Assignment -4
Python Programming

Assignment Date	28 October 2022
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Maximum Marks	2 Marks

Question-1: Download

the dataset

Output:

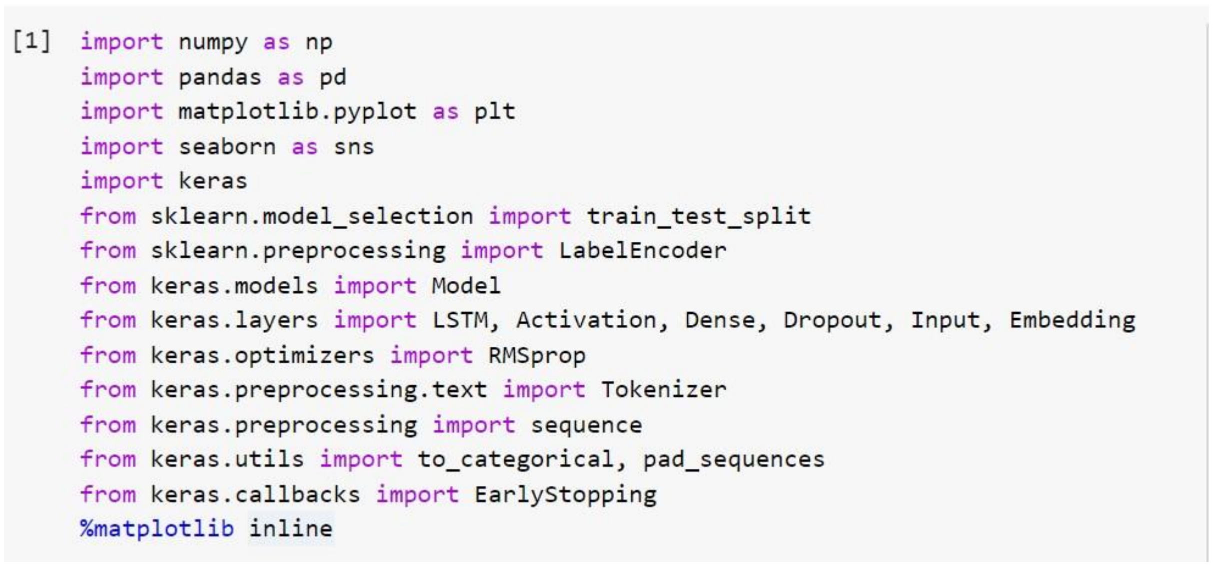
Download the dataset from https://www.kaggle.com/code/kredy10/simple-lstm-for-text-classification/data

spam

Question-2:

Import required library

Output:



```
[1] import numpy as np
    import pandas as pd
    import matplotlib.pyplot as plt
    import seaborn as sns
    import keras
    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.preprocessing import sequence
    from keras.utils import to_categorical, pad_sequences
    from keras.callbacks import EarlyStopping
    %matplotlib inline
```

Question 3:

Read dataset and do pre-processing **Output:**

```
[2]  df = pd.read_csv('spam.csv',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

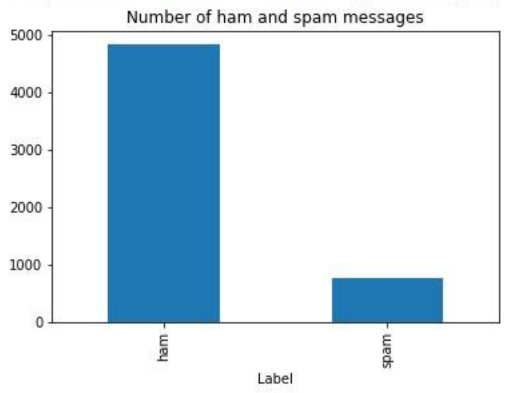
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
```

```
df.shape
```

```
(5572, 2)
```

```
df['v1'].value_counts().plot(kind='bar')
plt.xlabel('Label')
plt.title('Number of ham and spam messages')
```

```
Text(0.5, 1.0, 'Number of ham and spam messages')
```



```
X = df.v2
Y = df.v1
#label encoding for Y
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

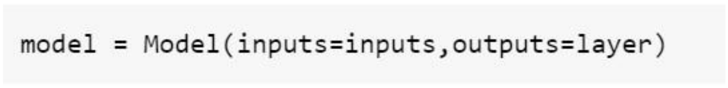
```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.20)
```

```
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 = keras.utils.pad_sequences(sequences,maxlen=max_len)
```

Question 4:

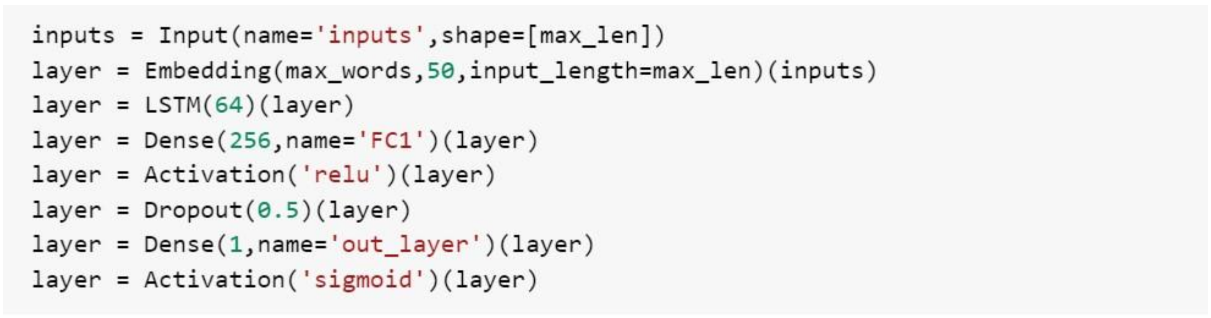
Create Model

Output:



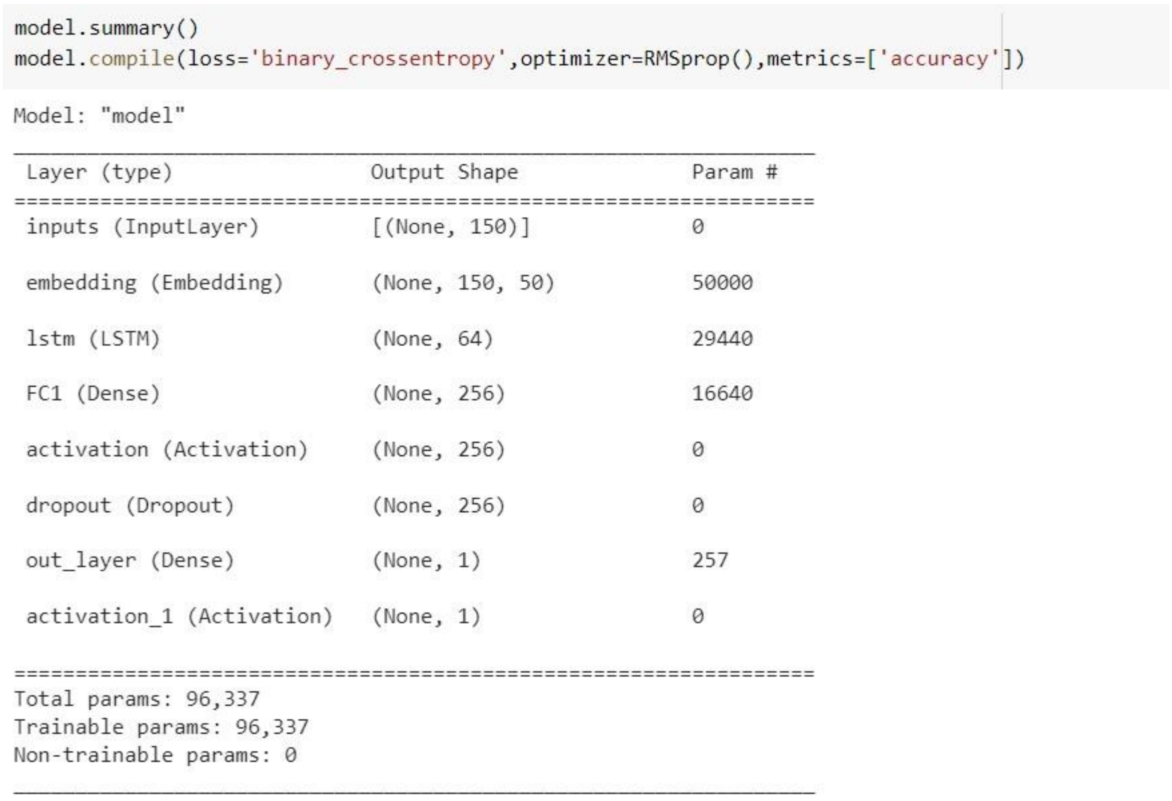
```
model = Model(inputs=inputs,outputs=layer)
```

Question 5:
Add Layers (LSTM, Dense-(Hidden Layers), Output) **Output:**



```
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)
```

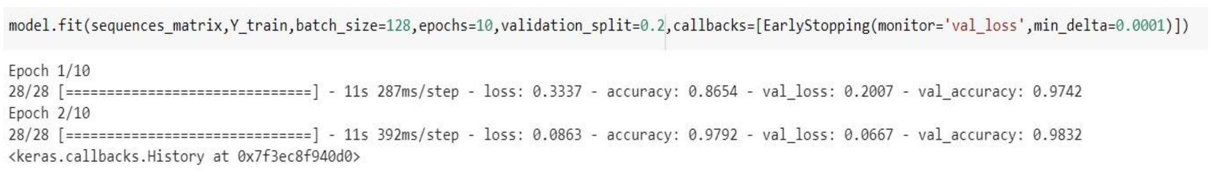
Question 6: Compile
the Model **Output:**



```
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
_________________________________________________________________
```

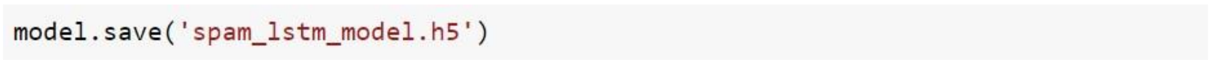
Question 7:
Fit the Model
Output:



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

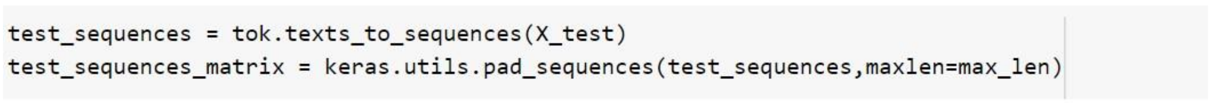
```
Epoch 1/10
28/28 [==============================] - 11s 287ms/step - loss: 0.3337 - accuracy: 0.8654 - val_loss: 0.2007 - val_accuracy: 0.9742
Epoch 2/10
28/28 [==============================] - 11s 392ms/step - loss: 0.0863 - accuracy: 0.9792 - val_loss: 0.0667 - val_accuracy: 0.9832
<keras.callbacks.History at 0x7f3ec8f940d0>
```

Question 8: Save
The Model
Output:

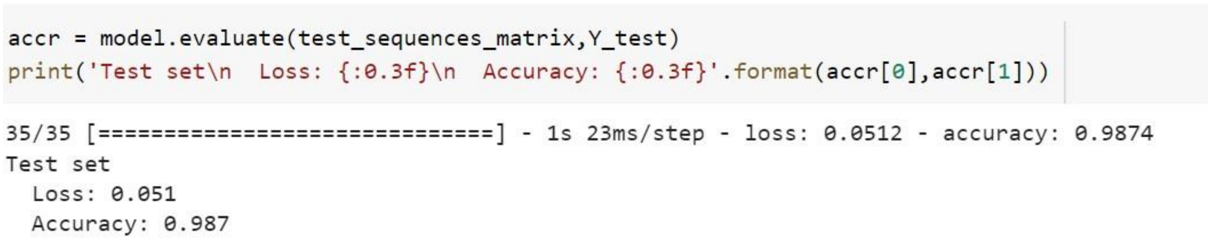


```
model.save('spam_lstm_model.h5')
```

Question 9:
Test The Model **Output:**



```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = keras.utils.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]))
```

```
35/35 [==============================] - 1s 23ms/step - loss: 0.0512 - accuracy: 0.9874
Test set
  Loss: 0.051
  Accuracy: 0.987
```