

Import the necessary libraries

```
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
%matplotlib inline
```

Load the data into Pandas dataframe

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

| | 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 |

```
df.tail()
```

| | v1 | v2 | Unnamed: 2 | Unnamed: 3 | Unnamed: 4 |
|------|------|---|------------|------------|------------|
| 5567 | spam | This is the 2nd time we have tried 2 contact u... | NaN | NaN | NaN |
| 5568 | ham | Will I_b going to esplanade fr home? | NaN | NaN | NaN |
| 5569 | ham | Pity, * was in mood for that. So...any other s... | NaN | NaN | NaN |
| 5570 | ham | The guy did some bitching but I acted like i'd... | NaN | NaN | NaN |

```
# Checking datatype
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 5 columns):
#   Column          Non-Null Count  Dtype
---  -
0   v1               5572 non-null   object
1   v2               5572 non-null   object
2   Unnamed: 2       50 non-null     object
3   Unnamed: 3       12 non-null     object
4   Unnamed: 4       6 non-null      object
dtypes: object(5)
memory usage: 217.8+ KB
```

```
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
```

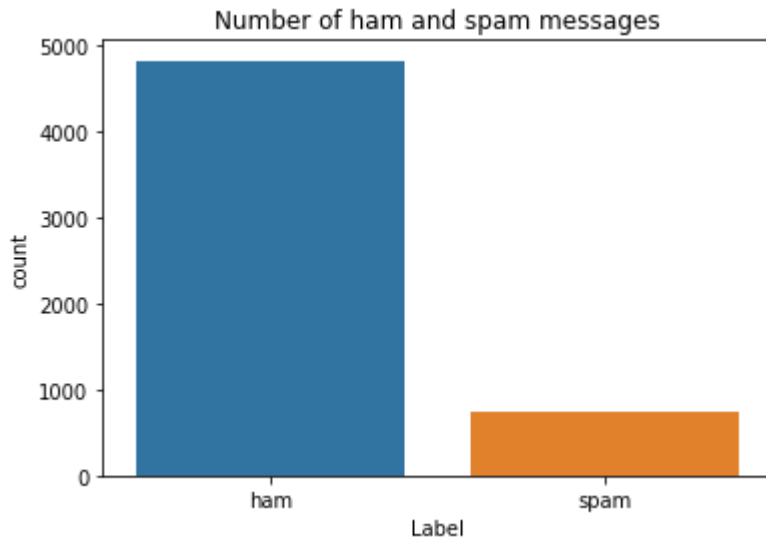
```
sns.countplot(df.v1)
plt.xlabel('Label')
plt.title('Number of ham and spam messages')
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning: Pass t
FutureWarning
```

```
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 t
FutureWarning
```

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



```
# Convert list into array
```

```
x_train,y_train = np.array(x_train),np.array(y_train)
```

```
# Building model
```

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import LSTM, Dense
```

```
model = Sequential()
model.add(LSTM(50, input_shape=(60, 1),return_sequences=True))
model.add(LSTM(50,return_sequences=True))
model.add(LSTM(50,return_sequences=True))
model.add(LSTM(50,return_sequences=True))
model.add(Dense(1))
```

```
model.compile(optimizer='adam',loss='mse')
```

```
# save model
```

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

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