Assignment 4

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1. Download the dataset link

Label - Ham or Spam

Message - Message

```
import warnings
warnings.filterwarnings("ignore")
```

2. Importing Required Library

```
import re
import nltk
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from nltk.stem import WordNetLemmatizer
from nltk.corpus import stopwords
from wordcloud import WordCloud,STOPWORDS,ImageColorGenerator
```

3. Read dataset and do Preprocessing

```
df = pd.read_csv("/content/spam.csv",encoding='ISO-8859-1')
```

```
df = df.iloc[:,:2]
df.columns=['label','message']
df.head()
```

	label	message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina

```
df.info()
```

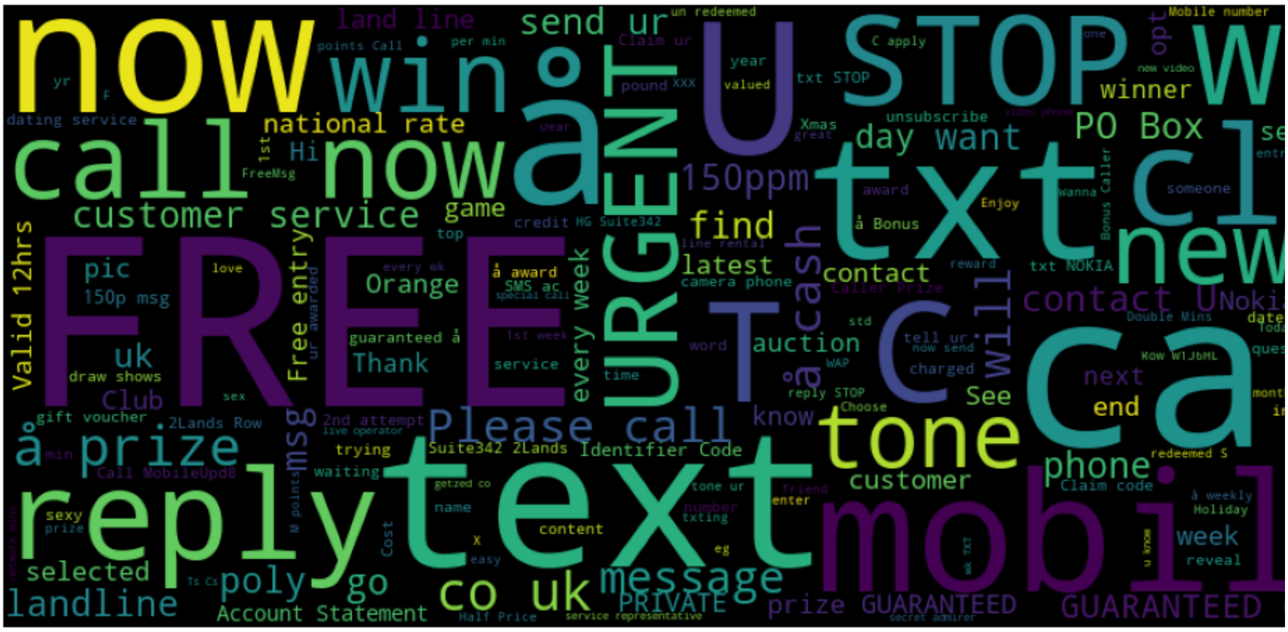
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 2 columns):
 #   Column   Non-Null Count  Dtype 
---  ------   --------------  ----- 
 0   label    5572 non-null   object
 1   message  5572 non-null   object
dtypes: object(2)
memory usage: 87.2+ KB
```

```
ms1 = pd.Series((df.loc[df['label']=='ham','message']).tolist()).astype(str)
wordcloud = WordCloud(stopwords=STOPWORDS,width=800,height=600,background_color='black').
plt.figure(figsize=(20,10))
plt.imshow(wordcloud)
plt.axis('off')
```

```
(-0.5, 799.5, 599.5, -0.5)
```

```
ms2 = pd.Series((df.loc[df['label']=='spam','message']).tolist()).astype(str)
wordcloud = WordCloud(stopwords=STOPWORDS,width=1000,height=400,background_color='black').
plt.figure(figsize=(20,10))
plt.imshow(wordcloud)
plt.axis('off')
```

```
(-0.5, 999.5, 399.5, -0.5)
```



```
from nltk.stem.wordnet import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
corpus = []
```

```
import nltk
from nltk.corpus import stopwords
nltk.download('all')
```

```
for i in range(len(df)):
    review = re.sub('[^a-zA-Z]',' ',df['message'][i])
    review = review.lower()
    review = review.split()
    review = [lemmatizer.lemmatize(i) for i in review if not i in set(stopwords.words('eng
    review = ' '.join(review)
    corpus.append(review)
```

```
[nltk_data] Downloading collection 'all'
[nltk_data]    |
[nltk_data]    | Downloading package abc to /root/nltk_data...
```

```
[nltk_data]    |   Package abc is already up-to-date!
[nltk_data]    | Downloading package alpino to /root/nltk_data...
[nltk_data]    |   Package alpino is already up-to-date!
[nltk_data]    | Downloading package averaged_perceptron_tagger to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package averaged_perceptron_tagger is already up-
[nltk_data]    |       to-date!
[nltk_data]    | Downloading package averaged_perceptron_tagger_ru to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package averaged_perceptron_tagger_ru is already
[nltk_data]    |       up-to-date!
[nltk_data]    | Downloading package basque_grammars to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package basque_grammars is already up-to-date!
[nltk_data]    | Downloading package biocreative_ppi to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package biocreative_ppi is already up-to-date!
[nltk_data]    | Downloading package bllip_wsj_no_aux to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package bllip_wsj_no_aux is already up-to-date!
[nltk_data]    | Downloading package book_grammars to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package book_grammars is already up-to-date!
[nltk_data]    | Downloading package brown to /root/nltk_data...
[nltk_data]    |   Package brown is already up-to-date!
[nltk_data]    | Downloading package brown_tei to /root/nltk_data...
[nltk_data]    |   Package brown_tei is already up-to-date!
[nltk_data]    | Downloading package cess_cat to /root/nltk_data...
[nltk_data]    |   Package cess_cat is already up-to-date!
[nltk_data]    | Downloading package cess_esp to /root/nltk_data...
[nltk_data]    |   Package cess_esp is already up-to-date!
[nltk_data]    | Downloading package chat80 to /root/nltk_data...
[nltk_data]    |   Package chat80 is already up-to-date!
[nltk_data]    | Downloading package city_database to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package city_database is already up-to-date!
[nltk_data]    | Downloading package cmudict to /root/nltk_data...
[nltk_data]    |   Package cmudict is already up-to-date!
[nltk_data]    | Downloading package comparative_sentences to
[nltk_data]    |     /root/nltk_data...
[nltk_data]    |   Package comparative_sentences is already up-to-
[nltk_data]    |       date!
[nltk_data]    | Downloading package comtrans to /root/nltk_data...
[nltk_data]    |   Package comtrans is already up-to-date!
[nltk_data]    | Downloading package conll2000 to /root/nltk_data...
[nltk_data]    |   Package conll2000 is already up-to-date!
[nltk_data]    | Downloading package conll2002 to /root/nltk_data...
[nltk_data]    |   Package conll2002 is already up-to-date!
[nltk_data]    | Downloading package conll2007 to /root/nltk_data...
[nltk_data]    |   Package conll2007 is already up-to-date!
[nltk_data]    | Downloading package crubadan to /root/nltk_data...
[nltk_data]    |   Package crubadan is already up-to-date!
[nltk_data]    | Downloading package dependency_treebank to
[nltk_data]    |     /root/nltk_data...
```

4. Create Model

```
from keras.preprocessing.text import Tokenizer
from keras_preprocessing.sequence import pad_sequences
from keras.layers import Dense,Dropout,LSTM,Embedding
from keras.models import Sequential,load_model
```

```
token = Tokenizer()
token.fit_on_texts(corpus)
text_to_seq = token.texts_to_sequences(corpus)
```

```
max_length_sequence = max([len(i) for i in text_to_seq])
padded_seq = pad_sequences(text_to_seq, maxlen=max_length_sequence, padding="pre")
```

```
padded_seq
```

```
     array([[   0,    0,    0, ...,   16, 3551,   70],
            [   0,    0,    0, ...,  359,    1, 1610],
            [   0,    0,    0, ...,  218,   29,  293],
            ...,
            [   0,    0,    0, ..., 7042, 1095, 3547],
            [   0,    0,    0, ...,  842,    1,   10],
            [   0,    0,    0, ..., 2198,  347,  152]], dtype=int32)
```

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y = le.fit_transform(df['label'])
```

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(padded_seq,y,test_size=0.25,random_state=
```

```
X_train.shape
```

```
     (4179, 77)
```

5. Add Layers

```
TOT_SIZE = len(token.word_index) + 1
model = Sequential()
#IP Layer
model.add(Embedding(TOT_SIZE,32,input_length=max_length_sequence))
model.add(LSTM(units=50, activation = 'relu',return_sequences=True))
model.add(Dropout(0.2))
#Layer2
model.add(LSTM(units=60, activation = 'relu'))
model.add(Dropout(0.3))
#output layer
model.add(Dense(units=1, activation='sigmoid'))
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 embedding (Embedding)       (None, 77, 32)            225408    
                                                                 
 lstm (LSTM)                 (None, 77, 50)            16600     
                                                                 
 dropout (Dropout)           (None, 77, 50)            0         
                                                                 
 lstm_1 (LSTM)               (None, 60)                26640     
                                                                 
 dropout_1 (Dropout)         (None, 60)                0         
                                                                 
 dense (Dense)               (None, 1)                 61        
                                                                 
=================================================================
Total params: 268,709
Trainable params: 268,709
Non-trainable params: 0
_________________________________________________________________
```

6 Compile the model

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

7 Fit the model

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

```
Epoch 1/10
131/131 [==============================] - 15s 88ms/step - loss: 1.4885 - accuracy:
Epoch 2/10
131/131 [==============================] - 11s 86ms/step - loss: 0.1367 - accuracy:
Epoch 3/10
131/131 [==============================] - 11s 86ms/step - loss: 237.5092 - accuracy
Epoch 4/10
131/131 [==============================] - 11s 86ms/step - loss: 79.0844 - accuracy:
Epoch 5/10
131/131 [==============================] - 11s 87ms/step - loss: 0.0371 - accuracy:
Epoch 6/10
131/131 [==============================] - 12s 92ms/step - loss: 0.0317 - accuracy:
Epoch 7/10
131/131 [==============================] - 13s 100ms/step - loss: 0.0305 - accuracy:
Epoch 8/10
131/131 [==============================] - 11s 86ms/step - loss: 2.3668 - accuracy:
Epoch 9/10
131/131 [==============================] - 11s 85ms/step - loss: 0.0976 - accuracy:
Epoch 10/10
131/131 [==============================] - 11s 85ms/step - loss: 0.1221 - accuracy:
<keras.callbacks.History at 0x7fe2ea7f3510>
```

```
model.evaluate(X_test,y_test)
```

```
44/44 [==============================] - 2s 39ms/step - loss: 0.0912 - accuracy: 0.9
[0.0912092924118042, 0.9870782494544983]
```

8. Save the Model

```
from pickle import dump,load
tfid = 'tfid.sav'
lstm = 'lstm.sav'
```

```
dump(token,open(tfid,'wb'))
model.save('nlp.h5')
```

9. Test the Model

```
def preprocess(raw_mess):
    review = re.sub('[^a-zA-Z]',' ',raw_mess)
    review = review.lower()
    review = review.split()
    review = [lemmatizer.lemmatize(i) for i in review if not i in set(stopwords.words('eng
    review = ' '.join(review)
    return review
```

```
def predict(mess):
    vect = load(open(tfid,'rb'))
    classifier = load_model('nlp.h5')
    clean = preprocess(mess)
    text_to_seq = token.texts_to_sequences([mess])
    padded_seq = pad_sequences(text_to_seq, maxlen=77, padding="pre")
    pred = classifier.predict(padded_seq)
    return pred
```

```
msg = input("Enter a message: ")
predi = predict(msg)
if predi >= 0.6:
    print("It is a spam")
else:
    print("Not a spam")
```

```
Enter a message: What you thinked about me. First time you saw me in class
1/1 [==============================] - 0s 335ms/step
Not a spam
```

```
msg = input("Enter a message: ")
predi = predict(msg)
if predi >= 0.6:
    print("It is a spam")
else:
    print("Not a spam")
```

```
Enter a message: Thanks for your subscription to Ringtone UK your mobile will be cha
1/1 [==============================] - 0s 293ms/step
It is a spam
```