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Assignment-4

Required Libraries

```
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
```

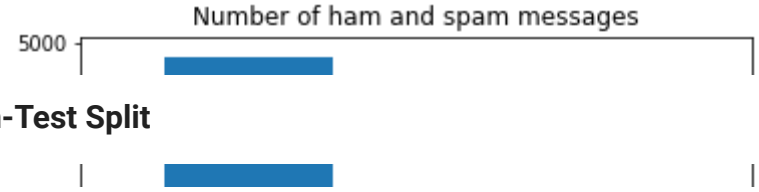
Unzip, read the dataset and preprocess

```
df = pd.read_csv('spam.csv',delimiter=',',encoding='latin-1')
df.head()
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
df.shape
```

```
(5572, 2)
```

```
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')
```



Train-Test Split

```
X = df.v2
Y = df.v1
#label encoding for Y
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=0.20)
```

Tokenizer

```
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)
```

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)
```

Create and Compile the Model

```
model = Model(inputs=inputs,outputs=layer)
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
_________________________________________________________________
```

Fit and save the Model

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

```
Epoch 1/10
28/28 [==============================] - 11s 282ms/step - loss: 0.3189 - accuracy: 0
Epoch 2/10
28/28 [==============================] - 8s 301ms/step - loss: 0.0926 - accuracy: 0.9
<keras.callbacks.History at 0x7f38ed729a10>
```

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

Test the Mode

```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = keras.utils.pad_sequences(test_sequences,maxlen=max_len)
accr = model.evaluate(test_sequences_matrix,Y_test)
print('Test set\n Loss: {:0.3f}\n Accuracy: {:0.3f}'.format(accr[0],accr[1]))
```

```
35/35 [==============================] - 1s 23ms/step - loss: 0.0439 - accuracy: 0.99
Test set
 Loss: 0.044
 Accuracy: 0.990
```

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