

## Assignment -4

### Python Programming

|                     |                 |
|---------------------|-----------------|
| Assignment Date     | 29 October 2022 |
| Student Name        | Anushti K       |
| Student Roll Number | 821919104004    |
| Maximum Marks       | 2 MARKS         |

## SMS SPAM CLASSIFICATION

### Import the necessary libraries

```
✓ [3] import pandas as pd
Ds      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
```

```
✓ 1s ▶ 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
```

### Download the Dataset

Dataset Downloaded and uploaded to drive <https://www.kaggle.com/code/kredy10/simple-lstmfor-textclassification/data>

## Read dataset and pre-processing

```
✓ [5] df = pd.read_csv(r'/content/spam.csv',encoding='latin-1')
```

```
✓ [6] from google.colab import drive  
drive.mount('/content/drive')
```

Mounted at /content/drive

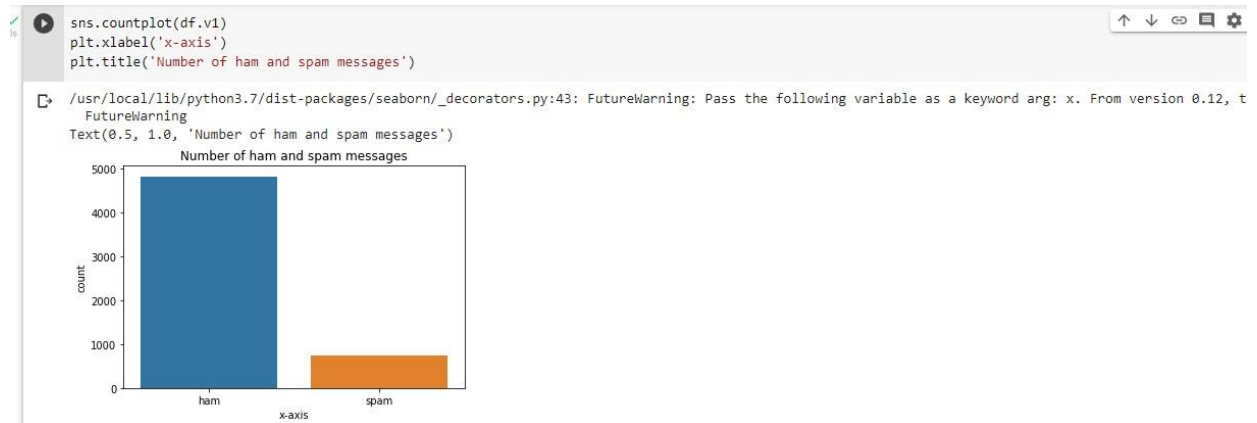
```
✓ [7] df.head()
```

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

```
[9] 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
```



## Create input vectors and process labels

```
[11] X = df.v2
     Y = df.v1

[12] le = LabelEncoder()
     Y = le.fit_transform(Y)

[13] Y = Y.reshape(-1,1)
```

## Split the training and testing data

### ▼ SPLIT THE TRAINING AND TESTING DATA

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

## Process the data

```
{x}
[15] max_words = 1000
     max_len = 150

[16] tok = Tokenizer(num_words=max_words)
     tok.fit_on_texts(X_train)

[17] sequences = tok.texts_to_sequences(X_train)
     sequences_matrix = sequence.pad_sequences(sequences,maxlen=max_len)
```

## Create models and add layers

```
[18] def RNN():
      inputs = Input(name='inputs',shape=[max_len])
      layer = Embedding(max_words,50,input_length=max_len)(inputs)
      layer = LSTM(128)(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('tanh')(layer)
      model = Model(inputs=inputs,outputs=layer)
      return model

[19] model = RNN()

[20] model.summary()
```

Model: "model"

| Layer (type)              | Output Shape    | Param # |
|---------------------------|-----------------|---------|
| inputs (InputLayer)       | [(None, 150)]   | 0       |
| embedding (Embedding)     | (None, 150, 50) | 50000   |
| lstm (LSTM)               | (None, 128)     | 91648   |
| FC1 (Dense)               | (None, 256)     | 33024   |
| activation (Activation)   | (None, 256)     | 0       |
| dropout (Dropout)         | (None, 256)     | 0       |
| out_layer (Dense)         | (None, 1)       | 257     |
| activation 1 (Activation) | (None, 1)       | 0       |

=====

Total params: 174,929  
Trainable params: 174,929  
Non-trainable params: 0

=====

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

## FIT THE MODEL

### ✓ FIT THE MODEL

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=100,
          validation_split=0.2,callbacks=[EarlyStopping(monitor='val_loss',min_delta=0.0001)])

Epoch 1/100
28/28 [=====] - 20s 588ms/step - loss: 0.2843 - accuracy: 0.9032 - mse: 0.0745 - mae: 0.1490 - val_loss: 0.0882 - val_accuracy: 0.9798 -
Epoch 2/100
28/28 [=====] - 16s 560ms/step - loss: 0.0686 - accuracy: 0.9851 - mse: 0.0207 - mae: 0.1019 - val_loss: 0.0597 - val_accuracy: 0.9888 -
<keras.callbacks.History at 0x7fe2cc854ad0>
```

```
{x} [23] test_sequences = tok.texts_to_sequences(X_test)
      test_sequences_matrix = sequence.pad_sequences(test_sequences,maxlen=max_len)

[24] accr = model.evaluate(test_sequences_matrix,Y_test)

35/35 [=====] - 3s 84ms/step - loss: 0.1451 - accuracy: 0.9767 - mse: 0.0345 - mae: 0.1364

[25] print('Test set\n Loss: {:.3f}\n Accuracy: {:.3f}'.format(accr[0],accr[1]))

Test set
Loss: 0.145
Accuracy: 0.977
```

## SAVE THE MODEL

```
THE EDIT VIEW INSERT RUNNING TOOLS HELP All changes saved

+ Code + Text
```

### ✓ SAVE THE MODEL

```
[29] model.save(r"sms_classifier.h5")
```

## TEST THE MODEL

```
[30] from tensorflow.keras.models import load_model
      m2 = load_model(r"sms_classifier.h5")

[31] m2.evaluate(test_sequences_matrix,Y_test)

35/35 [=====] - 3s 80ms/step - loss: 0.1451 - accuracy: 0.9767 - mse: 0.0345 - mae: 0.1364
[0.14514318108558655,
 0.9766815900802612,
 0.03450622037053108,
 0.13644741475582123]
```