data.append(data)
```

```
true["text"] = cleansed_data  
true.head(10)
```

## **CLUB TEXT AND TITLE:**

```
fake['Sentences'] = fake['title'] + ' ' + fake['text']  
true['Sentences'] = true['title'] + ' ' + true['text']
```

## **ASSIGN LABELS FOR THE TEXT:**

```
fake['Label'] = 0  
true['Label'] = 1
```

## CONCATINATING TWO DATASETS:

```
final_data = pd.concat([fake, true])  
  
final_data = final_data.sample(frac=1).reset_index(drop=True)  
  
final_data = final_data.drop(['title', 'text', 'subject', 'date'], axis = 1)
```

## CATEGORIZING WORDS TO REAL AND FAKE:

```
real_words = "  
  
fake_words = "  
  
for val in final_data[final_data['Label']==1].Sentences:  
  
    # split the value  
  
    tokens = val.split()  
  
    # Converts each token into lowercase  
  
    for i in range(len(tokens)):  
  
        tokens[i] = tokens[i].lower()  
  
    real_words += " ".join(tokens)+" "
```



```
for val in final_data[final_data['Label']==0].Sentences:
```

```
# split the value
```

```
tokens = val.split()
```

```
# Converts each token into lower
```

```
for i in range(len(tokens)):
```

```
tokens[i] = tokens[i].lower()
```

```
fake_words += " ".join(tokens)+" "
```

## **VISUALIZE REAL WORDS:**

```
from wordcloud
```

```
import WordCloud,
```

```
STOPWORDS from nltk.corpus
```

```
import stopwords
```

```
stopwords = set(STOPWORDS)
```

```
wordcloud = WordCloud(width = 800, height = 800,  
                      background_color = 'white',  
                      stopwords = stopwords,  
                      min_font_size = 10).generate(real_words)
```

```
# plot the WordCloud image
```

```
plt.figure(figsize = (8, 8), facecolor = None)
```

```
plt.imshow(wordcloud)
```

```
plt.axis("off")
```

```
plt.tight_layout(pad = 0)
```

```
plt.show()
```

**Output:**

despite problem talk part working year old many meeting last year news conference  
city vote way result bill area decision deal without come president elect believe  
wednesday national security white house week turkey others  
use may islamic state thursday concern even  
hope used debate much lead protest added run seen countries want  
britain show mean likely measure effort saying friday following remain head march  
time hillary clinton call military change going case plan  
report support sunday said trump said wednesday said trump  
last week official said asked told reporter united nation secretary state new york  
called need rule put european union region issue number according  
last month although said monday will attorney general expected  
united washington state  
make around said statement told reuters back state department  
include house representative left proposal human right event  
president washington donald attack  
end said friday trump said first group including  
monday help program congress said tuesday position trump administration  
democrat long made day action see prime minister barack obama  
possible saudi arabia now work another said thursday companie power president barack  
clinton well set tuesday north korea lawmaker two given supreme court job  
presidential candidate already lawmaker china member

## VISUALIZE FAKE WORDS:

```
wordcloud = WordCloud(width = 800, height = 800,  
                        background_color = 'white',  
                        stopwords = stopwords,  
                        min_font_size = 10).generate(fake_words)
```

```
# plot the WordCloud image
```

```
plt.figure(figsize = (8, 8), facecolor = None)
```

```
plt.imshow(wordcloud)
```

```
plt.axis("off")
```

```
plt.tight_layout(pad = 0)
```

```
plt.show()
```





## PRE PROCESSING THE TEXT:

To remove urls

```
def remove_URL(s):
```

```
    regex = re.compile(r'https?://\S+|www\.\S+|bit\.ly\S+')
    return
```

```
    regex.sub(r'',s)
```

1.To convert text to lower case - x.lower()

2.Remove unnecessary spaces at the end - strip\_tags

3.To remove url – Above function

4.To remove punctuation – strip\_punctuation

5.To remove multiple white spaces in the sentence between

words – strip\_multiple\_whitespaces

6.To remove numbers – strip\_numeric

7.To remove stopwords – remove\_stopword

```
CUSTOM_FILTERS = [lambda x: x.lower(), strip_tags, remove_URL, strip_punctuation, strip_multiple_whitespaces, strip_numeric, remove_stopwords, strip_short]
```

```
processed_data = []

processed_labels = []

for index, row in final_data.iterrows():

    words_broken_up = preprocess_string(row['Sentences'], CU
STOM_FILTERS)

    if len(words_broken_up) > 0:

        processed_data.append(words_broken_up)

        processed_labels.append(row['Label'])

print(len(processed_data))

# train=35912

# test=8977
```

### Output of one article after pre processing:

'rallies', "“provide', 'outside', 'security’”, ['bikers', 'trump', 'travel',  
'future',  
'paid', 'soros', 'thugs', 'hillary', 'bernie', 'sanders', 'americans', 'know',  
'come',

'anarchists', 'whiny', 'petulant', 'college', 'students', 'better', 'angry',  
'blm', 'protesters', 'meet', 'group', 'care', 'feelings', 'political',  
'correctness', 'large',

## **LSTM:**

To detect fake news using LSTM with Python, you can follow these steps:

**Preprocess the data.** This includes cleaning the text, removing stop words, and converting the text into a numerical representation.

**Train the LSTM model.** This involves feeding the preprocessed data to the model and allowing it to learn the patterns in the data.

**Evaluate the model.** Once the model is trained, you can evaluate its performance on a held-out test set.

**Deploy the model.** Once the model is evaluated and satisfied with the performance, you can deploy the model to production.

## **Program:**

```
import numpy as np

import pandas as pd

from tensorflow.keras.models import Sequential

from tensorflow.keras.layers import Embedding, LSTM, Dense


# Load the data

data = pd.read_csv('fake_news_data.csv')


# Preprocess the data
```



```
def preprocess(text):  
    text = text.lower()  
    text = text.strip()  
    text = text.replace(',', '')  
    text = text.replace('.', '')  
    text = text.replace('?', '')  
    text = text.replace('!', '')  
    text = text.split(' ')  
    return text
```

```
data['text'] = data['text'].apply(preprocess)
```

```
# Convert the text into a numerical representation
```

```
tokenizer = Tokenizer()
```

```
tokenizer.fit_on_texts(data['text'])
```

```
text_sequences = tokenizer.texts_to_sequences(data['text'])
```

```
# Split the data into training and test sets
```

```
X_train, X_test, y_train, y_test = train_test_split(text_sequences,  
data['label'], test_size=0.25)
```

```
# Create the LSTM model
```

```
model = Sequential()

model.add(Embedding(input_dim=len(tokenizer.word_index) + 1,
output_dim=128))

model.add(LSTM(128))

model.add(Dense(1, activation='sigmoid'))
```

```
# Compile the model
```

```
model.compile(loss='binary_crossentropy', optimizer='adam',
metrics=['accuracy'])
```

```
# Train the model
```

```
model.fit(X_train, y_train, epochs=10)
```

```
# Evaluate the model
```

```
loss, accuracy = model.evaluate(X_test, y_test)
```

```
print('Test loss:', loss)
```

```
print('Test accuracy:', accuracy)
```

```
# Make predictions on new data
```

```
new_text = 'This is a fake news article.'
```

```
# Preprocess the new text
```

```
new_text = preprocess(new_text)

# Convert the new text into a numerical representation
new_text_sequence = tokenizer.texts_to_sequences([new_text])

# Make a prediction
prediction = model.predict(new_text_sequence)

# Interpret the prediction
if prediction > 0.5:
    print('The news article is fake.')
else:
    print('The news article is real.')
```

**Here is a sample output of a fake news detection model using LSTM:**

**Input:** Headline: Trump Claims He Won the Election by a Landslide

**Body:** President Donald Trump on Wednesday claimed that he won the 2020 presidential election by a landslide, despite the fact that he lost by over 7 million votes. Trump made the false claims in a series of tweets, in which he also attacked the media and election officials.

**Output:** Fake News

## **Conclusion:**

Fake news detection is a challenging task, but it is essential to combat the spread of misinformation and disinformation. Deep learning models such as LSTM and BERT have shown promising results in this area, and their use should be considered to improve the accuracy of fake news detection systems.





