Assignment-4

SMS Spam Classification

Assignment Date	30 September 2022
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Maximum Marks	2 Marks

SMS SPAM Classification

Import required libraries

```
import pandas as pd
import numpy as np
import re
import collections
import contractions
import seaborn as sns
import matplotlib.pyplot as plt
plt.style.use('dark_background')
import nltk
from nltk.stem import WordNetLemmatizer
from nltk.corpus import stopwords
import warnings
warnings.simplefilter(action='ignore', category=Warning)
import keras
from keras.layers import Dense, Embedding, LSTM, Dropout
from keras.models import Sequential
from keras.preprocessing.text import Tokenizer
from keras_preprocessing.sequence import pad_sequences
```

Download the dataset

```
df = pd.read_csv("spam.csv", encoding='ISO-8859-1')
df.shape
```

```
(5572, 5)
```

Read dataset and do pre-processing

```
df.head(10)
```

```
     v1  ... Unnamed: 4
0   ham  ...        NaN
1   ham  ...        NaN
2  spam  ...        NaN
```

```
3   ham  ...        NaN
4   ham  ...        NaN
5  spam  ...        NaN
6   ham  ...        NaN
7   ham  ...        NaN
8  spam  ...        NaN
9  spam  ...        NaN

[10 rows x 5 columns]
```

```
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.isnull().any()
```

```
v1            False
v2            False
Unnamed: 2     True
Unnamed: 3     True
Unnamed: 4     True
dtype: bool
```

```
df.isnull().sum()
```

```
v1               0
v2               0
Unnamed: 2    5522
Unnamed: 3    5560
Unnamed: 4    5566
dtype: int64
```

```
df.drop(["Unnamed: 2", "Unnamed: 3", "Unnamed: 4"], axis=1,
inplace=True)
df.columns = ["Spam/Ham","Message"]
```

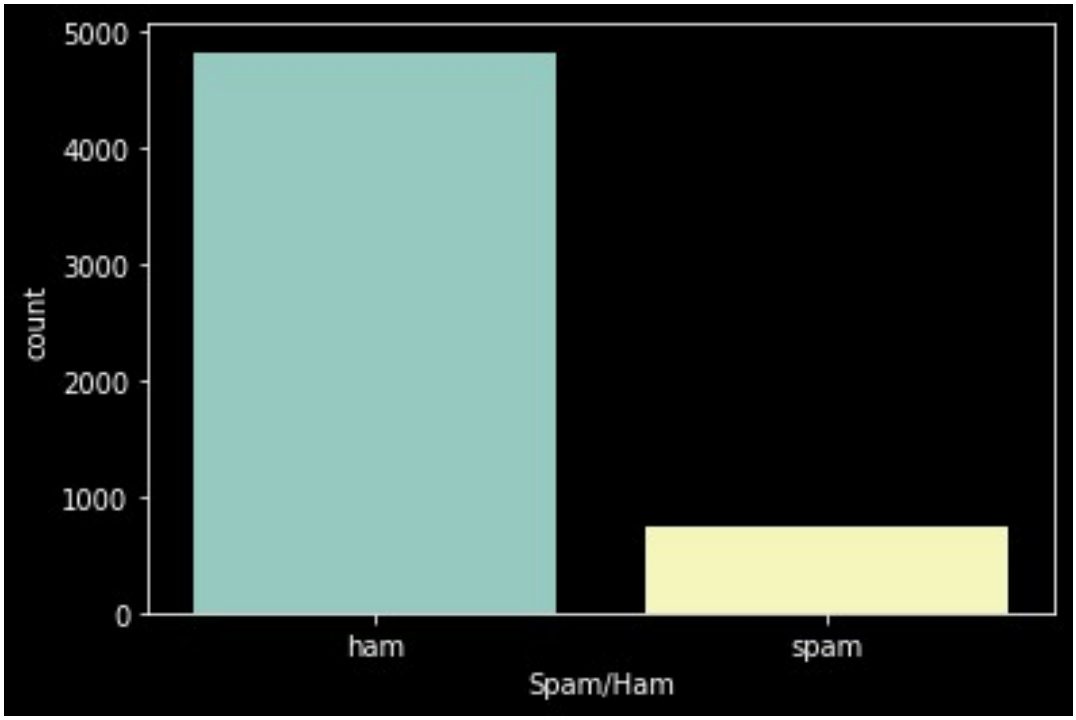
```
df.head()
```

```
  Spam/Ham                                            Message
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...
```

```
sns.countplot(df["Spam/Ham"])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f4de8b9e610>
```




```
def preprocessing(data):
      sms = contractions.fix(data)
      sms = sms.lower()
      sms = re.sub(r'https?://S+|www.S+', "", sms).strip()
      sms = re.sub("[^a-z ]", "", sms)
      return sms
X = df["Message"].apply(preprocessing)
```

```
from sklearn.preprocessing import LabelEncoder
lb_enc = LabelEncoder()
y = lb_enc.fit_transform(df["Spam/Ham"])
```

```
tokenizer = Tokenizer()
tokenizer.fit_on_texts(X)
text_to_sequence = tokenizer.texts_to_sequences(X)
```

```
max_length_sequence = max([len(i) for i in text_to_sequence])
padded_sms_sequence = pad_sequences(text_to_sequence,
maxlen=max_length_sequence,
                                    padding = "pre")
padded_sms_sequence
```

```
array([[   0,    0,    0, ...,   50, 3915,  134],
       [   0,    0,    0, ...,  419,    1, 1715],
       [   0,    0,    0, ..., 2653,  348, 2654],
       ...,
       [   0,    0,    0, ..., 8472,  222, 8473],
       [   0,    0,    0, ...,  144,   17,   45],
       [   0,    0,    0, ...,    3,   61,  233]], dtype=int32)
```

Create Model

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

```
TOT_SIZE = len(tokenizer.word_index)+1
def create_model():
      lstm_model = Sequential()
      lstm_model.add(Embedding(TOT_SIZE, 32,
input_length=max_length_sequence))
      lstm_model.add(LSTM(100))
      lstm_model.add(Dropout(0.4))
      lstm_model.add(Dense(20, activation="relu"))
      lstm_model.add(Dropout(0.3))
      lstm_model.add(Dense(1, activation = "sigmoid"))
      return lstm_model
lstm_model = create_model()
```

Compile the Model

```
lstm_model.compile(loss = "binary_crossentropy", optimizer = "adam",
metrics = ["accuracy"])

lstm_model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, 172, 32)           271200

 lstm (LSTM)                 (None, 100)               53200

 dropout (Dropout)           (None, 100)               0

 dense (Dense)               (None, 20)                2020

 dropout_1 (Dropout)         (None, 20)                0

 dense_1 (Dense)             (None, 1)                 21

=================================================================
Total params: 326,441
Trainable params: 326,441
```

```
Non-trainable params: 0
_________________________________________________________________
```

Fit the Model

```
lstm_model.fit(padded_sms_sequence, y, epochs = 5,
validation_split=0.2, batch_size=16)
```

```
Epoch 1/5
279/279 [==============================] - 34s 112ms/step - loss:
0.2117 - accuracy: 0.9361 - val_loss: 0.0662 - val_accuracy: 0.9821
Epoch 2/5
279/279 [==============================] - 34s 122ms/step - loss:
0.1441 - accuracy: 0.9746 - val_loss: 0.0819 - val_accuracy: 0.9830
Epoch 3/5
279/279 [==============================] - 32s 114ms/step - loss:
0.0272 - accuracy: 0.9953 - val_loss: 0.0638 - val_accuracy: 0.9848
Epoch 4/5
279/279 [==============================] - 31s 111ms/step - loss:
0.0135 - accuracy: 0.9980 - val_loss: 0.0622 - val_accuracy: 0.9865
Epoch 5/5
279/279 [==============================] - 31s 111ms/step - loss:
0.0111 - accuracy: 0.9978 - val_loss: 0.0684 - val_accuracy: 0.9839

<keras.callbacks.History at 0x7f4de753af10>
```

Save The Model

```
lstm_model.save('sms.h5')
```

Test The Model

```
def predict_spam(predict_msg):
    new_seq = tokenizer.texts_to_sequences(predict_msg)
    padded = pad_sequences(new_seq, maxlen =max_length_sequence,
                      padding = 'pre')
    return (lstm_model.predict(padded))

message = str(input('Enter your message: '))
pred = predict_spam(message)
print(f"Prediction: {pred[0][0]}\n")
print(f"The sms is a {'spam' if pred[0][0]<0.5 else 'ham'}")
```

```
Enter your message: you've won something, the IRS is trying to contact
you, you have a refund coming or asking you to verify your bank
account
4/4 [==============================] - 0s 36ms/step
Prediction: 0.005271350499242544

The sms is a spam
```