

---

# Assignment 4

## ▼ 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 Co until i want point crazy Available only

```
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').generate_from_texts(ms1)
plt.figure(figsize=(20,10))
plt.imshow(wordcloud)
plt.axis('off')
```

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

[illegible]

```
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('english'))]
    review = ' '.join(review)
    corpus.append(review)
```

```
[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...
[nltk_data] | Downloading package verbnet to /root/nltk_data...
[nltk_data] | Unzipping corpora/verbnet.zip.
[nltk_data] | Downloading package verbnet3 to /root/nltk_data...
[nltk_data] | Unzipping corpora/verbnet3.zip.
[nltk_data] | Downloading package webtext to /root/nltk_data...
[nltk_data] | Unzipping corpora/webtext.zip.
[nltk_data] | Downloading package wmt15_eval to /root/nltk_data...
[nltk_data] | Unzipping models/wmt15_eval.zip.
[nltk_data] | Downloading package word2vec_sample to
[nltk_data] | /root/nltk_data...
[nltk_data] | Unzipping models/word2vec_sample.zip.
[nltk_data] | Downloading package wordnet to /root/nltk_data...
[nltk_data] | Downloading package wordnet2021 to /root/nltk_data...
[nltk_data] | Downloading package wordnet31 to /root/nltk_data...
[nltk_data] | Downloading package wordnet_ic to /root/nltk_data...
[nltk_data] | Unzipping corpora/wordnet_ic.zip.
[nltk_data] | Downloading package words to /root/nltk_data...
[nltk_data] | Unzipping corpora/words.zip.
[nltk_data] | Downloading package ycoe to /root/nltk_data...
[nltk_data] | Unzipping corpora/ycoe.zip.
[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=42)
```

```
X_train.shape
```

```
(4179, 77)
```

## ▼ 5. Add Layers

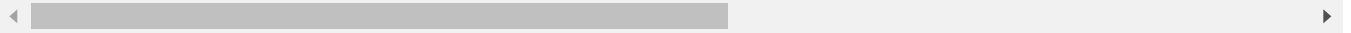
```
TOT_SIZE = len(token.word_index) + 1
model = Sequential()
#IP Layer
model.add(Embedding(TOT_SIZE,32,input_length=max_length_sequence))
model.add(LSTM(units=50, activation = 'relu',return_sequences=True))
```

```

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'))

```

WARNING:tensorflow:Layer lstm will not use cuDNN kernels since it doesn't meet the crit  
 WARNING:tensorflow:Layer lstm\_1 will not use cuDNN kernels since it doesn't meet the cr



```
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 [=====] - 41s 276ms/step - loss: 0.4606 - accuracy: 0.
Epoch 2/10
131/131 [=====] - 38s 287ms/step - loss: 85131.6016 - accuracy

```

```
Epoch 3/10
131/131 [=====] - 34s 262ms/step - loss: 0.2903 - accuracy: 0.
Epoch 4/10
131/131 [=====] - 34s 259ms/step - loss: 0.0757 - accuracy: 0.
Epoch 5/10
131/131 [=====] - 36s 271ms/step - loss: 0.0568 - accuracy: 0.
Epoch 6/10
131/131 [=====] - 34s 263ms/step - loss: 0.0383 - accuracy: 0.
Epoch 7/10
131/131 [=====] - 35s 264ms/step - loss: 0.0261 - accuracy: 0.
Epoch 8/10
131/131 [=====] - 34s 261ms/step - loss: 0.0422 - accuracy: 0.
Epoch 9/10
131/131 [=====] - 36s 278ms/step - loss: 0.3311 - accuracy: 0.
Epoch 10/10
131/131 [=====] - 34s 260ms/step - loss: 0.1278 - accuracy: 0.
<keras.callbacks.History at 0x7f8c1030a110>
```

◀  ▶

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

```
44/44 [=====] - 1s 22ms/step - loss: 0.6924 - accuracy: 0.7574
[0.6923743486404419, 0.757358193397522]
```

◀  ▶

## ▼ 8. Save the Model

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

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

```
WARNING:tensorflow:Compiled the loaded model, but the compiled metrics have yet to be b
```

◀  ▶

## ▼ 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('english'))]
    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: Hi How are you?

WARNING:tensorflow:Layer lstm\_2 will not use cuDNN kernels since it doesn't meet the criteria. It will use the slower tf.nn.nn\_rnn\_cell\_wrapper instead.

WARNING:tensorflow:Layer lstm\_3 will not use cuDNN kernels since it doesn't meet the criteria. It will use the slower tf.nn.nn\_rnn\_cell\_wrapper instead.

1/1 [=====] - 0s 258ms/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: spam

WARNING:tensorflow:Layer lstm\_2 will not use cuDNN kernels since it doesn't meet the criteria. It will use the slower tf.nn.nn\_rnn\_cell\_wrapper instead.

WARNING:tensorflow:Layer lstm\_3 will not use cuDNN kernels since it doesn't meet the criteria. It will use the slower tf.nn.nn\_rnn\_cell\_wrapper instead.

1/1 [=====] - 0s 271ms/step

Not a spam





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✓ 28s completed at 10:48 PM

