Import required library

In [41]:
```
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
import tensorflow
from tensorflow.keras.preprocessing.sequence import pad_sequences
```

Read dataset and do pre-processing

In [31]:
```
df = pd.read_csv('/content/drive/MyDrive/spam.csv',delimiter=',',encoding='latin-1')
df.head()
```

Out[31]:

	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 [32]:
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
df
```

Out[32]:

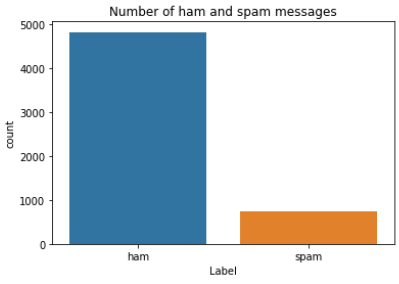
	v1	v2
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...
...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...
5568	ham	Will ì_ b going to esplanade fr home?
5569	ham	Pity, * was in mood for that. So...any other s...
5570	ham	The guy did some bitching but I acted like i'd...
5571	ham	Rofl. Its true to its name

5572 rows × 2 columns

In [33]:
```
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, t
he only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretatio
n.
  FutureWarning
```

Out[33]: `Text(0.5, 1.0, 'Number of ham and spam messages')`



Create Model

In [5]:
```
X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

In [42]:
```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.30,
random_state=7)
```

In [43]:
```
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 = pad_sequences(sequences,maxlen=max_len)
```

Add Layers (LSTM, Dense-(Hidden Layers), Output)

In [8]:
```
model=Sequential()
model.add(Embedding(max_words,50,input_length=max_len))
model.add(LSTM(64))
model.add(Dense(256,name='FC1'))
model.add(Activation('relu'))
model.add(Dropout(0.5))
model.add(Dense(1,name='out_layer'))
model.add(Activation('sigmoid'))
```

Compile the Model

In [36]:
```
model.compile(loss = 'binary_crossentropy', optimizer = RMSprop(), metrics = ['accuracy'])
```

Fit the Model

In [ ]:
```
data = model.fit(sequences_matrix,Y_train,batch_size=16,epochs=10,validation_split=0.25)
```

```
Epoch 1/10
183/183 [==============================] - 30s 124ms/step - loss: 0.1500 - accuracy: 0.9480 - val_loss: 0.0704 - val_accuracy: 0.9805
Epoch 2/10
183/183 [==============================] - 17s 91ms/step - loss: 0.0417 - accuracy: 0.9877 - val_loss: 0.0726 - val_accuracy: 0.9836
Epoch 3/10
183/183 [==============================] - 21s 112ms/step - loss: 0.0321 - accuracy: 0.9925 - val_loss: 0.0749 - val_accuracy: 0.9856
Epoch 4/10
183/183 [==============================] - 16s 85ms/step - loss: 0.0296 - accuracy: 0.9915 - val_loss: 0.0630 - val_accuracy: 0.9856
Epoch 5/10
183/183 [==============================] - 17s 92ms/step - loss: 0.0185 - accuracy: 0.9942 - val_loss: 0.0745 - val_accuracy: 0.9846
Epoch 6/10
183/183 [==============================] - 16s 88ms/step - loss: 0.0135 - accuracy: 0.9956 - val_loss: 0.0863 - val_accuracy: 0.9867
Epoch 7/10
183/183 [==============================] - 17s 90ms/step - loss: 0.0105 - accuracy: 0.9973 - val_loss: 0.0969 - val_accuracy: 0.9867
Epoch 8/10
 34/183 [====>.........................] - ETA: 12s - loss: 0.0027 - accuracy: 0.9982
```

Save The Model

In [47]:
```
model.save('Spam_Detector_model.h5')
```

Test The Model

In [48]:
```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = pad_sequences(test_sequences,maxlen=max_len)
test_accuracy = model.evaluate(test_sequences_matrix,Y_test)
```

```
53/53 [==============================] - 1s 24ms/step - loss: 0.2087 - accuracy: 0.9779
```

In [53]:
```
model.metrics_names
['loss', 'accuracy']
print('Test Loss: {:0.4f} and Test Accuracy: {:0.2f}%'.format(test_accuracy[0],test_accuracy[1]*100))
```

```
Test Loss: 0.2087 and Test Accuracy: 97.79%
```