

## Assignment -4

### SMS SPAM Classification

Assignment Date	29 October 2022
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Maximum Marks	2 Marks

### 1.Download the data set

### 2.Import library

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from keras.models import Model
from keras.layers import LSTM, Activation, Dense, Dropout, Input, Embedding
from keras.optimizers import RMSprop
from keras.preprocessing.text import Tokenizer
from keras_preprocessing import sequence
from keras.utils import to_categorical
from keras.callbacks import EarlyStopping
from keras.models import load_model
```

### 3.Read dataset and preprocessing

```
df = pd.read_csv('spam.csv',delimiter=',',encoding='latin-1')
df.head()
```

```
      v1                                     v2 Unnamed: 2  \
0  ham  Go until jurong point, crazy.. Available only ...   NaN
1  ham                                     Ok lar... Joking wif u oni...   NaN
2  spam  Free entry in 2 a wkly comp to win FA Cup fina...   NaN
3  ham  U dun say so early hor... U c already then say...   NaN
4  ham  Nah I don't think he goes to usf, he lives aro...   NaN

      Unnamed: 3  Unnamed: 4
0           NaN           NaN
1           NaN           NaN
```

```
2      NaN      NaN
3      NaN      NaN
4      NaN      NaN
```

*#dropping unwanted columns*

```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 5572 entries, 0 to 5571
```

```
Data columns (total 2 columns):
```

#	Column	Non-Null Count	Dtype
0	v1	5572 non-null	object
1	v2	5572 non-null	object

```
dtypes: object(2)
```

```
memory usage: 87.2+ KB
```

```
sns.countplot(df.v1)
```

```
plt.xlabel('Label')
```

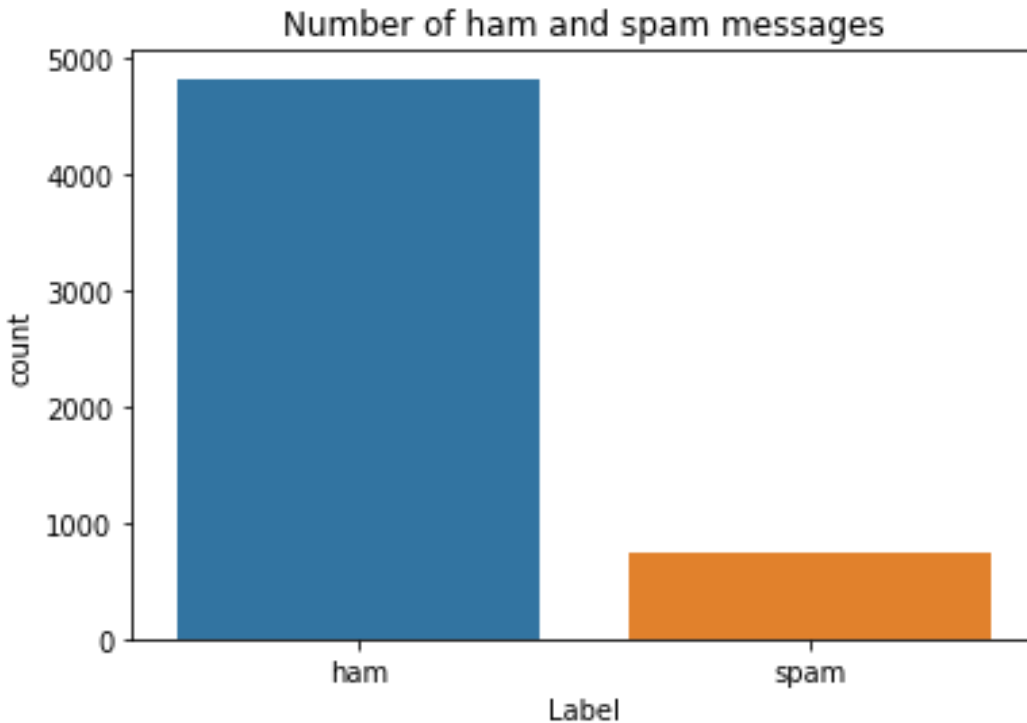
```
plt.title('Number of ham and spam messages')
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:
```

```
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
```

```
FutureWarning
```

```
Text(0.5, 1.0, 'Number of ham and spam messages')
```



```
X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)

X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)

max_words = 1000
max_len = 150
tok = Tokenizer(num_words=max_words)
tok.fit_on_texts(X_train)
sequences = tok.texts_to_sequences(X_train)
sequences_matrix = sequence.pad_sequences(sequences,maxlen=max_len)
```

#### 4.Create Model & 5.Add Layers (LSTM, Dense-(Hidden Layers), Output)

```
inputs = Input(name='inputs',shape=[max_len])
layer = Embedding(max_words,50,input_length=max_len)(inputs)
layer = LSTM(64)(layer)
layer = Dense(256,name='FC1')(layer)
layer = Activation('relu')(layer)
layer = Dropout(0.5)(layer)
layer = Dense(1,name='out_layer')(layer)
layer = Activation('sigmoid')(layer)
model = Model(inputs=inputs,outputs=layer)
```

## 6.Compile the model

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

Model: "model"

Layer (type)	Output Shape	Param #
inputs (InputLayer)	[(None, 150)]	0
embedding (Embedding)	(None, 150, 50)	50000
lstm (LSTM)	(None, 64)	29440
FC1 (Dense)	(None, 256)	16640
activation (Activation)	(None, 256)	0
dropout (Dropout)	(None, 256)	0
out_layer (Dense)	(None, 1)	257
activation_1 (Activation)	(None, 1)	0

=====  
Total params: 96,337  
Trainable params: 96,337  
Non-trainable params: 0  
=====

## 7.Fit the model

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,validation_split=0.2,callbacks=[EarlyStopping(monitor='val_loss',min_delta=0.0001)])
```

Epoch 1/10

30/30 [=====] - 14s 301ms/step - loss: 0.3161 - accuracy: 0.8788 - val\_loss: 0.1419 - val\_accuracy: 0.9641

Epoch 2/10

30/30 [=====] - 11s 385ms/step - loss: 0.0887 - accuracy: 0.9789 - val\_loss: 0.0677 - val\_accuracy: 0.9810

<keras.callbacks.History at 0x7f98f21de750>

## 8.Save the model

```
model.save('model.h5')
```

## 9. Test the model

```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = sequence.pad_sequences(test_sequences, maxlen=max_len)
```

```
accr = model.evaluate(test_sequences_matrix, Y_test)
```

```
27/27 [=====] - 1s 23ms/step - loss: 0.0870 -
accuracy: 0.9749
```

```
print('Test set\n Loss: {:.3f}\n Accuracy:
{:.3f}'.format(accr[0], accr[1]))
```

```
Test set
Loss: 0.087
Accuracy: 0.975
```

```
print("Loss: ", accr[0])
print("Accuracy:", accr[1]*100, "%")
```

```
Loss: 0.08696156740188599
Accuracy: 97.48803973197937 %
```