ASSIGNMENT-4

Date	29 Oct 2022
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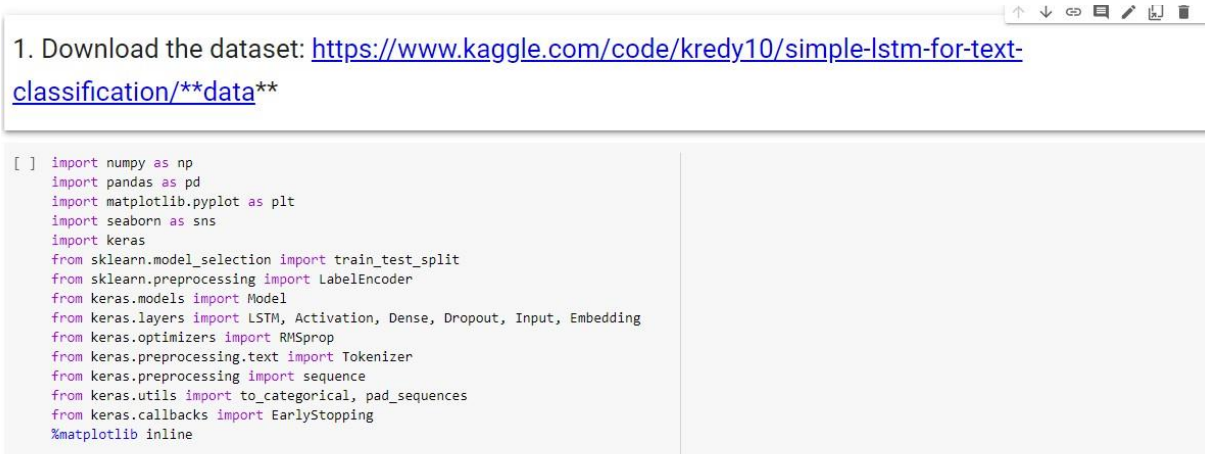
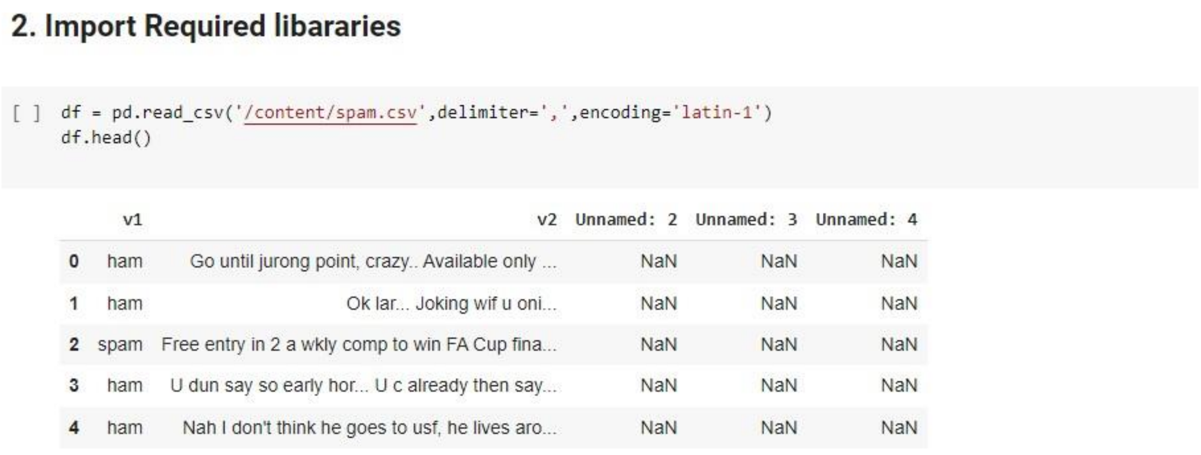
Maximum mark	2 mark



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

```
[ ] 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
```

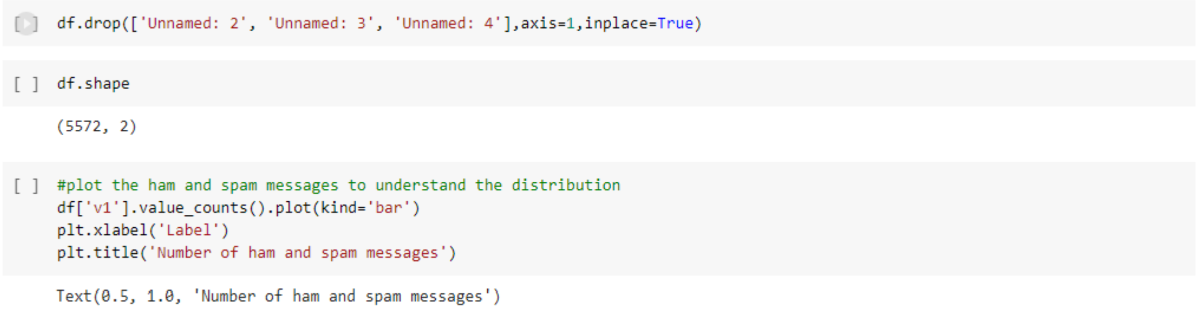


2. Import Required libararies

```
[ ] df = pd.read_csv('/content/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

3. Read dataset and pre-processing



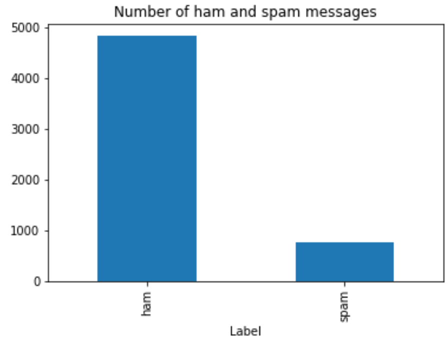
```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
```

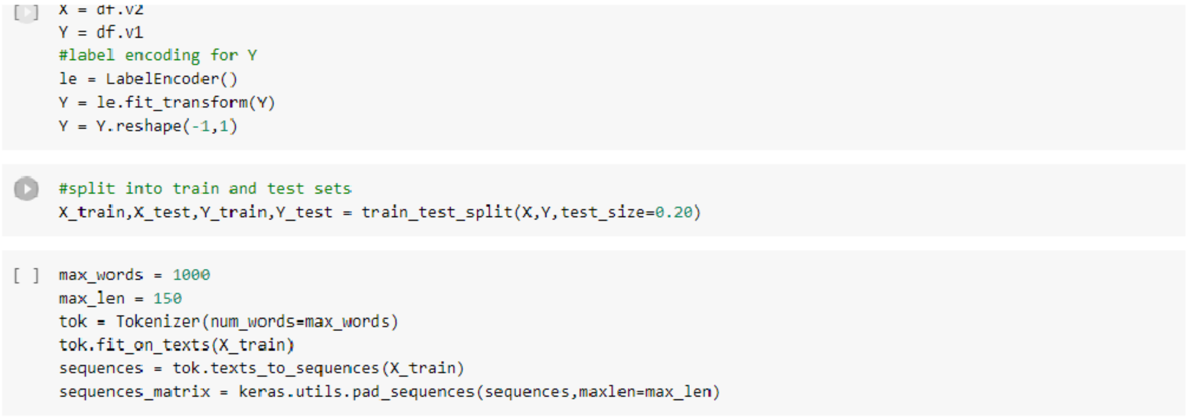
```
[ ] df.shape
```

```
(5572, 2)
```

```
[ ] #plot the ham and spam messages to understand the distribution
    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')
```

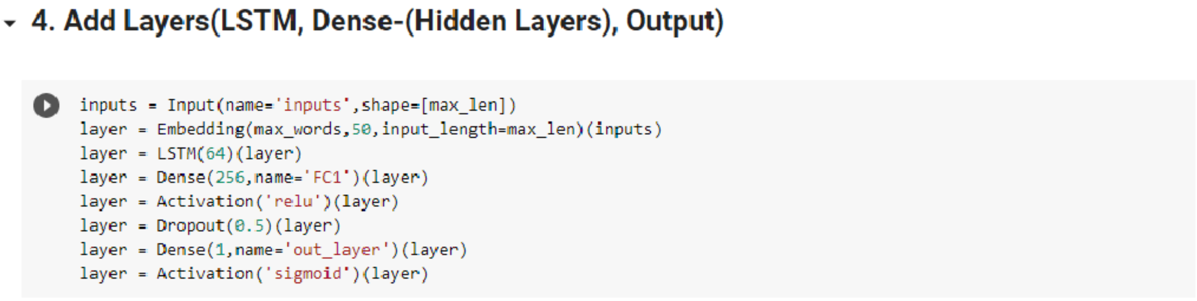




```
X = df.v2
Y = df.v1
#label encoding for Y
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

```
#split into train and test sets
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.20)
```

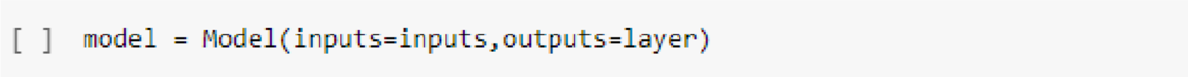
```
[ ] max_words = 1000
    max_len = 150
    tok = Tokenizer(num_words=max_words)
    tok.fit_on_texts(X_train)
    sequences = tok.texts_to_sequences(X_train)
    sequences_matrix = keras.utils.pad_sequences(sequences,maxlen=max_len)
```



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

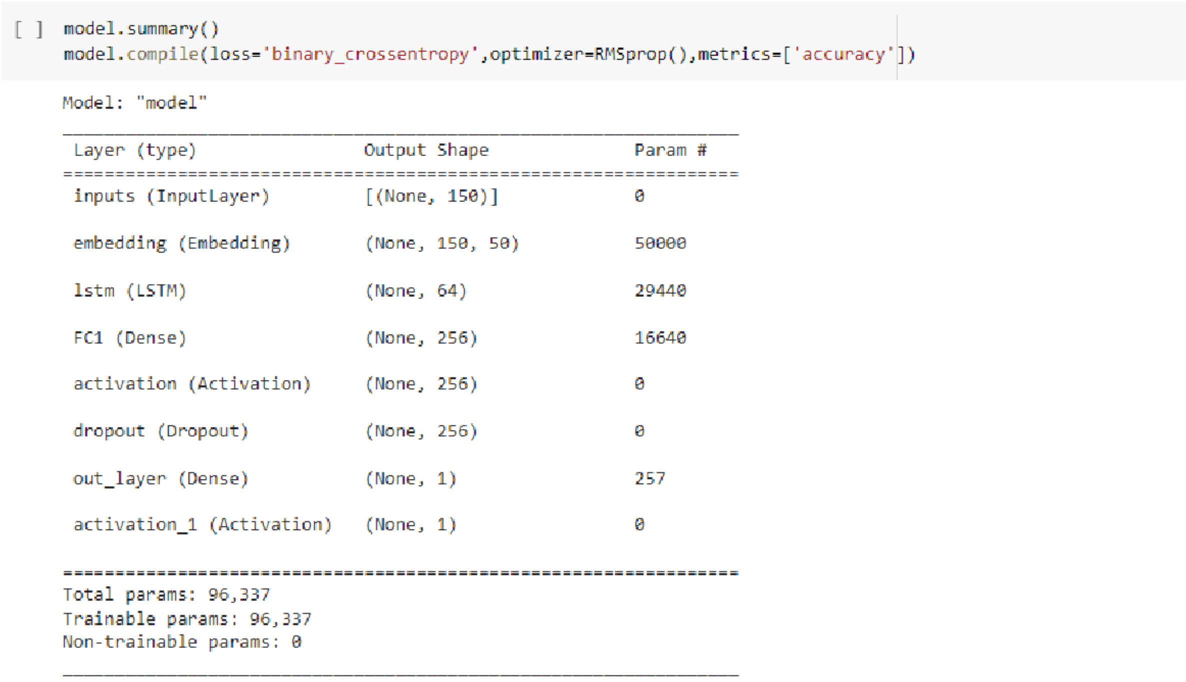
```
inputs = Input(name='inputs',shape=[max_len])
layer = Embedding(max_words,50,input_length=max_len)(inputs)
layer = LSTM(64)(layer)
layer = Dense(256,name='FC1')(layer)
layer = Activation('relu')(layer)
layer = Dropout(0.5)(layer)
layer = Dense(1,name='out_layer')(layer)
layer = Activation('sigmoid')(layer)
```

5. Create Model



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

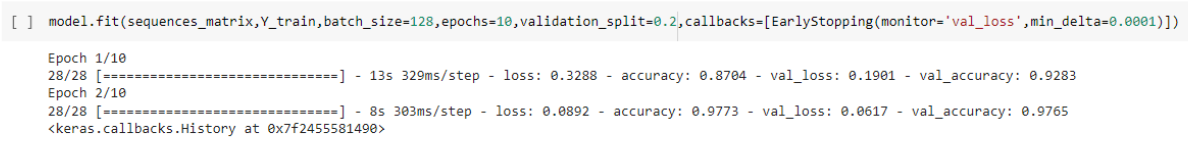
6. Compile the Model



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

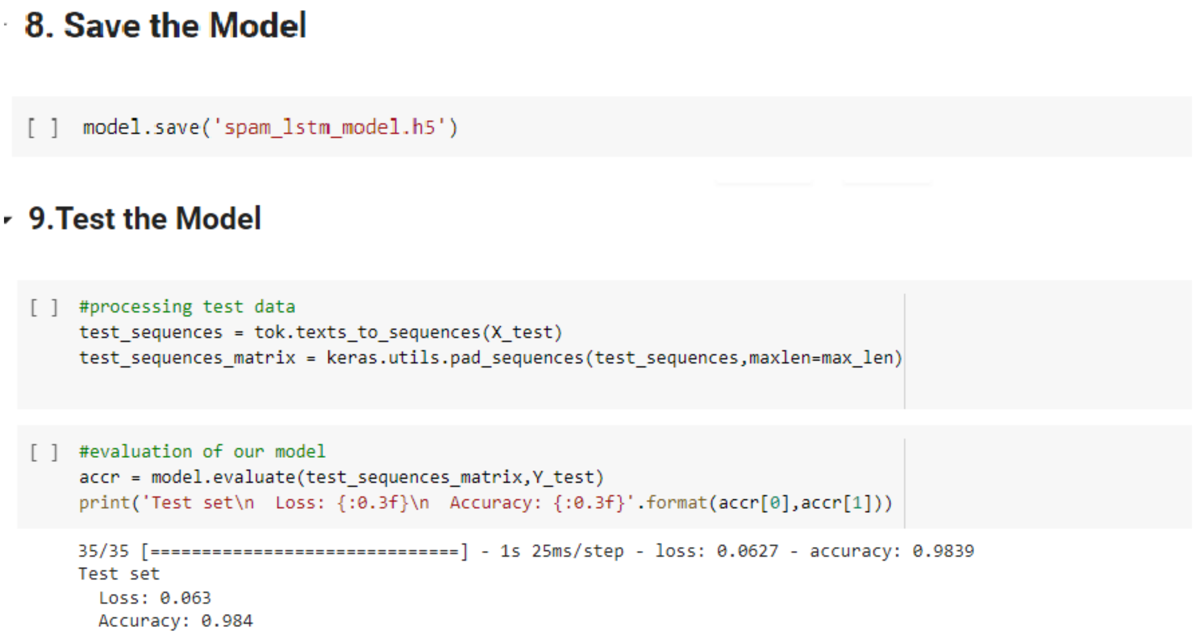
```
Model: "model"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 inputs (InputLayer)         [(None, 150)]             0

 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
_________________________________________________________________
```

7.Fit the Model



```
[ ]  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 [==============================] - 13s 329ms/step - loss: 0.3288 - accuracy: 0.8704 - val_loss: 0.1901 - val_accuracy: 0.9283
Epoch 2/10
28/28 [==============================] - 8s 303ms/step - loss: 0.0892 - accuracy: 0.9773 - val_loss: 0.0617 - val_accuracy: 0.9765
<keras.callbacks.History at 0x7f2455581490>
```



8. Save the Model

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

9.Test the Model

```
[ ]  #processing test data
     test_sequences = tok.texts_to_sequences(X_test)
     test_sequences_matrix = keras.utils.pad_sequences(test_sequences,maxlen=max_len)
```

```
[ ]  #evaluation of our model
     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 25ms/step - loss: 0.0627 - accuracy: 0.9839
Test set
  Loss: 0.063
  Accuracy: 0.984
```