Required libraries are imported

In [ ]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import keras
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, pad_sequences
from keras.callbacks import EarlyStopping
%matplotlib inline
```

unzip

In [ ]:

```
!unzip '/content/spam.csv'
```

```
Archive:  /content/spam.csv
  End-of-central-directory signature not found.  Either this file is not
  a zipfile, or it constitutes one disk of a multi-part archive.  In the
  latter case the central directory and zipfile comment will be found on
  the last disk(s) of this archive.
unzip:  cannot find zipfile directory in one of /content/spam.csv or
        /content/spam.csv.zip, and cannot find /content/spam.csv.ZIP, period.
```

Read the dataset and preprocessing

In [ ]:

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

Out[ ]:

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

In [ ]:

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

In [ ]:

```
df.shape
```

Out[ ]:

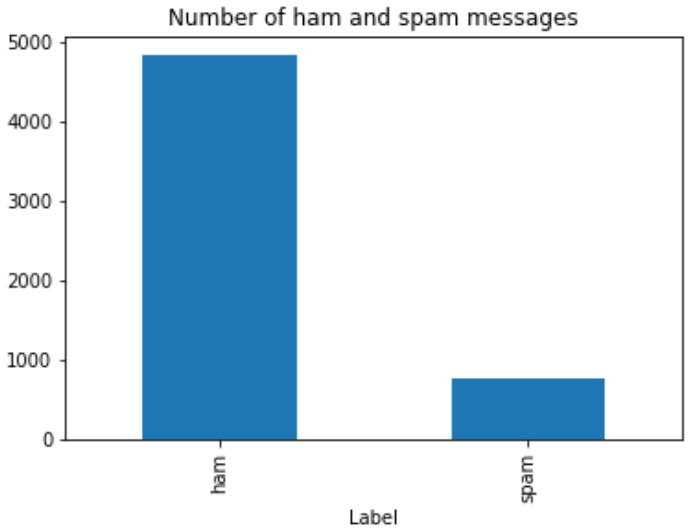
```
(5572, 2)
```

In [ ]:

```
df['v1'].value_counts().plot(kind='bar')
plt.xlabel('Label')
plt.title('Number of ham and spam messages')
```

Out[ ]:

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



In [ ]:

```
X = df.v2
Y = df.v1
#label encoding for Y
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

Train-Test Split

In [ ]:

```
#split into train and test

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

Tokenizer

In [ ]:

```
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)

In [ ]:

```
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)
```

Create Model

In [ ]:

```
model = Model(inputs=inputs,outputs=layer)
```

Compile the Model

In [ ]:

```
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

In [ ]:

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,validation_split=0.2,callback
s=[EarlyStopping(monitor='val_loss',min_delta=0.0001)])
```

```
Epoch 1/10
28/28 [==============================] - 11s 297ms/step - loss: 0.3182 - accuracy: 0.8850
- val_loss: 0.1459 - val_accuracy: 0.9507
Epoch 2/10
28/28 [==============================] - 8s 269ms/step - loss: 0.0879 - accuracy: 0.9778
- val_loss: 0.0733 - val_accuracy: 0.9798
```

Out[ ]:

```
<keras.callbacks.History at 0x7f868cfcfa50>
```

Save the Model

In [ ]:

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

Test the Mode

In [ ]:

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

In [ ]:

```
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 23ms/step - loss: 0.0733 - accuracy: 0.9803
Test set
  Loss: 0.073
  Accuracy: 0.980
```