Assignment -4

1. Import the necessary libraries

```
import pandas as pdimport
numpy as np
import matplotlib.pyplot as pltimport
seaborn as sns
from sklearn.model_selection import train_test_splitfrom
sklearn.preprocessing import LabelEncoder
from keras.models import Model
from keras.layers import LSTM, Activation, Dense, Dropout, Input, Embeddingfrom
keras.optimizers import RMSprop
from keras.preprocessing.text import Tokenizerfrom
keras.preprocessing import sequence
from keras.utils import pad_sequences from
keras.utils import to_categorical
from keras.callbacks import EarlyStopping
```

2. Read dataset and do pre-processing

(i) Read dataset

```
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

(ii) Preprocessing the dataset

```
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
```

```
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 = pad_sequences(sequences,maxlen=max_len)
```

3,4. Create model and 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)model.summary()
```

```
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

5. Compile the model

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

7. Train and Fit the model

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,
          validation_split=0.2)
```

```
Epoch 1/10
30/30 [==============================] - 8s 263ms/step - loss: 0.0060 - accurac
Epoch 30/30 Epoch 30/30                                  Epoch 4/10
2/10                                                         [==============================] - 8s
[==============================] - 8s                     263ms/step - loss: 0.0572 - accurac
263ms/step - loss: 0.0036 - accurac 3/10
                                [====================0.0038 -
                                ======                accurac
                                ====] 5/10
30/30 Epoch                     - 8s 262ms/step - loss:
                  ====================]                    loss: - loss:   0.0018 0.0022 - accurac -
                  ========]    7/10              261ms/step
30/30 Epoch       6/10         - 8s - 8s         263ms/step -                              accurac
30/30 Epoch       ===========
                                  [==========              accurac

[========== 30/30             310ms/step - loss: 0.0020 -

[==============================] - 9s
 Epoch 8/10
                          30/30 Epoch 30/30 Epoch [========== ========== ========] 9/10 [==========
```

========== ========] - 8s - 8s 261ms/step 0.0015 0.0015 - accurac -
10/10 accurac
264ms/step - loss: - loss:

30/30
[==============================] - 8s Preprocessing the Test Dataset
<keras.callbacks.History at 0x7f2b60b5f110>

6. Save the model

test_sequences = tok.texts_to_sequences(X_test)
263ms/step - loss: 0.0021 - accurac

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

```
test_sequences_matrix = pad_sequences(test_sequences, maxlen=max_len)
```

7. Testing the model

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

27/27 [==============================] - 1s 21ms/step - loss: 0.2618 - accuracy

```
print('Test set\n Loss: {:0.3f}\n Accuracy: {:0.3f}'.format(accr[0],accr[1]))
```

Test set
Loss: 0.262
Accuracy: 0.977