

## ASSIGNMENT-4

|                 |              |
|-----------------|--------------|
| Date            | 29 Oct 2022  |
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| Maximum mark    | 2 mark       |

1. Download the dataset: [https://www.kaggle.com/code/kredy10/simple-lstm-for-text-classification/\\*\\*data\\*\\*](https://www.kaggle.com/code/kredy10/simple-lstm-for-text-classification/**data**)

```
[ ] import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import keras
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, pad_sequences
from keras.callbacks import EarlyStopping
%matplotlib inline
```

## 2. Import Required libararies

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

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

### 3. Read dataset and pre-processing

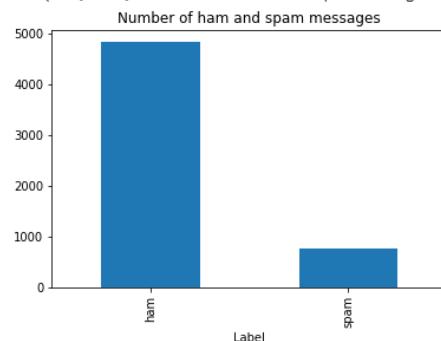
```
[ ] df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
```

```
[ ] df.shape
```

```
(5572, 2)
```

```
[ ] #plot the ham and spam messages to understand the distribution
df['v1'].value_counts().plot(kind='bar')
plt.xlabel('Label')
plt.title('Number of ham and spam messages')
```

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



```
[ ] X = dt.v2
```

```
Y = df.v1
```

```
#label encoding for Y
```

```
le = LabelEncoder()
```

```
Y = le.fit_transform(Y)
```

```
Y = Y.reshape(-1,1)
```

```
[ ] #split into train and test sets
```

```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.20)
```

```
[ ] 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 = keras.utils.pad_sequences(sequences,maxlen=max_len)
```

### 4. 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)
```

## 5. Create Model

```
[ ] 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  
28/28 [=====] - 13s 329ms/step - loss: 0.3288 - accuracy: 0.8704 - val_loss: 0.1901 - val_accuracy: 0.9283  
Epoch 2/10  
28/28 [=====] - 8s 303ms/step - loss: 0.0892 - accuracy: 0.9773 - val_loss: 0.0617 - val_accuracy: 0.9765  
<keras.callbacks.History at 0x7f2455581490>
```

## 8. Save the Model

```
[ ] model.save('spam_lstm_model.h5')
```

## 9. Test the Model

```
[ ] #processing test data
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = keras.utils.pad_sequences(test_sequences,maxlen=max_len)
```

```
[ ] #evaluation of our model
accr = model.evaluate(test_sequences_matrix,Y_test)
print('Test set\n Loss: {:.3f}\n Accuracy: {:.3f}'.format(accr[0],accr[1]))
```

```
35/35 [=====] - 1s 25ms/step - loss: 0.0627 - accuracy: 0.9839
Test set
Loss: 0.063
Accuracy: 0.984
```