Importing Required Modules

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
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.models import load_model
```

Read Data and Pre Processing

In [4]:
```
#Reading the dataset
df = pd.read_csv(r'spam.csv',delimiter=',',encoding = 'latin-1')
```

In [5]:
```
df.head()
```

Out[5]:

	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 [6]:
```
#Dropping Unnecessary Columns
df.drop(['Unnamed: 2','Unnamed: 3','Unnamed: 4'],axis = 1,inplace = True)
df
```

Out[6]:

	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 ü 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 [7]:
```
df.groupby(['v1']).size()
```

Out[7]:
```
v1
ham     4825
spam     747
dtype: int64
```

In [8]:
```
X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

In [9]:
```
Y
```

Out[9]:
```
array([[0],
       [0],
       [1],
       ...,
       [0],
       [0],
       [0]])
```

Training and Testing Data Split

```
In [10]: X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)
```

```
In [11]: 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)
```

```
In [12]: sequences_matrix
```

```
Out[12]: array([[  0,   0,   0, ..., 555, 237, 221],
                [  0,   0,   0, ...,  78, 107, 504],
                [  0,   0,   0, ...,  33,   3, 413],
                ...,
                [  0,   0,   0, ...,   3,  40, 121],
                [  0,   0,   0, ...,  13,  59,  14],
                [  0,   0,   0, ..., 107,   8, 400]], dtype=int32)
```

Creating LSTM model

```
In [13]: inputs = Input(name='InputLayer',shape=[max_len])
         layer = Embedding(max_words,50,input_length=max_len)(inputs)
         layer = LSTM(64)(layer)
         layer = Dense(256,name='FullyConnectedLayer1')(layer)
         layer = Activation('relu')(layer)
         layer = Dropout(0.5)(layer)
         layer = Dense(1,name='OutputLayer')(layer)
         layer = Activation('sigmoid')(layer)
```

Compile The Model

```
In [14]: model = Model(inputs=inputs,outputs=layer)
         model.summary()
         model.compile(loss='binary_crossentropy',optimizer=RMSprop(),metrics=['accuracy'])
```

```
Model: "model"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 InputLayer (InputLayer)     [(None, 150)]             0

 embedding (Embedding)       (None, 150, 50)           50000

 lstm (LSTM)                 (None, 64)                29440

 FullyConnectedLayer1 (Dense  (None, 256)              16640
 )

activation (Activation)     (None, 256)               0

dropout (Dropout)           (None, 256)               0

OutputLayer (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 [15]: model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,validation_split=0.2)
```

```
Epoch 1/10
30/30 [==============================] - 12s 306ms/step - loss: 0.3443 - accuracy: 0.8699 - val_loss: 0.1640 - val_accuracy: 0.9378
Epoch 2/10
30/30 [==============================] - 8s 283ms/step - loss: 0.0956 - accuracy: 0.9760 - val_loss: 0.0636 - val_accuracy: 0.9831
Epoch 3/10
30/30 [==============================] - 8s 255ms/step - loss: 0.0475 - accuracy: 0.9863 - val_loss: 0.0612 - val_accuracy: 0.9831
Epoch 4/10
30/30 [==============================] - 9s 289ms/step - loss: 0.0341 - accuracy: 0.9897 - val_loss: 0.0626 - val_accuracy: 0.9842
Epoch 5/10
30/30 [==============================] - 8s 268ms/step - loss: 0.0251 - accuracy: 0.9923 - val_loss: 0.0633 - val_accuracy: 0.9810
Epoch 6/10
30/30 [==============================] - 7s 245ms/step - loss: 0.0189 - accuracy: 0.9945 - val_loss: 0.0675 - val_accuracy: 0.9810
Epoch 7/10
```

Test The Model

```
In [17]:

test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix  = sequence.pad_sequences(test_sequences,maxlen=max_len)
accuracy = model.evaluate(test_sequences_matrix,Y_test)
print('Accuracy: {:0.3f}'.format(accuracy[1]))
```

```
27/27 [==============================] - 1s 21ms/step - loss: 0.0476 - accuracy: 0.9904
Accuracy: 0.990
```

```
In [18]:

y_pred = model.predict(test_sequences_matrix)
pred = y_pred[25:40].round(3)
test =Y_test[25:40]
```

```
27/27 [==============================] - 1s 20ms/step
```

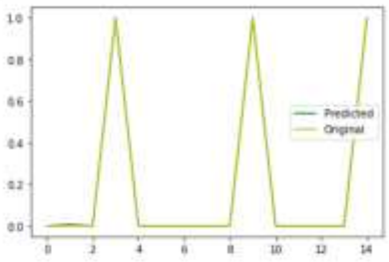
```
In [19]:

print(pred)
print(test)
```

```
[[0.   ]
 [0.007]
 [0.   ]
 [1.   ]
 [0.   ]
 [0.   ]
 [0.   ]
 [0.   ]
 [0.   ]
 [1.   ]
 [0.   ]
```

```
In [20]:

plt.plot(pred[:],color='g', label='Predicted')
plt.plot(test[:],color='y', label='Original')
plt.legend()
plt.show()
```


Predicted
Original