Importing Required Libraries

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import keras
import keras.utils
from keras import utils as np_utils
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_preprocessing.sequence import pad_sequences
%matplotlib inline
```

Reading Data and Preprocessing

```
data = pd.read_csv(r'/content/drive/MyDrive/Dataset/spam.csv', delimiter = ',', encoding =
data.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

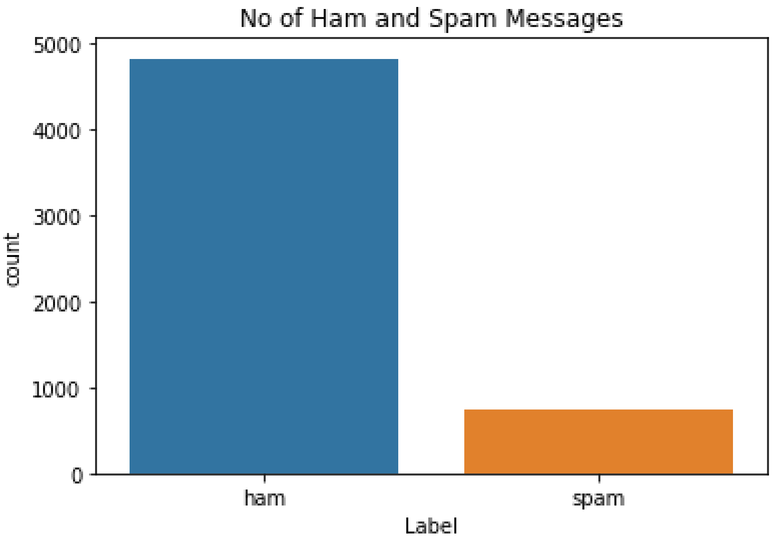
```
data.drop(['Unnamed: 2','Unnamed: 3','Unnamed: 4'],axis = 1, inplace = True)
```

```
data.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(data['v1'])
plt.title("No of Ham and Spam Messages")
plt.xlabel('Label')
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pas
  FutureWarning
Text(0.5, 0, 'Label')
```



Input and Output Vectors

```
X = data['v2']
Y = data['v1']
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

Splitting into Training and Testing Data

```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,random_state = 0,test_size = 0.25)
```

Processing the Data

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

Creating Model and Adding Layers

```
def RNN():
  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,layer)
  return model
```

Compiling the Model

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

```
Model: "model_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 inputs (InputLayer)         [(None, 150)]             0

 embedding_3 (Embedding)     (None, 150, 50)           50000

 lstm_3 (LSTM)               (None, 64)                29440

 FC1 (Dense)                 (None, 256)               16640

 activation_6 (Activation)   (None, 256)               0

 dropout_3 (Dropout)         (None, 256)               0

 out_layer (Dense)           (None, 1)                 257

 activation_7 (Activation)   (None, 1)                 0

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

Fitting the Model

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

```
1/10
[==============================] - 3s 31ms/step - loss: 0.3111 - accuracy: 0.8869 -
2/10
[==============================] - 0s 15ms/step - loss: 0.0972 - accuracy: 0.9785 -
.callbacks.History at 0x7fd1f53db150>
```

```
test_sequence = tok.texts_to_sequences(X_test)
test_sequence_matrix = keras.utils.data_utils.pad_sequences(test_sequence, maxlen = max_le
```

Saving the Model

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

Testing the Model

```
accur = model.evaluate(test_sequence_matrix, Y_test)
```

```
44/44 [==============================] - 0s 7ms/step - loss: 0.0657 - accuracy: 0.97
```

```
print('The Accuracy of the model \n Loss:{:0.3f}\n  Accuracy:{:0.3f}, '.format(accur[0],ac
```

```
The Accuracy of the model 
 Loss:0.066
  Accuracy:0.978,
```

✓ 0s completed at 11:43 AM