Download Dataset

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

Import required library

```
import numpy as np
import pandas as pd
import keras
```

```
import matplotlib.pyplot as plt
import seaborn as sns
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
%matplotlib inline
```

Read Dataset and do pre-processing

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

drop the unnamed values NaN

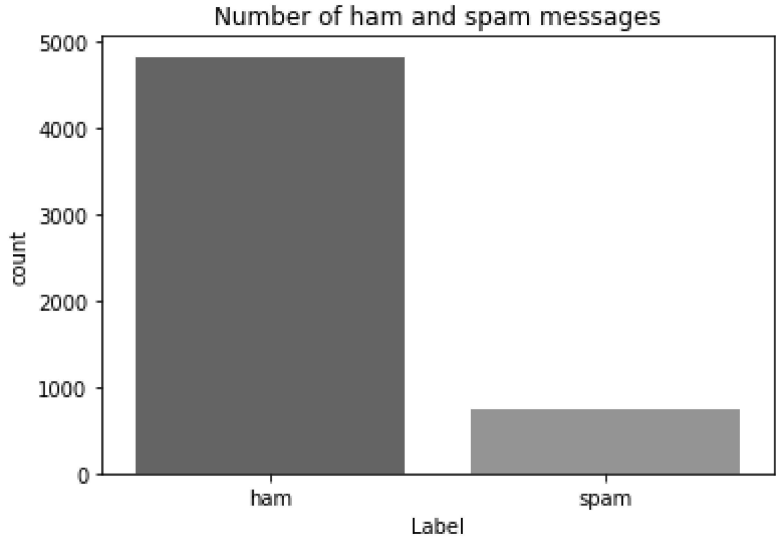
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
```

```
df.shape
```

```
(5572, 2)
```

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




```
X = df.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)
```

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)
```

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
_________________________________________________________________
```

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 [==============================] - 10s 256ms/step - loss: 0.3376 - accuracy: 0.877
Epoch 2/10
28/28 [==============================] - 7s 238ms/step - loss: 0.0930 - accuracy: 0.9778
<keras.callbacks.History at 0x7fc5ff20dcd0>
```

Save the Model

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

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

```
35/35 [==============================] - 1s 21ms/step - loss: 0.0492 - accuracy: 0.9839
Test set
 Loss: 0.049
 Accuracy: 0.984
```

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