Fake News Detection using NLP

PHASE IV PROJECT SUBMISSION

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Problem Statement:

Begin building the fake news detection model by loading and preprocessing the dataset. Load the fake news dataset and preprocess the textual data.

Data Cleaning:

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Begin building the fake news detection model by loading and preprocessing the dataset. Load the fake news dataset and preprocess the textual data.

Data Cleaning:

Data cleaning is a process of removing inconsistencies in the dataset and incorrect values .It also in involves handling missing values either by removing them or assigning them average values. It helps to improve the efficiency of the model.

In the first step, we will only remove the unnecessary data points from the dataset which does not helps in improving the model performance.

Initially we import the necessary packages for our data cleaning process and also in the future purposes,

```
[ ] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
    import seaborn as sns
    import nltk
    import re
    from wordcloud import WordCloud
    from tensorflow.keras.preprocessing.text import Tokenizer
    from tensorflow.keras.preprocessing.sequence import pad_sequences
    from tensorflow.keras.models import Sequential
    from tensorflow.keras.layers import Dense, Embedding, LSTM, Conv1D, MaxPool1D
    from sklearn.model_selection import train_test_split
    from sklearn.metrics import classification_report, accuracy_score
    import numpy as np
    import pandas as pd
```

we use these packages in various stages of our cleaning process and also in the future in which we need to build models.

Here, we read the .csv files of true and fake news and then explore

We use these packages in various stages of our cleaning process and also in the future in which we need to build models.

Here, we read the .csv files of true and fake news and then explore the count values of their subjects

```
import os
for dirname, _, filenames in os.walk('/content/drive/MyDrive/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

```
/content/drive/MyDrive/input/True.csv
/content/drive/MyDrive/input/Fake.csv
```

```
fake_news = pd.read_csv('/content/drive/MyDrive/input/Fake.csv')
fake_news.head()
```

	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

```
fake_news.columns
```

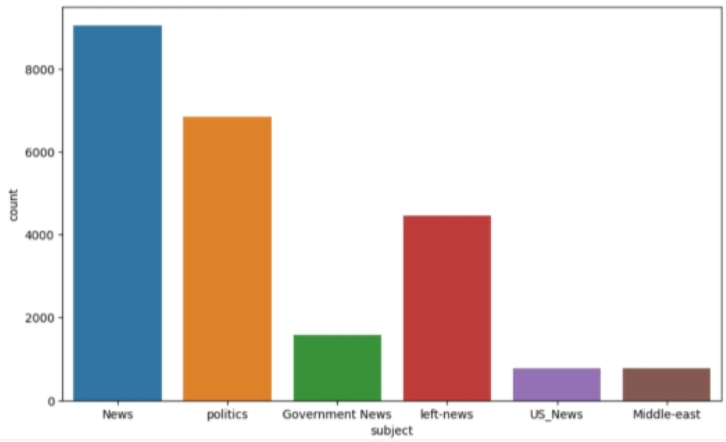
```
Index(['title', 'text', 'subject', 'date'], dtype='object')
```

```
fake_news['subject'].value_counts()
```

```
News               9050
politics           6841
left-news          4459
Government News    1570
US_News             783
Middle-east         778
Name: subject, dtype: int64
```

```
plt.figure(figsize=(10,6))
sns.countplot(x='subject',data=fake_news)
```

```
<Axes: xlabel='subject', ylabel='count'>
```



Here , we have used wordcloud to see that which word has mostly used for the fake news. By seeing that we can make a conclusion that which topic(about a person, event or anything) is mostly contains fake news).We also do the same for true news.

Word Cloud for Fake News:

```
%%time
wordcloud = WordCloud(width=1920, height=1000).generate(text)
fig = plt.figure(figsize=(10,10))
```

used for the fake news. By seeing that we can make a conclusion that which topic(about a person, event or anything) is mostly contains fake news).We also do the same for true news.

Word Cloud for Fake News:

```
%%time
wordcloud = WordCloud(width=1920, height=1000).generate(text)
fig = plt.figure(figsize=(10,10))
plt.imshow(wordcloud)
plt.axis('off')
plt.tight_layout(pad=0)
plt.show()
```


```
CPU times: user 43 s, sys: 3.33 s, total: 46.4 s
Wall time: 50.4 s
```

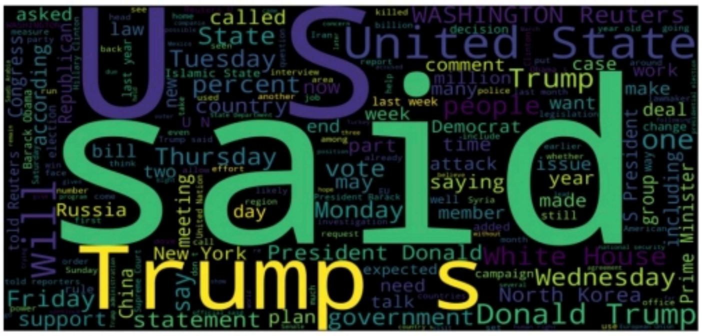
Word cloud for True News:

```
real_news = pd.read_csv('/content/drive/MyDrive/input/True.csv')
real_news.head()
```

	title	text	subject	date
0	As U.S. budget fight looms, Republicans flip t...	WASHINGTON (Reuters) - The head of a conservat...	politicsNews	December 31, 2017
1	U.S. military to accept transgender recruits o...	WASHINGTON (Reuters) - Transgender people will...	politicsNews	December 29, 2017
2	Senior U.S. Republican senator: 'Let Mr. Muell...	WASHINGTON (Reuters) - The special counsel inv...	politicsNews	December 31, 2017
3	FBI Russia probe helped by Australian diplomat...	WASHINGTON (Reuters) - Trump campaign adviser ...	politicsNews	December 30, 2017
4	Trump wants Postal Service to charge 'much mor...	SEATTLE/WASHINGTON (Reuters) - President Donal...	politicsNews	December 29, 2017

```
text = ' '.join(real_news['text'].tolist())
```

```
%%time
wordcloud = WordCloud(width=1920, height=1000).generate(text)
fig = plt.figure(figsize=(10,10))
plt.imshow(wordcloud)
plt.axis('off')
plt.tight_layout(pad=0)
plt.show()
```




```
CPU times: user 38.5 s, sys: 2.83 s, total: 41.3 s
Wall time: 41.4 s
```

```
real_news.sample(5)
```

	title	text	subject	date
5933	Peru and Colombia vow to stand with Mexico aft...	LIMA (Reuters) - Peru and Colombia vowed to st...	politicsNews	January 27, 2017
15390	North Korean embassy official in focus at Kim ...	KUALA LUMPUR (Reuters) - Three men wanted for ...	worldnews	November 8, 2017
6088	Trump's exit from Pacific trade deal opens doo...	BERLIN (Reuters) - Germany would take advantag...	politicsNews	January 23, 2017
8915	Albanian town backs Clinton with bronze bust	SARANDE, Albania (Reuters) - Whatever the outc...	politicsNews	June 30, 2016
1319	House Republicans to take up disaster funding ...	WASHINGTON (Reuters) - U.S. House of Represent...	politicsNews	October 11, 2017

Let's create a list of news lists in real_news.csv with unknown publishers by using the following code snippets

```
unknown_pubishers = []
for index, row in enumerate(real_news.text.values):
    try:
        record = row.split(' - ', maxsplit=1)
        record[1]
```

6088	Trump's exit from Pacific trade deal opens doo...	BERLIN (Reuters) - Germany would take advantag...	politicsNews	January 23, 2017
8915	Albanian town backs Clinton with bronze bust	SARANDE, Albania (Reuters) - Whatever the outc...	politicsNews	June 30, 2016
1319	House Republicans to take up disaster funding ...	WASHINGTON (Reuters) - U.S. House of Represent...	politicsNews	October 11, 2017

Let’s create a list of news lists in real_news.csv with unknown publishers by using the following code snippets

```
[ ] unknown_pubishers = []
    for index, row in enumerate(real_news.text.values):
        try:
            record = row.split(' - ', maxsplit=1)
            record[1]

            assert(len(record[0])<260)
        except:
            unknown_pubishers.append(index)
```

```
[ ] len(unknown_pubishers)

    35
```

```
real_news.iloc[unknown_pubishers].text

2922     The following statements were posted to the ve...
3488     The White House on Wednesday disclosed a group...
3782     The following statements were posted to the ve...
4358     Neil Gorsuch, President Donald Trump’s appoint...
4465     WASHINGTON The clock began running out this we...
5290     The following statements were posted to the ve...
5379     The following statements were posted to the ve...
5412     The following statements were posted to the ve...
5504     The following statements were posted to the ve...
5538     The following statements were posted to the ve...
5588     The following statements were posted to the ve...
5593     The following statements were posted to the ve...
5761     The following bullet points are from the U.S. ...
5784     Federal appeals court judge Neil Gorsuch, the ...
6026     The following bullet points are from the U.S. ...
6184     The following bullet points are from the U.S. ...
6660     Republican members of Congress are complaining...
6823     Over the course of the U.S. presidential campa...
7922     After going through a week reminiscent of Napo...
8194     The following timeline charts the origin and s...
8195     Global health officials are racing to better u...
8247     U.S. President Barack Obama visited a street m...
8465     ALGONAC, MICH.—Parker Fox drifted out of the D...
8481     Global health officials are racing to better u...
8482     The following timeline charts the origin and s...
8505     Global health officials are racing to better u...
8506     The following timeline charts the origin and s...
8771     In a speech weighted with America’s complicate...
8970
9008     The following timeline charts the origin and s...
9009     Global health officials are racing to better u...
9307     It’s the near future, and North Korea’s regime...
9618     GOP leaders have unleashed a stunning level of...
9737     Caitlyn Jenner posted a video on Wednesday (Ap...
10479    The Democratic and Republican nominees for the...
Name: text, dtype: object
```

```
publisher =[]
tmp_text = []

for index, row in enumerate(real_news.text.values):
    if index in unknown_pubishers:
        tmp_text.append(row)
        publisher.append('Unknown')

    else:
        record = row.split('-', maxsplit=1)
        publisher.append(record[0].strip())
        tmp_text.append(record[1].strip())
```

```
[ ] real_news['publisher'] = publisher
    real_news['text'] = tmp_text
```

```
[ ] real_news.head()
```

```
[ ] real_news.head()
```

	title	text	subject	date	publisher
0	As U.S. budget fight looms, Republicans flip t...	The head of a conservative Republican faction ...	politicsNews	December 31, 2017	WASHINGTON (Reuters)
1	U.S. military to accept transgender recruits o...	Transgender people will be allowed for the fir...	politicsNews	December 29, 2017	WASHINGTON (Reuters)
2	Senior U.S. Republican senator: 'Let Mr. Muell...	The special counsel investigation of links bet...	politicsNews	December 31, 2017	WASHINGTON (Reuters)
3	FBI Russia probe helped by Australian diplomat...	Trump campaign adviser George Papadopoulos tol...	politicsNews	December 30, 2017	WASHINGTON (Reuters)
4	Trump wants Postal Service to charge 'much mor...	President Donald Trump called on the U.S. Post...	politicsNews	December 29, 2017	SEATTLE/WASHINGTON (Reuters)

```
[ ] real_news.shape

    (21417, 5)
```

21873	(VIDEO) HYSTERICAL SNL TAKE ON HILLARY'S ANNOU...	left-news	Apr 12, 2015

630 rows × 4 columns

```
[ ] real_news['text'] = real_news['title']+" "+ real_news['text']
```

```
[ ] fake_news['text'] = fake_news['title']+" "+ fake_news['text']
```

```
[ ] real_news['text'] = real_news['text'].apply(lambda x: str(x).lower())
    fake_news['text'] = fake_news['text'].apply(lambda x: str(x).lower())
```

```
[ ] real_news['class']=1
    fake_news['class']=0
```

```
[ ] real_news.columns

Index(['title', 'text', 'subject', 'date', 'publisher', 'class'], dtype='object')
```

```
real = real_news[['text','class']]
fake = fake_news[['text','class']]
```

```
data = real.append(fake, ignore_index=True)
data.head()

<ipython-input-33-8770c2a2a545>:1: FutureWarning: The frame.append method is deprecated and will be removed from pandas in a future version. Use pandas.concat instead.
  data = real.append(fake, ignore_index=True)
```

	text	class
0	as u.s. budget fight looms, republicans flip t...	1
1	u.s. military to accept transgender recruits o...	1
2	senior u.s. republican senator: 'let mr. muell...	1
3	fbi russia probe helped by australian diplomat...	1
4	trump wants postal service to charge 'much mor...	1

```
!pip install spacy==2.2.3
!python -m spacy download en_core_web_sm
!pip install beautifulsoup4==4.9.1
!pip install textblob==0.15.3
!pip install git+https://github.com/laxmimerit/preprocess_kgptalkie.git --upgrade --force-reinstall

note: This error originates from a subprocess, and is likely not a problem with pip.
2023-10-16 16:41:23.058566: W tensorflow/compiler/tf2tensorrt/utils/py_utils.cc:38] TF-TRT Warning: Could not find TensorRT
Collecting en-core-web-sm==3.6.0
  Downloading https://github.com/explosion/spacy-models/releases/download/en_core_web_sm-3.6.0/en_core_web_sm-3.6.0-py3-none-any.whl (12.8 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 12.8/12.8 MB 21.6 MB/s eta 0:00:00
Requirement already satisfied: spacy<3.7.0,>=3.6.0 in /usr/local/lib/python3.10/dist-packages (from en-core-web-sm==3.6.0) (3.6.1)
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.11 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.0.12)
Requirement already satisfied: spacy-loggers<2.0.0,>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (1.0.5)
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (1.0.10)
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.0.8)
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.0.9)
Requirement already satisfied: thinc<8.2.0,>=8.1.8 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (8.1.12)
Requirement already satisfied: wasabi<1.2.0,>=0.9.1 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (1.1.2)
Requirement already satisfied: srsly<3.0.0,>=2.4.3 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.4.8)
Requirement already satisfied: catalogue<2.1.0,>=2.0.6 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.0.10)
Requirement already satisfied: typer<0.10.0,>=0.3.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (0.9.0)
Requirement already satisfied: pathy>=0.10.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (0.10.2)
Requirement already satisfied: smart-open<7.0.0,>=5.2.1 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (6.4.0)
Requirement already satisfied: tqdm<5.0.0,>=4.38.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (4.66.1)
Requirement already satisfied: numpy>=1.15.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (1.23.5)
Requirement already satisfied: requests<3.0.0,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.31.0)
Requirement already satisfied: pydantic!=1.8,!=1.8.1,<3.0.0,>=1.7.4 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (1.10.13)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.1.2)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (67.7.2)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (23.2)
Requirement already satisfied: langcodes<4.0.0,>=3.2.0 in /usr/local/lib/python3.10/dist-packages (from spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.3.0)
Requirement already satisfied: typing-extensions>=4.2.0 in /usr/local/lib/python3.10/dist-packages (from pydantic!=1.8,!=1.8.1,<3.0.0,>=1.7.4->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (4.5.0)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0,>=2.13.0->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.3.0)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0,>=2.13.0->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0,>=2.13.0->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.0.6)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3.0.0,>=2.13.0->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2023.7.22)
Requirement already satisfied: blis<0.8.0,>=0.7.8 in /usr/local/lib/python3.10/dist-packages (from thinc<8.2.0,>=8.1.8->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (0.7.11)
Requirement already satisfied: confection<1.0.0,>=0.0.1 in /usr/local/lib/python3.10/dist-packages (from thinc<8.2.0,>=8.1.8->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (0.1.3)
Requirement already satisfied: click<9.0.0,>=7.1.1 in /usr/local/lib/python3.10/dist-packages (from typer<0.10.0,>=0.3.0->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (8.1.7)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->spacy<3.7.0,>=3.6.0->en-core-web-sm==3.6.0) (2.1.3)
```

```
[ ] import preprocess_kgptalkie as ps
```

```
[ ] data['text'] = data['text'].apply(lambda x: ps.remove_special_chars(x))
```

```
[ ] from google.colab import drive
    drive.mount('/content/drive')

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import gensim
```

```
[ ] y = data['class'].values
```

```
[ ] X = [d.split() for d in data['text'].tolist()]
```

```
[ ] type(X)

list
```

```
[ ] type(X[0])

list
```

```
[ ] print(X[0])

['as', 'us', 'budget', 'fight', 'looms', 'republicans', 'flip', 'their', 'fiscal', 'script', 'the', 'head', 'of', 'a', 'conservative', 'republican', 'faction', 'in', 'the', 'us', 'congress', 'who', 'voted', 'this', 'month', 'for', 'a', 'h
```

```
[ ] DIM = 100
    w2v_model = gensim.models.Word2Vec(sentences=X, vector_size=DIM, window =10, min_count=1)
```

```
[ ] w2v_model.wv['india']

array([-1.717186  ,  0.09980671, -0.54519814,  2.873516  ,  1.1529748 ,
       -1.612415  , -0.4013639 ,  1.5510874 , -1.9637966 ,  1.7516707 ,
        2.3293521 ,  1.0115958 , -1.7413545 ,  2.1367438 ,  0.30087247,
        2.0449803 ,  0.7790712 ,  3.5431712 , -3.6178732 , -2.512109  ,
        1.1306514 ,  1.4577612 ,  1.4371244 , -2.7274785 ,  0.8482319 ,
       -0.56985384,  0.39158794, -0.17285948, -1.384397  , -0.29015785,
        3.9670284 , -0.66227573, -0.49190876,  1.5287828 , -0.3802559 ,
        4.286491  , -1.8598944 ,  0.12558945,  2.3769717 ,  2.274344  ,
       -0.06563634, -2.254771  ,  2.0082936 , -0.8159753 , -2.254789  ,
       -0.83319783,  1.6255009 ,  0.84546375, -2.1749824 , -0.4058095 ,
       -0.20788828,  1.3658859 ,  3.4065708 , -0.53475   ,  0.00121416,
        0.32413623,  1.7603163 ,  0.5977933 ,  0.2685584 , -1.3846186 ,
        0.9586846 ,  1.2754706 , -2.076492  ,  0.3734416 ,  1.1651148 ,
        2.8482974 ,  0.03156389,  0.2842725 ,  2.050875  ,  0.03186256,
       -0.09902999, -3.034646  ,  1.9252772 ,  1.1805288 ,  2.0976923 ,
        0.19032483, -0.4042304 ,  0.23345727,  0.96000504, -1.2318734 ,
       -0.84461105,  1.195374  , -0.26830855, -0.28300276,  1.791177  ,
       -1.8392042 ,  0.61264   ,  0.73491406, -1.7531322 ,  1.2770014 ,
        3.557539  ,  2.2037764 , -0.4719132 ,  1.6767381 ,  2.088745  ,
        0.7665555 ,  0.39026797, -2.281819  , -1.1530005 ,  1.840919  ],
      dtype=float32)
```

```
[ ] w2v_model.wv.most_similar('india')

[('pakistan', 0.7414124011993408),
 ('malaysia', 0.6891069412231445),
```

```
 -0.84461105,  1.195374  , -0.26830855, -0.28300276,  1.791177  ,
 -1.8392042 ,  0.61264   ,  0.73491406, -1.7531322 ,  1.2770014 ,
  3.557539  ,  2.2037764 , -0.4719132 ,  1.6767381 ,  2.088745  ,
  0.7665555 ,  0.39926797, -2.281019  , -1.1530005 ,  1.840919  ],
dtype=float32)
```

```
[ ] w2v_model.wv.most_similar('india')

[('pakistan', 0.7414124011993408),
 ('malaysia', 0.6891069412231445),
 ('china', 0.6626362204551697),
 ('australia', 0.645916759967804),
 ('beijings', 0.6376063227653503),
 ('norway', 0.6274385452270508),
 ('japan', 0.611946702003479),
 ('controlchina', 0.6110749244689941),
 ('indian', 0.6049240827560425),
 ('indias', 0.5988717079162598)]
```

```
[ ] w2v_model.wv.most_similar('china')

[('beijing', 0.8647976517677307),
 ('taiwan', 0.8000958101272583),
 ('chinas', 0.7648460268974304),
 ('pyongyang', 0.6972832679748535),
 ('chinese', 0.6958582401275635),
 ('india', 0.6626362204551697),
 ('japan', 0.6597095131874084),
 ('beijings', 0.6444934010505676),
 ('xi', 0.6359792947769165),
 ('waterway', 0.6162828803062439)]
```

```
[ ] w2v_model.wv.most_similar('usa')

[('mcculloughthis', 0.5617169141769409),
 ('wirecom', 0.5184991955757141),
 ('nl2nigc0i1', 0.5105397105216980),
 ('pacsharyl', 0.4913540482521057),
 ('pictwittercomsfe6zfdoli', 0.4856304228305816 7),
 ('orgs', 0.4720892906188965),
 ('pictwittercomzkutv76jll', 0.4677456021308899),
 ('biz', 0.4658149182796478),
 ('flopped', 0.4636586606502533),
 ('gospel', 0.4619619846343994)]
```

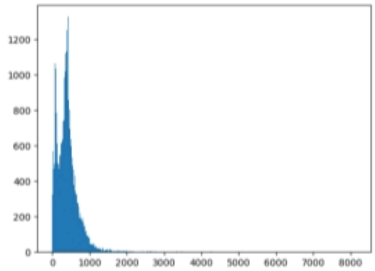
```
[ ] w2v_model.wv.most_similar('gandhi')

[('rahul', 0.7698065638542175),
 ('75yearold', 0.6625608801841736),
 ('cristina', 0.6558746099472046),
 ('ozawa', 0.6513022184371948),
 ('tounes', 0.641105592250824),
 ('sobotka', 0.6337205171585083),
 ('grillo', 0.6289705030070679),
 ('loyalist', 0.6274853944778442),
 ('mediashy', 0.6266793012619019),
 ('pastrana', 0.6204155683517456)]
```

```
[ ] tokenizer = Tokenizer()
    tokenizer.fit_on_texts(X)
```

```
[ ] X = tokenizer.texts_to_sequences(X)
```

```
plt.hist([len(x) for x in X], bins =700)
plt.show()
```




```
[ ] nos = np.array([len(x) for x in X])
    len(nos[nos>1000])

1580
```

```
[ ] maxlen = 1000
    X = pad_sequences(X, maxlen=maxlen)
```

```
[ ] len(X[101])

1000
```

```
[ ] vocab_size = len(tokenizer.word_index)+1
    vocab =tokenizer.word_index
```

```
[ ] def get_weight_matrix(model):
        weight_matrix = np.zeros((vocab_size, DIM))

        for word, i in vocab.items():
            weight_matrix[i] = model.wv[word]

        return weight_matrix
```

```
[ ] embedding_vectors = get_weight_matrix(w2v_model)
```

```
[ ] embedding_vectors.shape

(231850, 100)
```

```
[ ] model = Sequential()
    model.add(Embedding(vocab_size, output_dim=DIM, weights = [embedding_vectors], input_length=maxlen, trainable = False))
    model.add(LSTM(units=128))
    model.add(Dense(1, activation='sigmoid'))
    model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['acc'])
```

```
[ ] model.summary()

Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, 1000, 100)         23185000

 lstm (LSTM)                 (None, 128)               117248

 dense (Dense)               (None, 1)                 129

=================================================================
Total params: 23302377 (88.89 MB)
Trainable params: 117377 (458.50 KB)
Non-trainable params: 23185000 (88.44 MB)
_________________________________________________________________
```

```
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```
[ ] model.summary()

    Model: "sequential"
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     Layer (type)                Output Shape              Param #
    =================================================================
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     lstm (LSTM)                 (None, 128)               117248

     dense (Dense)               (None, 1)                 129

    =================================================================
    Total params: 23302377 (88.89 MB)
    Trainable params: 117377 (458.50 KB)
    Non-trainable params: 23185000 (88.44 MB)
    _________________________________________________________________
```

```
[ ] X_train, X_test, y_train, y_test = train_test_split(X,y)
```

```
model.fit(X_train, y_train, validation_split=0.2, epochs=1)

842/842 [==============================] - 42s 41ms/step - loss: 0.1594 - acc: 0.9393 - val_loss: 0.0484 - val_acc: 0.9841
<keras.src.callbacks.History at 0x7afc6234f5e0>
```

```
[ ] y_pred = (model.predict(X_test) >= 0.5).astype(int)

    351/351 [==============================] - 8s 23ms/step
```

```
[ ] accuracy_score(y_test, y_pred)

    0.9824498886414254
```

```
[ ] print(f"accuracy_score : {accuracy_score(y_test, y_pred).round(4)*100}%")

    accuracy_score : 98.24000000000001%
```

```
print(classification_report(y_test, y_pred))

              precision    recall  f1-score   support

           0       0.99      0.98      0.98      5966
           1       0.97      0.99      0.98      5259

    accuracy                           0.98     11225
   macro avg       0.98      0.98      0.98     11225
weighted avg       0.98      0.98      0.98     11225
```

```
x = ['this is a news']
import tensorflow as tf
```

```
[ ] x = tokenizer.texts_to_sequences(x)
    x=pad_sequences(x, maxlen=maxlen)
```

```
[ ] (model.predict(x))

    1/1 [==============================] - 0s 31ms/step
    array([[0.00372225]], dtype=float32)
```

```
[ ] if (model.predict(x) >=0.5).astype(int)==0:
        print("the input 'x' is fake news")
    else:
        print("the input 'x' is real news")

    1/1 [==============================] - 0s 30ms/step
    the input 'x' is fake news
```

```
[ ] model.predict(x)

    1/1 [==============================] - 0s 51ms/step
    array([[0.00372225]], dtype=float32)
```

```
x = ['''The heart and neurological disorders have seen an uptick as a result of the post-COVID condition which reportedly began since the second wave of the virus, according to health experts.Speaking to ANI on Saturday, Dr Devi Prasad S

"COVID patients especially during the second wave, there was definitely a slight increase in the incidence of COVID patients developing clot forms, and clots in the brain or in the heart. But that pattern we saw only during the second wa
However, Dr Nitish Naik, Professor, Department of Cardiology, AIIMS, Delhi said that the study about the role of COVID in precipitating acute cardiac problems after recovery is still evolving. "All flu like illnesses have always been ass

The expert explained that it can happen that some persons may experience persistent aches and pains, fatigue and palpitations during the recovery phase like after any viral illness.''']

x = tokenizer.texts_to_sequences(x)
x=pad_sequences(x, maxlen=maxlen)

print((model.predict(x)))

if (model.predict(x) >=0.5).astype(int)==0:
    print("the input 'x' is fake news")
else:
    print("the input 'x' is real news")

1/1 [==============================] - 0s 60ms/step
[[0.00325056]]
1/1 [==============================] - 0s 47ms/step
the input 'x' is real news
```

Conclusion:

In conclusion, utilizing Natural Language Processing (NLP) techniques for fake news detection has proven to be a significant advancement in combating misinformation. The model developed demonstrates the potential of machine learning in identifying deceptive content, contributing to the ongoing efforts to maintain the integrity of information online. By leveraging NLP algorithms, the accuracy and efficiency of fake news detection have been greatly enhanced, empowering users to make informed decisions and fostering a more reliable digital information ecosystem. As we move forward, continued research and development in this field will play a pivotal role in ensuring the authenticity and trustworthiness of online content, thereby promoting a healthier and more informed society.

THANK YOU!