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## ▼ 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').g
plt.figure(figsize=(20,10))
plt.imshow(wordcloud)
plt.axis('off')
```

```
(-0.5, 999.5, 399.5, -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] | /root/nltk_data...
[nltk_data] | Unzipping grammars/sample_grammars.zip.
[nltk_data] | Downloading package semcor to /root/nltk_data...
[nltk_data] | Downloading package senseval to /root/nltk_data...
[nltk_data] | Unzipping corpora/senseval.zip.
```

```

[nltk_data] | Downloading package sentence_polarity to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/sentence_polarity.zip.
[nltk_data] | Downloading package sentiwordnet to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/sentiwordnet.zip.
[nltk_data] | Downloading package shakespeare to /root/nltk_data...
[nltk_data] | Unzipping corpora/shakespeare.zip.
[nltk_data] | Downloading package sinica_treebank to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/sinica_treebank.zip.
[nltk_data] | Downloading package smultron to /root/nltk_data...
[nltk_data] | Unzipping corpora/smultron.zip.
[nltk_data] | Downloading package snowball_data to
[nltk_data] | /root/nltk_data...
[nltk_data] | Downloading package spanish_grammars to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping grammars/spanish_grammars.zip.
[nltk_data] | Downloading package state_union to /root/nltk_data...
[nltk_data] | Unzipping corpora/state_union.zip.
[nltk_data] | Downloading package stopwords to /root/nltk_data...
[nltk_data] | Unzipping corpora/stopwords.zip.
[nltk_data] | Downloading package subjectivity to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/subjectivity.zip.
[nltk_data] | Downloading package swadesh to /root/nltk_data...
[nltk_data] | Unzipping corpora/swadesh.zip.
[nltk_data] | Downloading package switchboard to /root/nltk_data...
[nltk_data] | Unzipping corpora/switchboard.zip.
[nltk_data] | Downloading package tagsets to /root/nltk_data...
[nltk_data] | Unzipping help/tagsets.zip.
[nltk_data] | Downloading package timit to /root/nltk_data...
[nltk_data] | Unzipping corpora/timit.zip.
[nltk_data] | Downloading package toolbox to /root/nltk_data...
[nltk_data] | Unzipping corpora/toolbox.zip.
[nltk_data] | Downloading package treebank to /root/nltk_data...
[nltk_data] | Unzipping corpora/treebank.zip.
[nltk_data] | Downloading package twitter_samples to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/twitter_samples.zip.
[nltk_data] | Downloading package udhr to /root/nltk_data...
[nltk_data] | Unzipping corpora/udhr.zip.
[nltk_data] | Downloading package udhr2 to /root/nltk_data...
[nltk_data] | Unzipping corpora/udhr2.zip.
[nltk_data] | Downloading package unicode_samples to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping corpora/unicode_samples.zip.
[nltk_data] | Downloading package universal_tagset to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping taggers/universal_tagset.zip.
[nltk_data] | Downloading package universal_treebanks_v20 to
[nltk_data] | /root/nltk_data...
[nltk_data] | Downloading package vader_lexicon 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
```

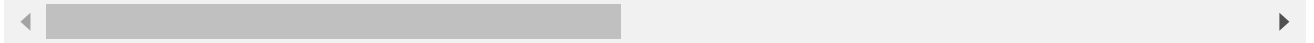
```
def predict(mess):  
    vect = load(open(tfid,'rb'))  
    classifier = load_model('nlp.h5')  
    clean = preprocess(mess)  
    text_to_seq = token.texts_to_sequences([mess])  
    padded_seq = pad_sequences(text_to_seq, maxlen=77, padding="pre")  
    pred = classifier.predict(padded_seq)  
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



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