Assignment-IV

Fertilizer recommendation system for disease prediction

Date	28 October 2022
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Maximum marks	2 marks

```python
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
import csv

with open('/spam.csv', 'r') as csvfile:
  reader = csv.reader(csvfile)

df = pd.read_csv(r'/spam.csv',encoding='latin-1')

df.head()
```

```
     v1                                                 v2 Unnamed: 2  \
0   ham  Go until jurong point, crazy.. Available only ...        NaN
1   ham                      Ok lar... Joking wif u oni...        NaN
2  spam  Free entry in 2 a wkly comp to win FA Cup fina...        NaN
3   ham  U dun say so early hor... U c already then say...        NaN
4   ham  Nah I don't think he goes to usf, he lives aro...        NaN

  Unnamed: 3 Unnamed: 4
0        NaN        NaN
1        NaN        NaN
```

```
2        NaN        NaN
3        NaN        NaN
4        NaN        NaN
```

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

```python
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
```

```python
sns.countplot(df.v1)
```
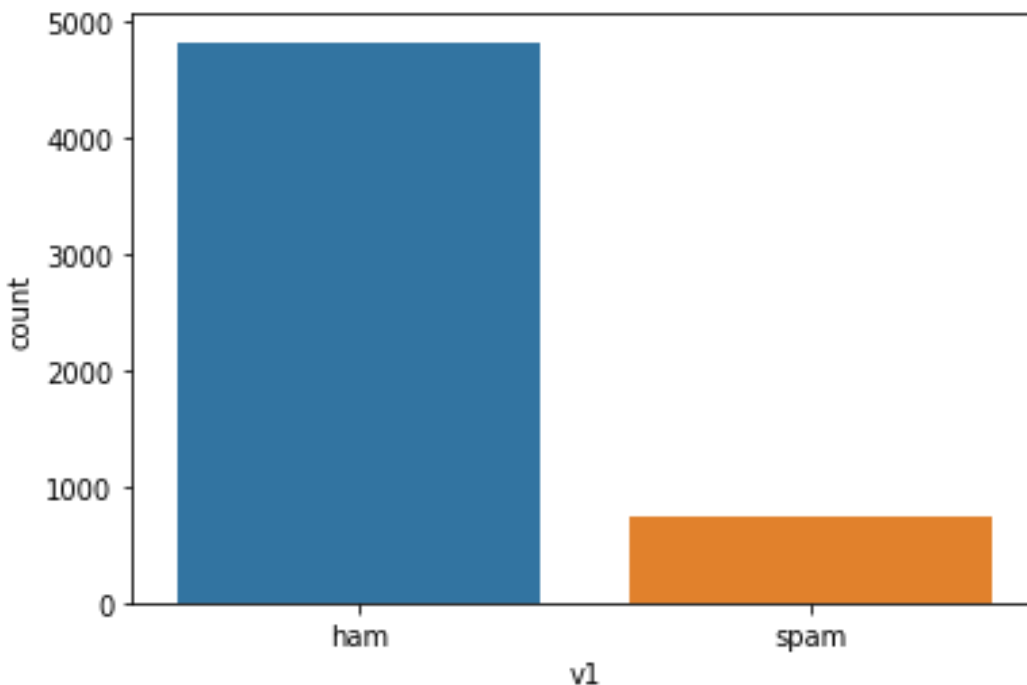
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  FutureWarning

<matplotlib.axes._subplots.AxesSubplot at 0x7f5197dac250>
```

```python
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=0.20)

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)

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

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
_____
```

```python
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
28/28 [==============================] - 17s 486ms/step - loss: 0.2960 -
accuracy: 0.8819 - mse: 0.0821 - mae: 0.1563 - val_loss: 0.1341 -
val_accuracy: 0.9675 - val_mse: 0.0344 - val_mae: 0.1237
Epoch 2/10
28/28 [==============================] - 13s 462ms/step - loss: 0.1149 -
accuracy: 0.9764 - mse: 0.0381 - mae: 0.1538 - val_loss: 0.1321 -
val_accuracy: 0.9798 - val_mse: 0.0437 - val_mae: 0.1695

<keras.callbacks.History at 0x7f5193192590>
```

```python
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 78ms/step - loss: 0.1590 -
accuracy: 0.9812 - mse: 0.0451 - mae: 0.1733
```

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

```
Test set
  Loss: 0.159
  Accuracy: 0.981
```

```python
model.save("./assign4model.h5")
```

```python
from tensorflow.keras.models import load_model
m2 = load_model("./assign4model.h5")
```

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

```
35/35 [==============================] - 3s 68ms/step - loss: 0.1590 -
accuracy: 0.9812 - mse: 0.0451 - mae: 0.1733

[0.1589982509613037,
 0.9811659455299377,
```

0.04506031796336174,
0.17333826422691345]