Assignment -IV STM for Text Classification

Assignment Date	11 November 2022
Student Name	K.Redeem Emima
Student Roll Number	9517201903120
Maximum Marks	2 Marks

#Import necessary libraries

import numpy as np import pandas as pd

import matplotlib.pyplot as plt import

seaborn as sns %matplotlib inline

from sklearn.model_selection import train_test_split

from keras.layers import Dense , LSTM , Embedding , Dropout , Activation , Flatten

from sklearn.preprocessing import LabelEncoder from

keras.preprocessing.text import Tokenizer from keras.models import

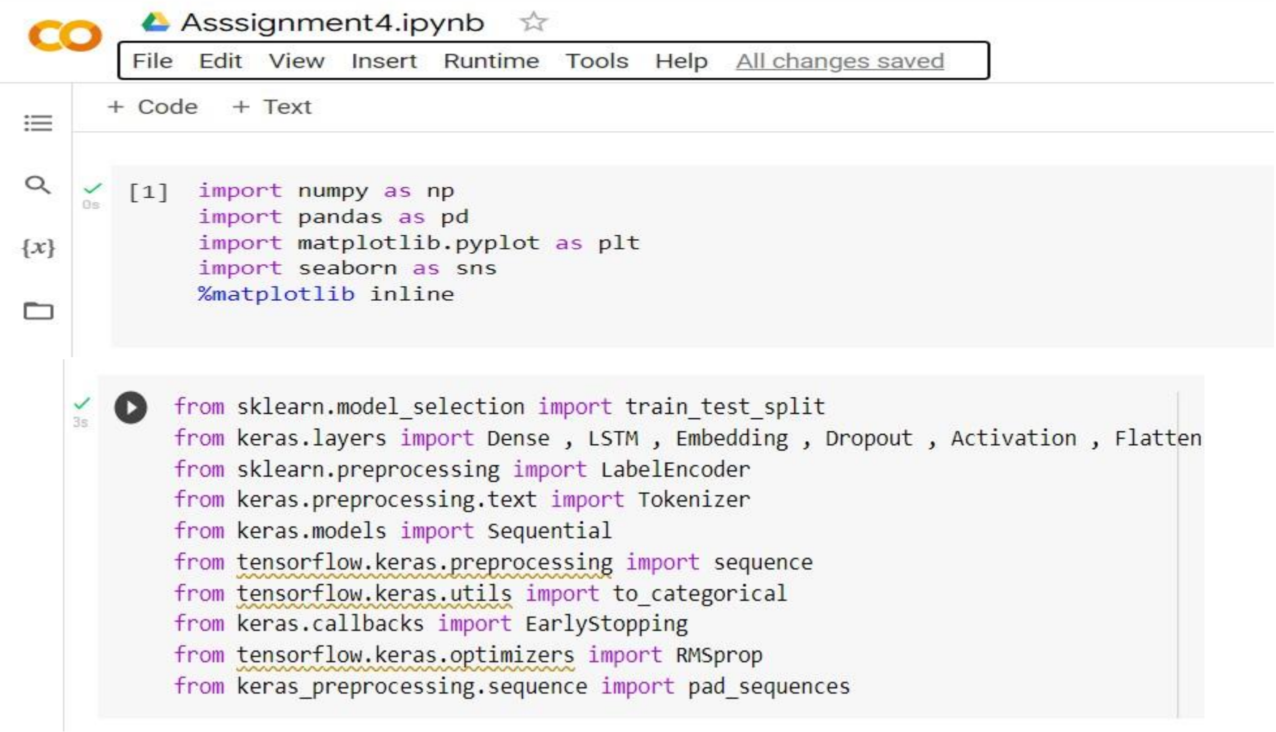
Sequential

from tensorflow.keras.preprocessing import sequence from

tensorflow.keras.utils import to_categorical from keras.callbacks import

EarlyStopping from tensorflow.keras.optimizers import RMSprop from

keras_preprocessing.sequence import pad_sequences



```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

```
from sklearn.model_selection import train_test_split
from keras.layers import Dense , LSTM , Embedding , Dropout , Activation , Flatten
from sklearn.preprocessing import LabelEncoder
from keras.preprocessing.text import Tokenizer
from keras.models import Sequential
from tensorflow.keras.preprocessing import sequence
from tensorflow.keras.utils import to_categorical
from keras.callbacks import EarlyStopping
from tensorflow.keras.optimizers import RMSprop
from keras_preprocessing.sequence import pad_sequences
```

#Read dataset and do pre-processing

data = pd.read_csv('/content/spam.csv',delimiter=',',encoding='latin-1') data

#Information about dataset

data.describe().T data.shape

#Check if there is any missing values data.isnull().sum()

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

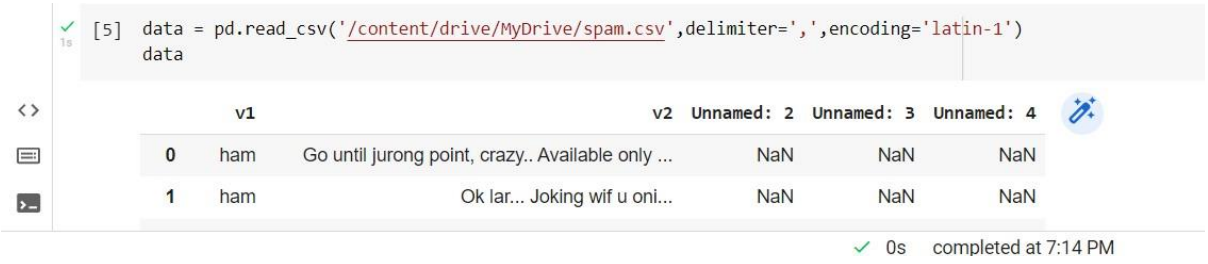
#Visualize the dataset sns.countplot(data.v1)

#Preprocess using Label Encoding

X = data.v2 Y = data.v1 le = LabelEncoder()

Y = le.fit_transform(Y)

Y = Y.reshape(-1,1)



```
[5] data = pd.read_csv('/content/drive/MyDrive/spam.csv',delimiter=',',encoding='latin-1')
    data
```

	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

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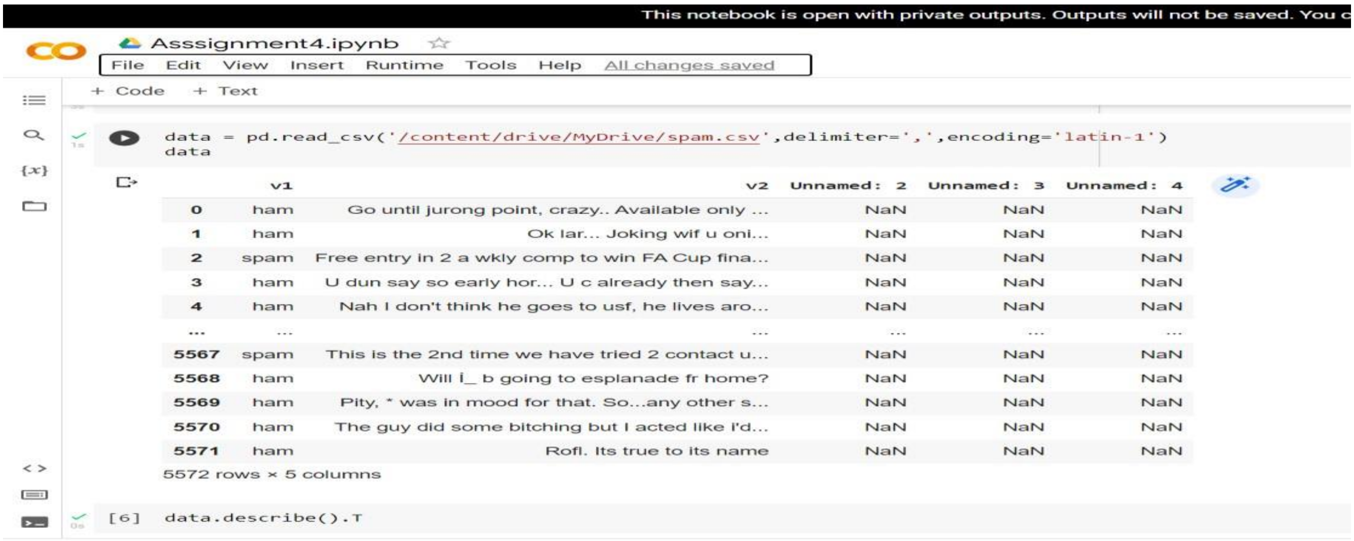

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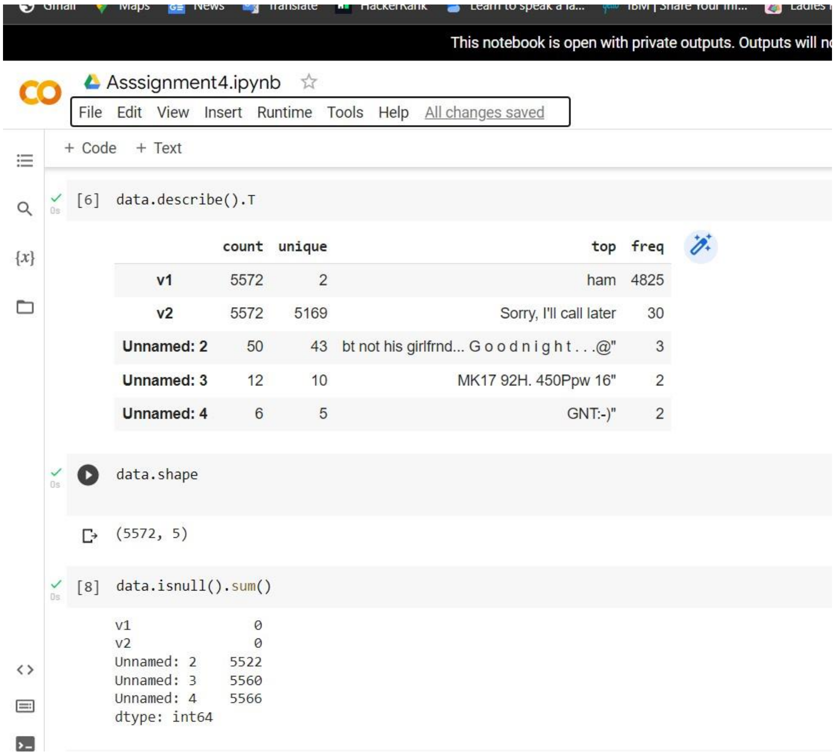
```
data = pd.read_csv('/content/drive/MyDrive/spam.csv',delimiter=',',encoding='latin-1')
data
```

	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
...	...	...	...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...	NaN	NaN	NaN
5568	ham	Will ì_ b going to esplanade fr home?	NaN	NaN	NaN
5569	ham	Pity, * was in mood for that. So...any other s...	NaN	NaN	NaN
5570	ham	The guy did some bitching but I acted like i'd...	NaN	NaN	NaN
5571	ham	Rofl. Its true to its name	NaN	NaN	NaN

5572 rows × 5 columns

```
[6] data.describe().T
```


Gmail Maps News Translate HackerRank Learn to speak a la... IBM | Share Your Inf... Ladies
This notebook is open with private outputs. Outputs will n
Asssignment4.ipynb
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```
[6] data.describe().T
```

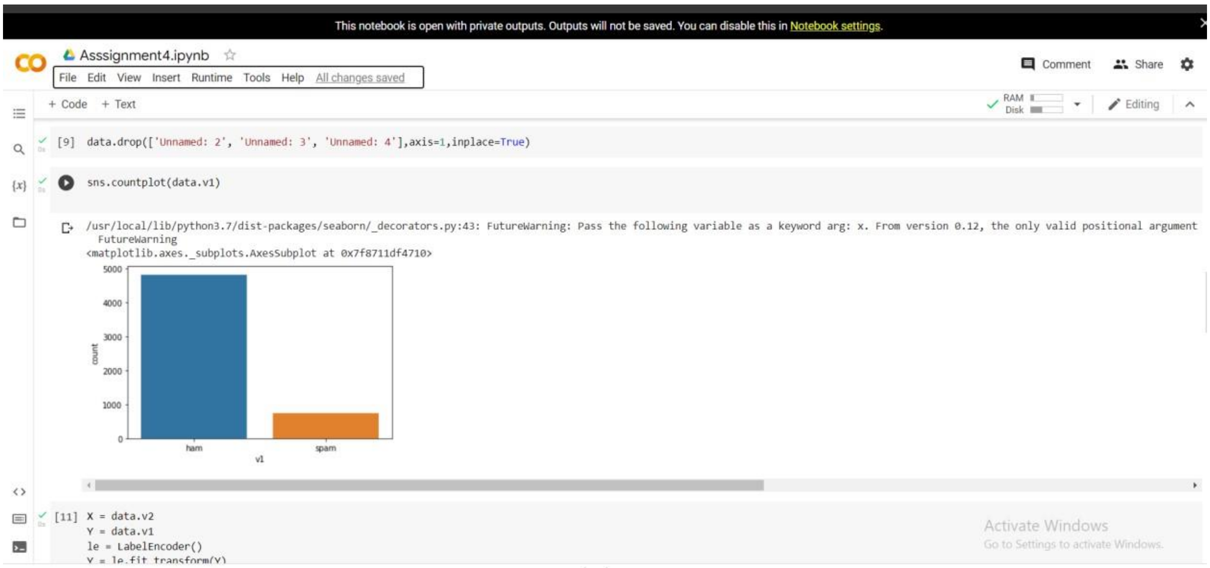
	count	unique	top	freq
v1	5572	2	ham	4825
v2	5572	5169	Sorry, I'll call later	30
Unnamed: 2	50	43	bt not his girlfrnd... G o o d n i g h t . . .@"	3
Unnamed: 3	12	10	MK17 92H. 450Ppw 16"	2
Unnamed: 4	6	5	GNT:-)"	2

```
data.shape
```

```
(5572, 5)
```

```
[8] data.isnull().sum()
```

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


This notebook is open with private outputs. Outputs will not be saved. You can disable this in Notebook settings.
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File Edit View Insert Runtime Tools Help All changes saved
Comment
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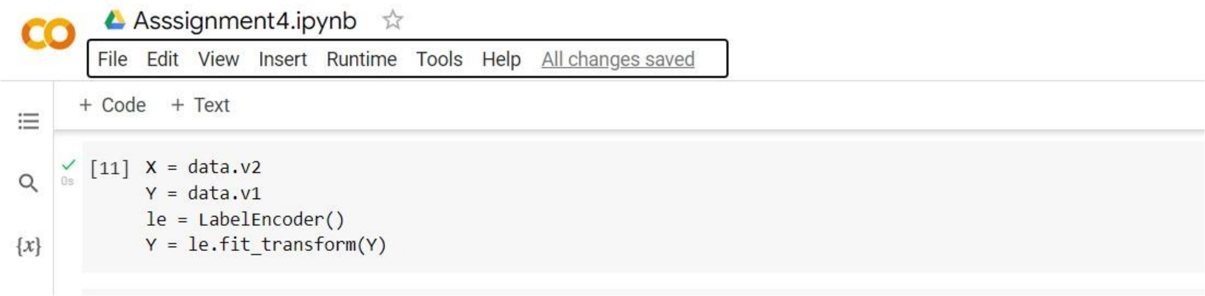
+ Code + Text
RAM
Disk
Editing
5000
4000
3000
2000
1000
0
count
ham
spam
v1
Activate Windows
Go to Settings to activate Windows.

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

```
sns.countplot(data.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
  FutureWarning
<matplotlib.axes._subplots.AxesSubplot at 0x7f8711df4710>
```

```
[11] X = data.v2
     Y = data.v1
     le = LabelEncoder()
     Y = le.fit_transform(Y)
```



```
[11] X = data.v2
     Y = data.v1
     le = LabelEncoder()
     Y = le.fit_transform(Y)
```

#Create Model and Add Layers (LSTM, Dense-(Hidden Layers), Output)

#Splitting into training and testing data

X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size = 0.2) max_word = 1000 max_len = 250

token = Tokenizer(num_words = max_word) token.fit_on_texts(X_train)

sequences = token.texts_to_sequences(X_train)

seq_matrix = sequence.pad_sequences(sequences , maxlen = max_len)

#Creating the model model = Sequential()

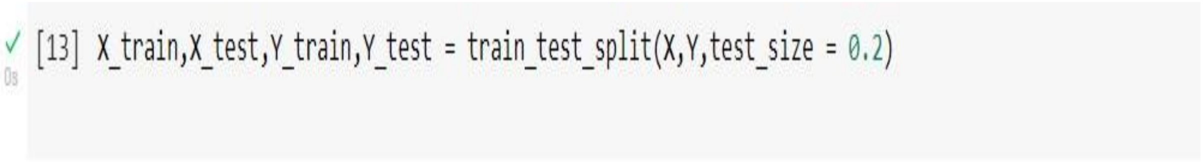
model.add(Embedding(max_word , 32 , input_length = max_len))

model.add(LSTM(64))

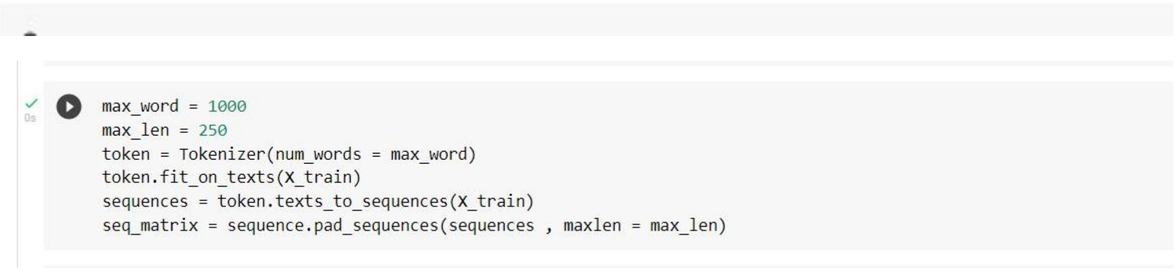
model.add(Flatten())

model.add(Dense(250, activation='relu')) model.add(Dropout(0.5))

model.add(Dense(120, activation='relu')) model.add(Dense(1, activation='sigmoid'))



```
[13] X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size = 0.2)
```



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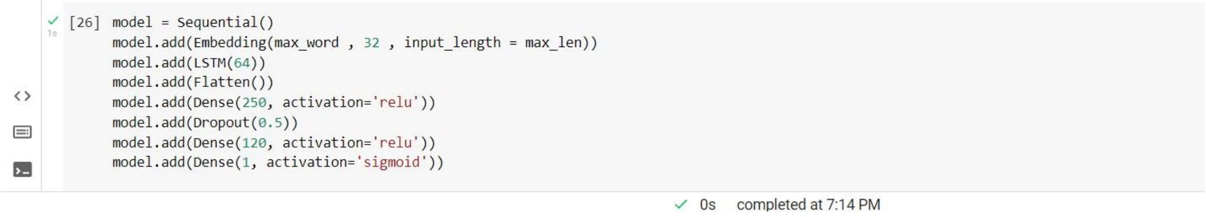
```



```
[26] model = Sequential()
     model.add(Embedding(max_word , 32 , input_length = max_len))
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     model.add(Dense(120, activation='relu'))
     model.add(Dense(1, activation='sigmoid'))
```

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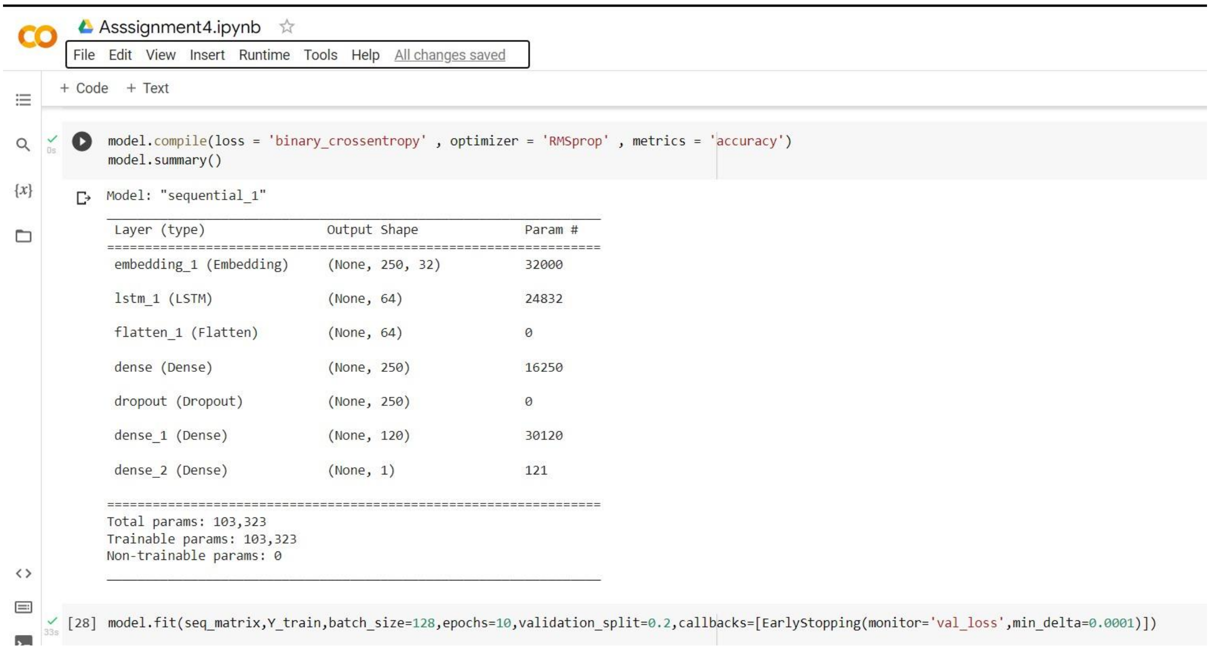
#compile the model

model.compile(loss = 'binary_crossentropy' , optimizer = 'RMSprop' , metrics =

'accuracy') model.summary()



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

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding_1 (Embedding)     (None, 250, 32)           32000

 lstm_1 (LSTM)               (None, 64)                24832

 flatten_1 (Flatten)         (None, 64)                0

 dense (Dense)               (None, 250)               16250

 dropout (Dropout)           (None, 250)               0

 dense_1 (Dense)             (None, 120)               30120

 dense_2 (Dense)             (None, 1)                 121

=================================================================
Total params: 103,323
Trainable params: 103,323
Non-trainable params: 0
_________________________________________________________________
```

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

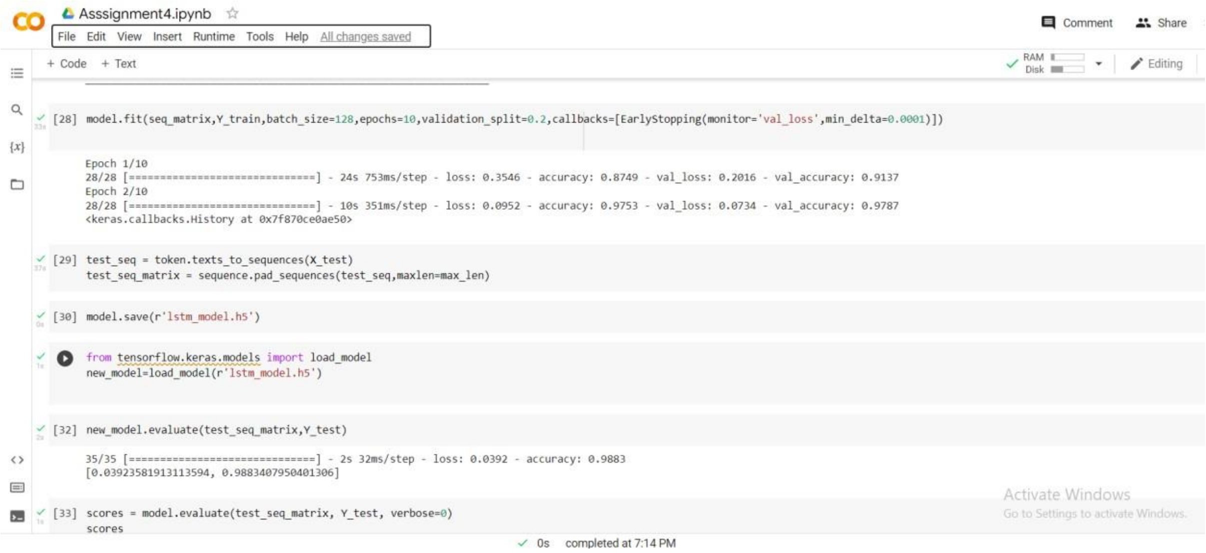
#Fit the model

model.fit(seq_matrix,Y_train,batch_size=128,epochs=10,validation_split=0.2,c allbacks=[EarlySt

opping(monitor='val_loss',min_delta=0.0001)]) test_seq =

token.texts_to_sequences(X_test)

test_seq_matrix = sequence.pad_sequences(test_seq,maxlen=max_len)


Asssignment4.ipynb
File Edit View Insert Runtime Tools Help All changes saved
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Activate Windows
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```
[28] model.fit(seq_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 [==============================] - 24s 753ms/step - loss: 0.3546 - accuracy: 0.8749 - val_loss: 0.2016 - val_accuracy: 0.9137
     Epoch 2/10
     28/28 [==============================] - 10s 351ms/step - loss: 0.0952 - accuracy: 0.9753 - val_loss: 0.0734 - val_accuracy: 0.9787
     <keras.callbacks.History at 0x7f870ce0ae50>

[29] test_seq = token.texts_to_sequences(X_test)
     test_seq_matrix = sequence.pad_sequences(test_seq,maxlen=max_len)

[30] model.save(r'lstm_model.h5')

     from tensorflow.keras.models import load_model
     new_model=load_model(r'lstm_model.h5')

[32] new_model.evaluate(test_seq_matrix,Y_test)

     35/35 [==============================] - 2s 32ms/step - loss: 0.0392 - accuracy: 0.9883
     [0.03923581913113594, 0.9883407950401306]

[33] scores = model.evaluate(test_seq_matrix, Y_test, verbose=0)
     scores
```

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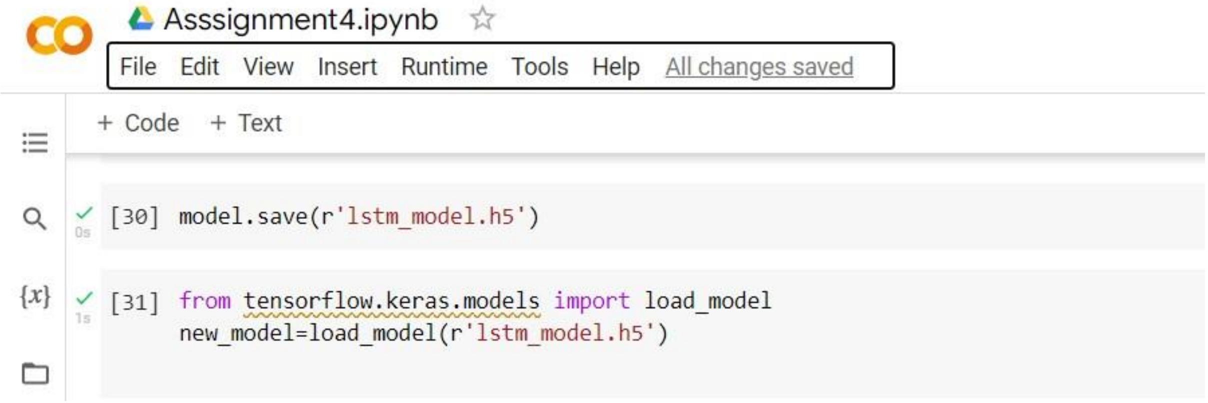
#Save the model

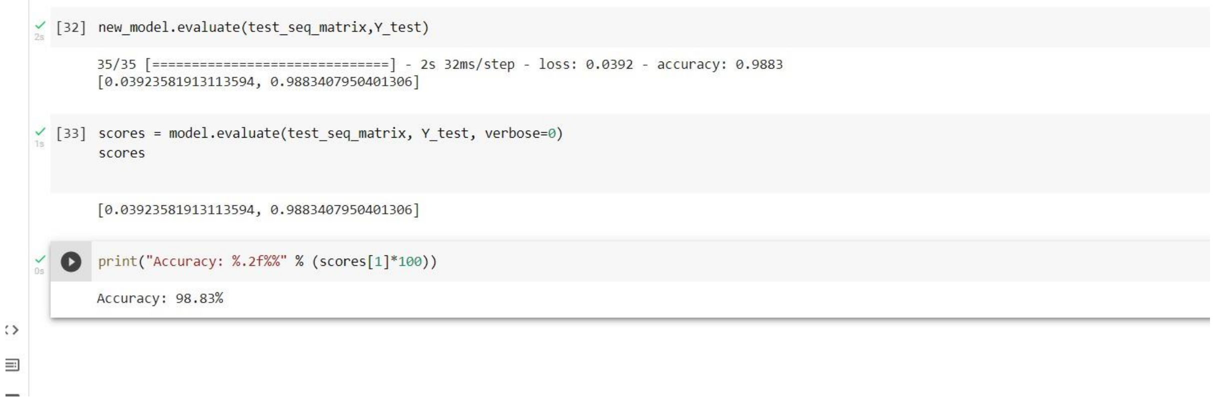
model.save(r'lstm_model.h5')



```
[30]  model.save(r'lstm_model.h5')

[31]  from tensorflow.keras.models import load_model
      new_model=load_model(r'lstm_model.h5')
```

#Test the model: from tensorflow.keras.models import load_model new_model=load_model(r'lstm_model.h5') new_model.evaluate(test_seq_matrix,Y_test) scores = model.evaluate(test_seq_matrix, Y_test, verbose=0) scores print("Accuracy: %.2f%%" % (scores[1]*100))



```
[32]  new_model.evaluate(test_seq_matrix,Y_test)

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[33]  scores = model.evaluate(test_seq_matrix, Y_test, verbose=0)
      scores

      [0.03923581913113594, 0.9883407950401306]

      print("Accuracy: %.2f%%" % (scores[1]*100))

      Accuracy: 98.83%
```