1.Download The Dataset link using https://www.kaggle.com/code/kredy10/simple-lstm-for-text-classification/data

2. 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
from keras.models import load_model
%matplotlib inline
```

3.Read the Dataset and do pre-processing

Read the dataset

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

```
     v1                                                  v2 Unnamed: 2
\
0   ham  Go until jurong point, crazy.. Available only ...         NaN

1   ham                      Ok lar... Joking wif u oni...         NaN

2  spam  Free entry in 2 a wkly comp to win FA Cup fina...         NaN

3   ham  U dun say so early hor... U c already then say...         NaN

4   ham  Nah I don't think he goes to usf, he lives aro...         NaN


  Unnamed: 3 Unnamed: 4
0        NaN        NaN
1        NaN        NaN
2        NaN        NaN
3        NaN        NaN
4        NaN        NaN
```

pre-porocessing

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

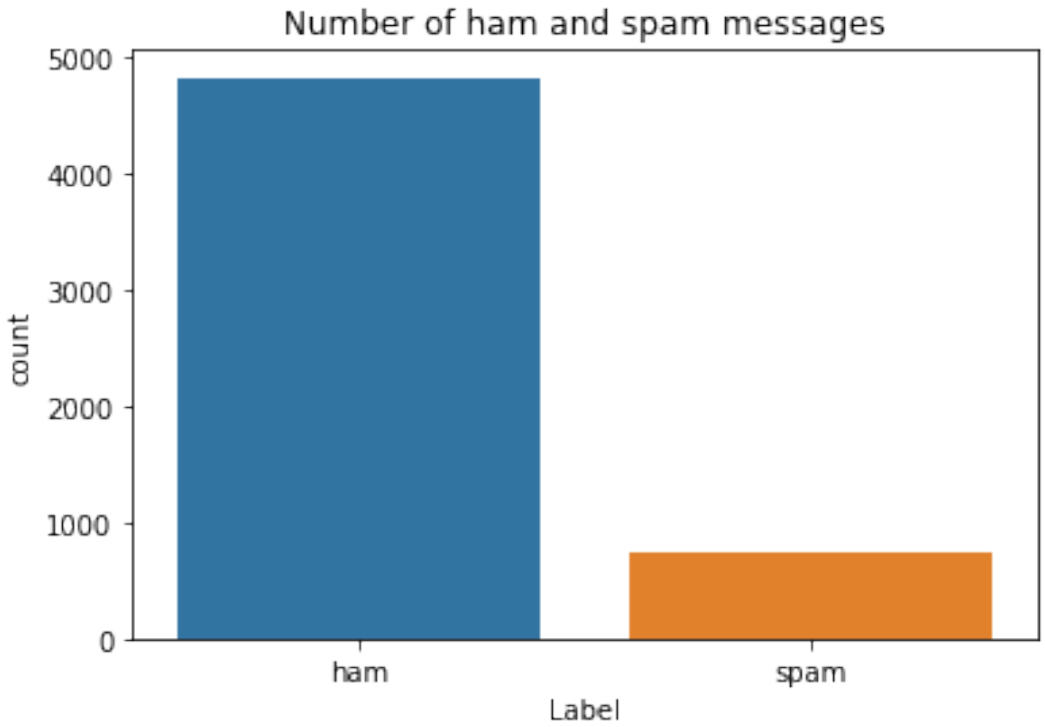
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   v1      5572 non-null   object
 1   v2      5572 non-null   object
dtypes: object(2)
memory usage: 87.2+ KB
```

4.Create Model

```
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')
```



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

5.Add Layer(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)
```

6.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
_________________________________________________________________
```

7.Fit the Model

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

```
Epoch 1/10
30/30 [==============================] - 8s 269ms/step - loss: 0.0476
- accuracy: 0.9852 - val_loss: 0.0552 - val_accuracy: 0.9863
Epoch 2/10
30/30 [==============================] - 8s 266ms/step - loss: 0.0352
- accuracy: 0.9905 - val_loss: 0.0472 - val_accuracy: 0.9873
Epoch 3/10
30/30 [==============================] - 8s 265ms/step - loss: 0.0288
- accuracy: 0.9910 - val_loss: 0.0525 - val_accuracy: 0.9852
Epoch 4/10
30/30 [==============================] - 8s 266ms/step - loss: 0.0171
- accuracy: 0.9950 - val_loss: 0.0614 - val_accuracy: 0.9842
Epoch 5/10
30/30 [==============================] - 11s 362ms/step - loss: 0.0132
- accuracy: 0.9958 - val_loss: 0.0714 - val_accuracy: 0.9831
Epoch 6/10
30/30 [==============================] - 11s 378ms/step - loss: 0.0085
- accuracy: 0.9974 - val_loss: 0.0846 - val_accuracy: 0.9831
Epoch 7/10
30/30 [==============================] - 9s 308ms/step - loss: 0.0072
- accuracy: 0.9984 - val_loss: 0.0928 - val_accuracy: 0.9800
Epoch 8/10
30/30 [==============================] - 13s 430ms/step - loss: 0.0058
- accuracy: 0.9989 - val_loss: 0.0940 - val_accuracy: 0.9852
Epoch 9/10
30/30 [==============================] - 14s 465ms/step - loss: 0.0050
- accuracy: 0.9984 - val_loss: 0.0996 - val_accuracy: 0.9852
Epoch 10/10
30/30 [==============================] - 17s 556ms/step - loss: 0.0057
- accuracy: 0.9989 - val_loss: 0.1146 - val_accuracy: 0.9789

<keras.callbacks.History at 0x7f281c6e5d10>
```

8.Save the Model

```
model.save("model.h5")
```

9.Test the Model

```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix=pad_sequences(test_sequences,maxlen=max_len)

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

```
27/27 [==============================] - 1s 45ms/step - loss: 0.0812 -
accuracy: 0.9833
```

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

```
Test set
  Loss: 0.081
  Accuracy: 0.983
```