ASSIGNMENT-04

Problem Statement :- SMS SPAM Classification

Assignment Date	5 October 2022
Student Name	Sahana J M
Student Roll Number	113219071033
Maximum Marks	2 Marks

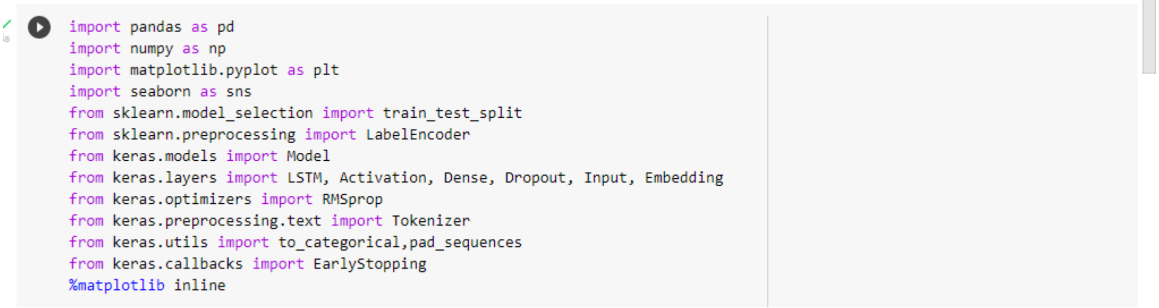
QUESTION 1:

Download the Dataset

Dataset is downloaded and uploaded

QUESTION 2:

Import required library



```
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.utils import to_categorical,pad_sequences
from keras.callbacks import EarlyStopping
%matplotlib inline
```

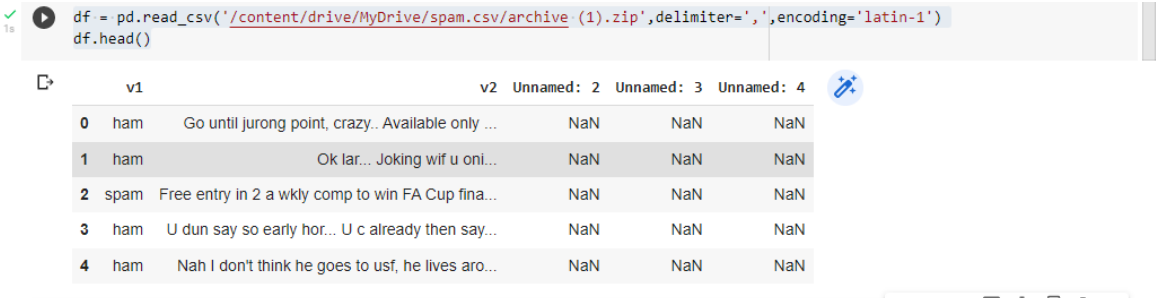
QUESTION 3:

Read dataset and do pre-processing

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

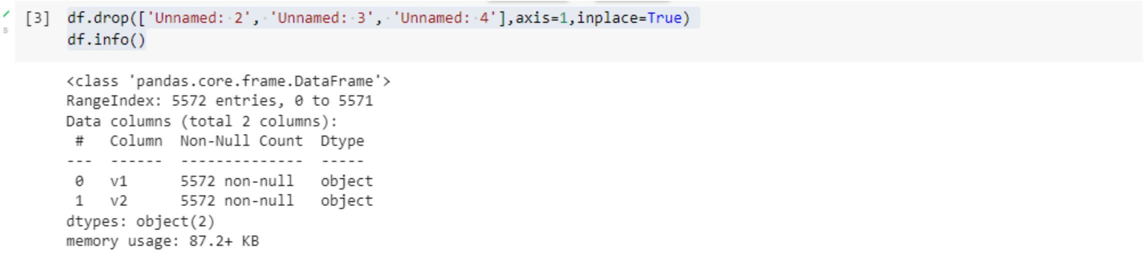
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed:
4'],axis=1,inplace=True)
```

```
df.info()
```



```
df = pd.read_csv('/content/drive/MyDrive/spam.csv/archive (1).zip',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



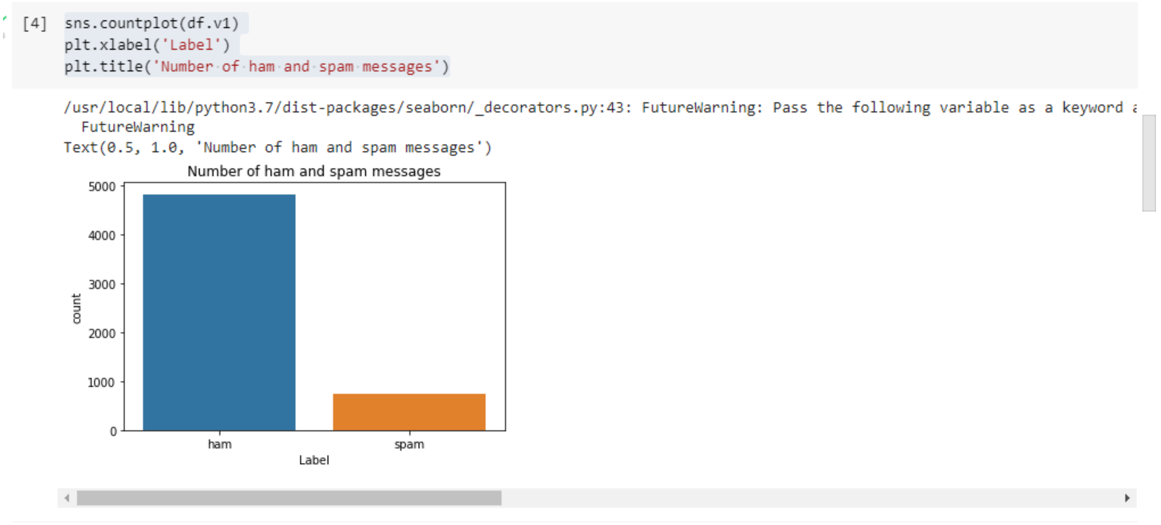
```
[3] df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
    df.info()
```

```
<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
```

QUESTION 4:

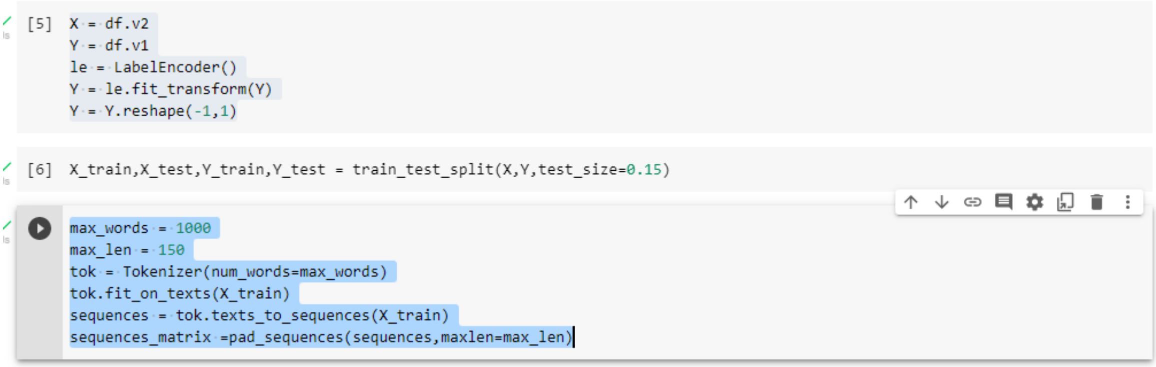
Create model

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

X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)

X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)

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)
```



```
[4] 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 a
  FutureWarning
Text(0.5, 1.0, 'Number of ham and spam messages')
```



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

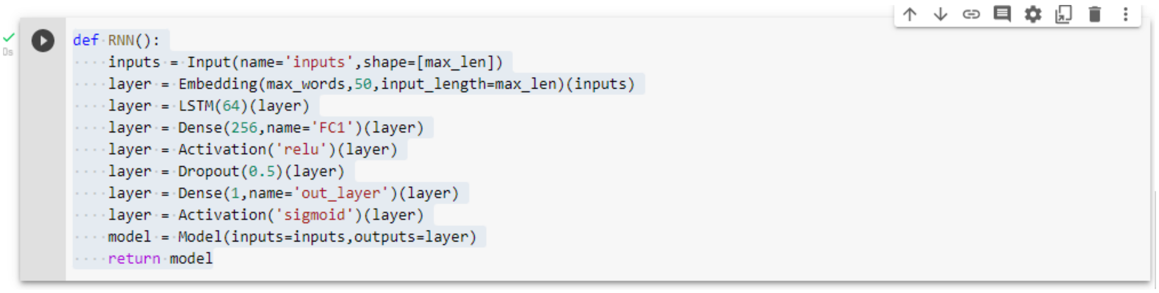
```
[6] X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)
```

```
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)
```

QUESTION 5:

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

```
def RNN():
    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)
    model = Model(inputs=inputs,outputs=layer)
    return model
```



```
def RNN():
    inputs = Input(name='inputs',shape=[max_len])
    layer = Embedding(max_words,50,input_length=max_len)(inputs)
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    layer = Dense(1,name='out_layer')(layer)
    layer = Activation('sigmoid')(layer)
    model = Model(inputs=inputs,outputs=layer)
    return model
```

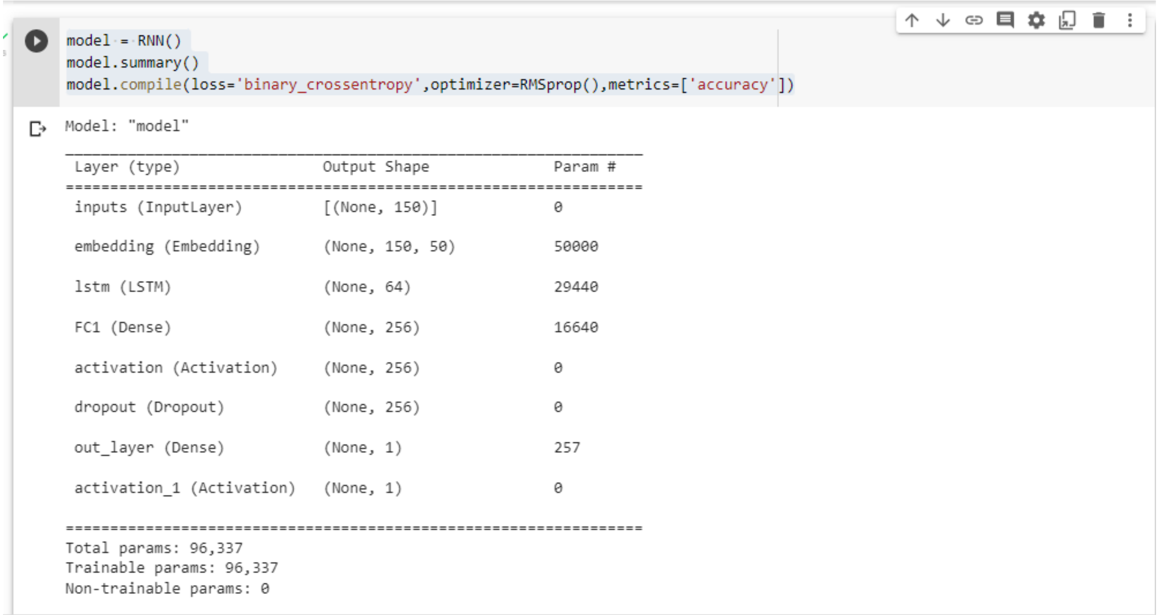
QUESTION 6:

Compile the Model

```
model = RNN()

model.summary()

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



```
model = RNN()
model.summary()
model.compile(loss='binary_crossentropy',optimizer=RMSprop(),metrics=['accuracy'])
```

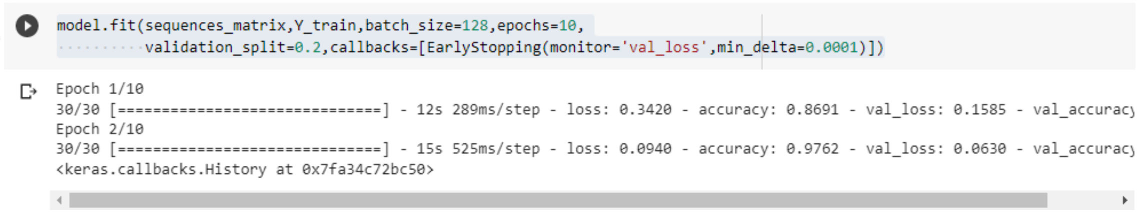
```
Model: "model"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 inputs (InputLayer)         [(None, 150)]             0         
                 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

QUESTION 7:

Fit the Model

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,

validation_split=0.2,callbacks=[EarlyStopping(monitor='val_loss',min_delta=
0.0001)])
```



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

```
Epoch 1/10
30/30 [==============================] - 12s 289ms/step - loss: 0.3420 - accuracy: 0.8691 - val_loss: 0.1585 - val_accuracy
Epoch 2/10
30/30 [==============================] - 15s 525ms/step - loss: 0.0940 - accuracy: 0.9762 - val_loss: 0.0630 - val_accuracy
<keras.callbacks.History at 0x7fa34c72bc50>
```

QUESTION 8:

Test The Model

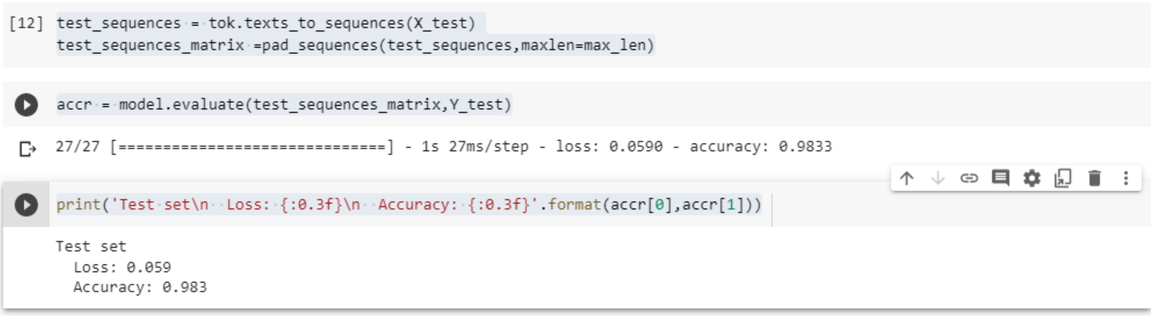
```
test_sequences = tok.texts_to_sequences(X_test)

test_sequences_matrix =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]))
```



```
[12] test_sequences = tok.texts_to_sequences(X_test)
     test_sequences_matrix =pad_sequences(test_sequences,maxlen=max_len)
```

```
accr = model.evaluate(test_sequences_matrix,Y_test)
```

```
27/27 [==============================] - 1s 27ms/step - loss: 0.0590 - accuracy: 0.9833
```

```
print('Test set\n  Loss: {:0.3f}\n  Accuracy: {:0.3f}'.format(accr[0],accr[1]))
```

```
Test set
  Loss: 0.059
  Accuracy: 0.983
```