download dataset

import libraries

```
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
```

read dataset and preprocessing

```
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
```

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

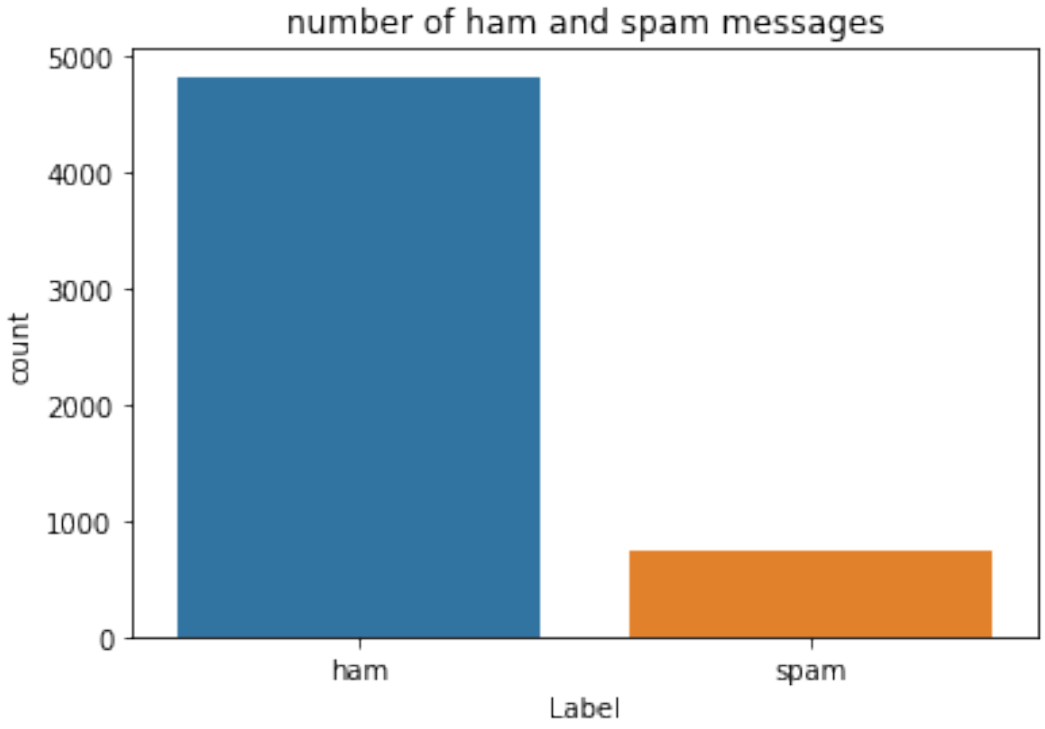
```
df.shape
```

```
(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: 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)
```

train test split

```
X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.20)
```

```
from os import XATTR_CREATE
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)
```

create lstm model

add layers

```
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='FC')(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_6 (Embedding)     (None, 150, 50)           50000

 lstm_6 (LSTM)               (None, 64)                29440

 FC (Dense)                  (None, 256)               16640

 activation_1 (Activation)   (None, 256)               0

 dropout_1 (Dropout)         (None, 256)               0

 out_layer (Dense)           (None, 1)                 257

 activation_2 (Activation)   (None, 1)                 0

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

save the model

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

test the model

```
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 [==============================] - 2s 23ms/step - loss: 0.6918 -
accuracy: 0.7327
Test set
 Loss: 0.692
 Accuracy: 0.733
```