

Assignment Date	27 October 2022
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Maximum Marks	2 Marks

SMS SPAM CLASSIFICATION

```
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 tensorflow.keras.models import Model
from tensorflow.keras.layers import LSTM, Activation, Dense, Dropout, Input, Embedding
from tensorflow.keras.optimizers import RMSprop
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing import sequence
from tensorflow.keras.utils import to_categorical
from tensorflow.keras.callbacks import EarlyStopping
%matplotlib inline
```

READ DATASET AND DO PREPROCESSING

```
df = pd.read_csv(r'spam.csv',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

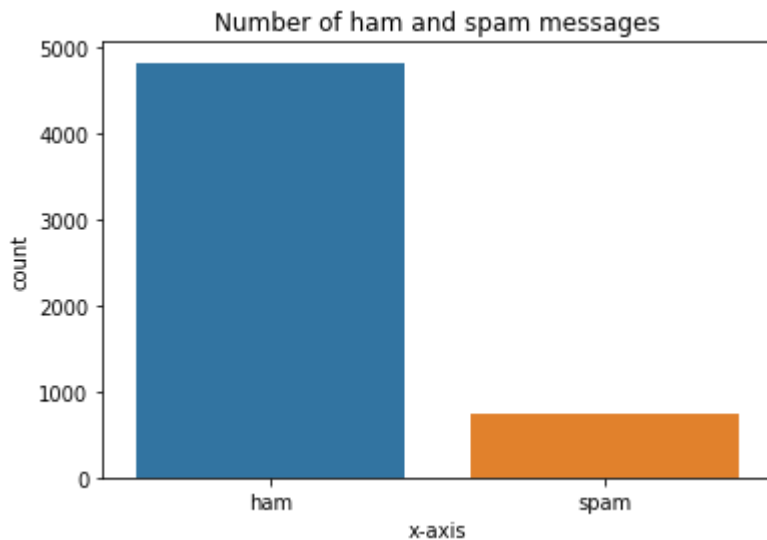
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)

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:
```

```
plt.xlabel('x-axis')
plt.title('Number of ham and spam messages')
```

87.2+ KB
/usr/local/lib/python3.7/dist-pack
ages/seaborn/_decorators.py:43:
FutureWarning: Pass the follo
FutureWarning
Text(0.5, 1.0, 'Number of ham and spam messages')



CREATE INPUT VECTORS AND PROCESS LABELS

```
X =  
df.v2Y  
= df.v1
```

```
le = LabelEncoder()  
Y = le.fit_transform(Y)
```

```
Y = Y.reshape(-1,1)
```

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

```
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)
```

CREATE MODELS AND ADD LAYERS

```
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
```

```
model = RNN()
```

```
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		

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

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 [=====] - 13s 460ms/step - loss: 0.0961 - accuracy: 0.9778 - mse
Epoch 2/100
28/28 [=====] - 14s 507ms/step - loss: 0.0728 - accuracy: 0.9885 - mse
<keras.callbacks.History at 0x7f2c8029f350>
```

```
test_sequences = tok.texts_to_sequences(X_test) test_sequences_matrix =  
sequence.pad_sequences(test_sequences,maxlen=max_len)
```

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

```
35/35 [=====] - 3s 92ms/step - loss: 0.1390 - accuracy: 0.9821 - mse:
```

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

```
Test set  
Loss: 0.139  
Accuracy: 0.982
```

SAVE THE MODEL

```
model.save(r"C:\Users\aruna\OneDrive\Desktop\model_lstm.h5")
```

TEST THE MODEL

```
from tensorflow.keras.models import load_model m2 =  
load_model(r"C:\Users\aruna\OneDrive\Desktop\model_lstm.h5")
```

```
m2.evaluate(test_sequences_matrix,Y_test)
```

```
35/35 [=====] - 4s 68ms/step - loss: 0.1390 - accuracy: 0.9821 - mse:  
[0.13899557292461395,  
0.9820627570152283,  
0.07788368314504623,  
0.23931345343589783]
```