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

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

Dataset downloaded

Import required library

```
import pandas as pd
import numpy as np
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/units/spam.csv',delimiter=',',enco
ding='latin-1')
```

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

```
df.head()
```

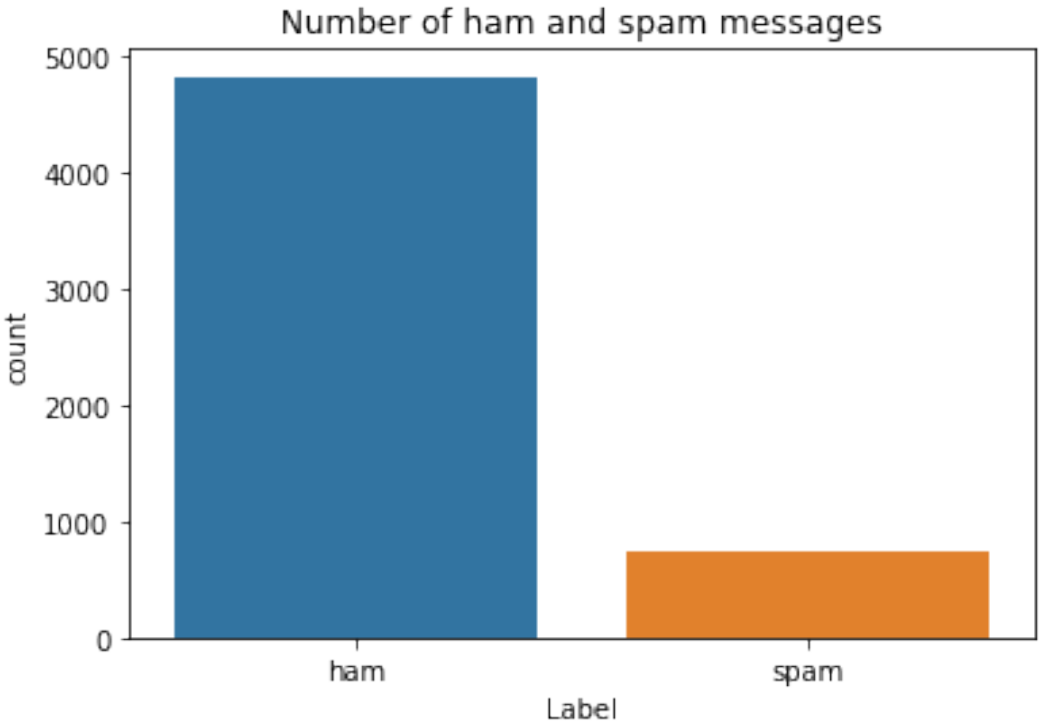
```
     v1                                                  v2
0   ham  Go until jurong point, crazy.. Available only ...
1   ham                      Ok lar... Joking wif u oni...
2  spam  Free entry in 2 a wkly comp to win FA Cup fina...
3   ham  U dun say so early hor... U c already then say...
4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

```
#Understanding distribution
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: Pass the following variable as a keyword arg: x. From
version 0.12, the only valid positional argument will be `data`, and
passing other arguments without an explicit keyword will result in an
```

```
error or misinterpretation.
  FutureWarning
```

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




```
#training and test data
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)

#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)
sequences_matrix = sequence.pad_sequences(sequences,maxlen=max_len)
```

Create Model and Add Layers (LSTM, Dense-(Hidden Layers), Output)

```
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=inputs,outputs=layer)
    return model
```

Compile the Model

```
model = RNN()
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_d
elta=0.0001)])
```

```
Epoch 1/10
30/30 [==============================] - 12s 292ms/step - loss: 0.3222
- accuracy: 0.8812 - val_loss: 0.1987 - val_accuracy: 0.9198
Epoch 2/10
```

```
30/30 [==============================] - 8s 270ms/step - loss: 0.0818
- accuracy: 0.9789 - val_loss: 0.0778 - val_accuracy: 0.9747

<keras.callbacks.History at 0x7fb9f8048f50>
```

Save The Model

```
model.save('my_model')
```

```
WARNING:absl:Found untraced functions such as lstm_cell_layer_call_fn,
lstm_cell_layer_call_and_return_conditional_losses while saving
(showing 2 of 2). These functions will not be directly callable after
loading.
```

Test The Model

```
def test():
  test_sequences = tok.texts_to_sequences(X_test)
  test_sequences_matrix =
sequence.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]))

test()
```

```
27/27 [==============================] - 1s 43ms/step - loss: 0.0693 -
accuracy: 0.9833
Test set
  Loss: 0.069
  Accuracy: 0.983
```