SAI NIKITH REDDY YARRAM (700742917)

MACHINE LEARNING

CRN: 30521

ASSIGNMENT 2

JUNE 22nd 2023

GITHUB LINK: https://github.com/nikithreddy30/MLAssignment2

VIDEO LINK: https://drive.google.com/file/d/1MW-Abr3wolZVLyTi0Q_LqGX6_ZQomYC1/view?usp=sharing

1. Pandas

1. Read the provided CSV file 'data.csv' Print array shape.

```
#1. Read the provided CSV file 'data.csv'
df = pd.read_csv("/content/data.csv")
print(df.head())
```

```
   Duration  Pulse  Maxpulse  Calories
0        60    110       130     409.1
1        60    117       145     479.0
2        60    103       135     340.0
3        45    109       175     282.4
4        45    117       148     406.0
```

2. Show the basic statistical description about the data

```
#2. Show the basic statistical description about the data
print(df.describe())
```

```
         Duration       Pulse    Maxpulse     Calories
count  169.000000  169.000000  169.000000   164.000000
mean    63.846154  107.461538  134.047337   375.790244
std     42.299949   14.510259   16.450434   266.379919
min     15.000000   80.000000  100.000000    50.300000
25%     45.000000  100.000000  124.000000   250.925000
50%     60.000000  105.000000  131.000000   318.600000
75%     60.000000  111.000000  141.000000   387.600000
max    300.000000  159.000000  184.000000  1860.400000
```

3. Check if the data has null values

```
#3. Check if the data has null values

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

```
Duration    False
Pulse       False
Maxpulse    False
Calories     True
dtype: bool
```

a. Replace the null values with the mean

```
#a. Replace the null values with the mean
df.fillna(df.mean(), inplace=True)
df.isnull().any()
```

```
Duration    False
Pulse       False
Maxpulse    False
Calories    False
dtype: bool
```

4. Select at least two columns and aggregate the data using: min, max, count, mean

```
#4. Select at least two columns and aggregate the data using: min, max, count, mean
df.agg({'Duration':['min','max','count','mean'],'Pulse':['min','max','count','mean']})
```

	Duration	Pulse
min	15.000000	80.000000
max	300.000000	159.000000
count	169.000000	169.000000
mean	63.846154	107.461538

5. Filter the dataframe to select the rows with calories values between 500 and1000

```
#5. Filter the dataframe to select the rows with calories values between 500 and1000
df.loc[(df['Calories']>500)&(df['Calories']<1000)]
```

	Duration	Pulse	Maxpulse	Calories
51	80	123	146	643.1
62	160	109	135	853.0
65	180	90	130	800.4
66	150	105	135	873.4
67	150	107	130	816.0
72	90	100	127	700.0
73	150	97	127	953.2
75	90	98	125	563.2
78	120	100	130	500.4
90	180	101	127	600.1
99	90	93	124	604.1
103	90	90	100	500.4
106	180	90	120	800.3
108	90	90	120	500.3

6.Filter the dataframe to select the rows with calories values > 500 and pulse <100

```python
#6. Filter the dataframe to select the rows with calories values > 500 and pulse < 100.
df.loc[(df['Calories']>500)&(df['Pulse']<100)]
```

	Duration	Pulse	Maxpulse	Calories
65	180	90	130	800.4
70	150	97	129	1115.0
73	150	97	127	953.2
75	90	98	125	563.2
99	90	93	124	604.1
103	90	90	100	500.4
106	180	90	120	800.3
108	90	90	120	500.3

7. Create a new “df_modified” dataframe that contains all the columns from df except for “Maxpulse”.

```python
#7. Create a new “df_modified” dataframe that contains all the columns from df except for “Maxpulse”.
df_modified = df[['Duration','Pulse','Calories']]
df_modified.head()
```

	Duration	Pulse	Calories
0	60	110	409.1
1	60	117	479.0
2	60	103	340.0
3	45	109	282.4
4	45	117	406.0

8. Delete the “Maxpulse” column from the main df dataframe

```
#8. Delete the "Maxpulse" column from the main df dataframe
del df['MaxPulse']
```

```
[29]
df.head()
```

	Duration	Pulse	Calories
0	60	110	409.1
1	60	117	479.0
2	60	103	340.0
3	45	109	282.4
4	45	117	406.0

9. Convert the datatype of Calories column to int datatype

```
#9. Convert the datatype of Calories column to int datatype.
df.dtypes
```

```
Duration      int64
Pulse         int64
Calories    float64
dtype: object
```

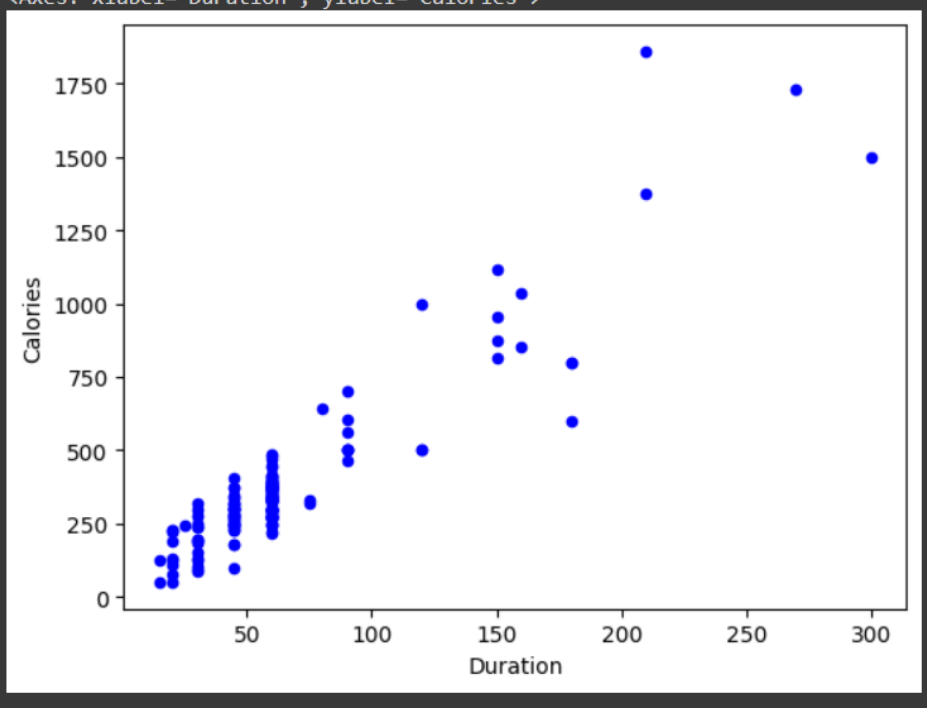
```
[31] df['Calories'] = df['Calories'].astype(np.int64)
     df.dtypes
```

```
Duration    int64
Pulse       int64
Calories    int64
dtype: object
```

10. Using pandas create a scatter plot for the two columns (Duration and Calories)

```
#10. Using pandas create a scatter plot for the two columns (Duration and Calories)
df.plot.scatter(x='Duration',y='Calories',c='blue')
```

```
<Axes: xlabel='Duration', ylabel='Calories'>
```



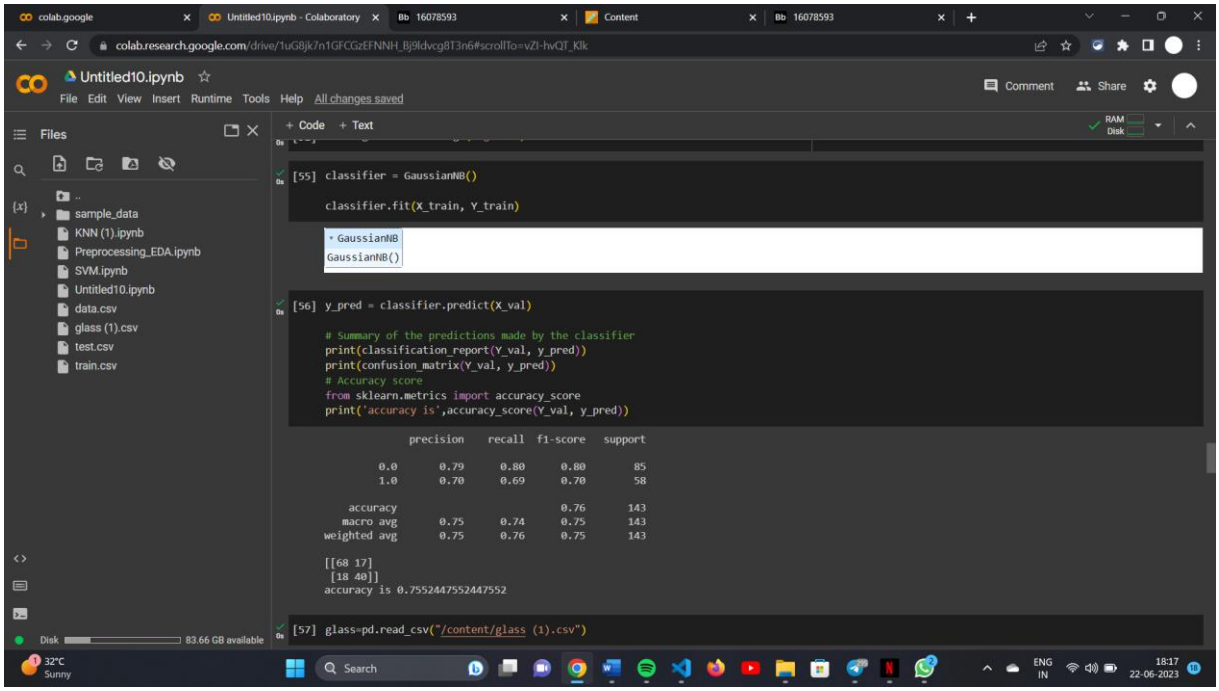
2. Scikit-learn

1. Implement Naïve Bayes method using scikit-learnlibrary.

a. Use the glass dataset available in Link also provided in your assignment.

b. Use train_test_split to create training and testing part.

2. Evaluate the model on testing part using score and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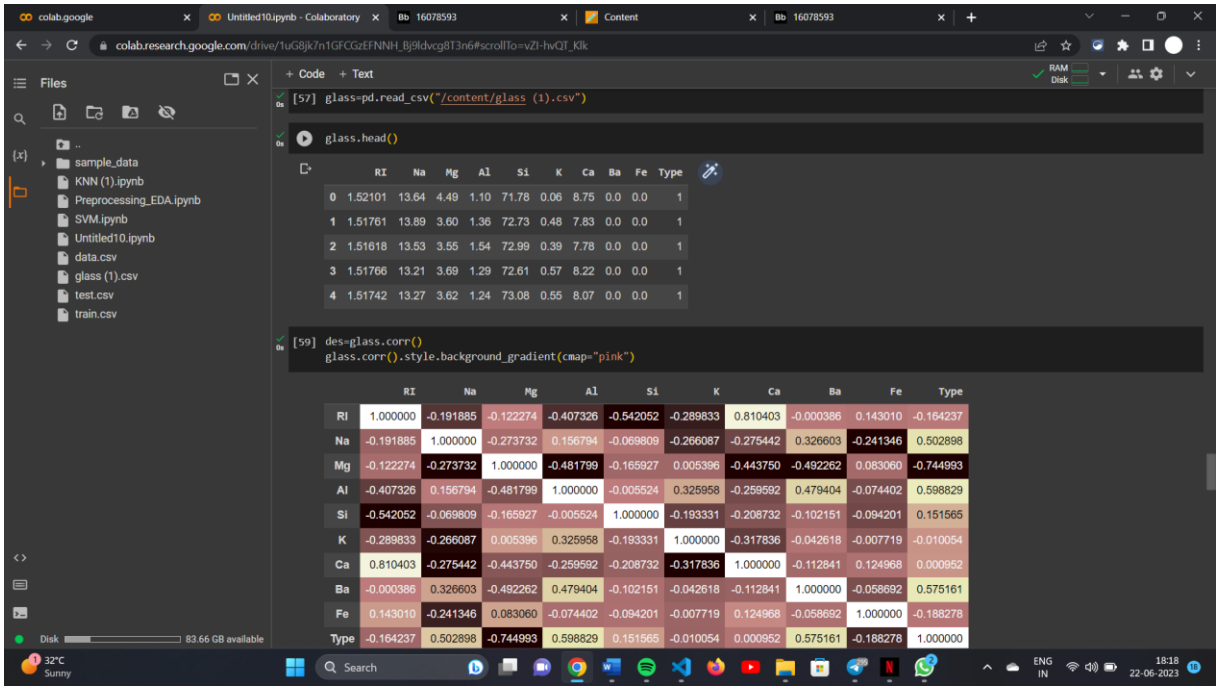
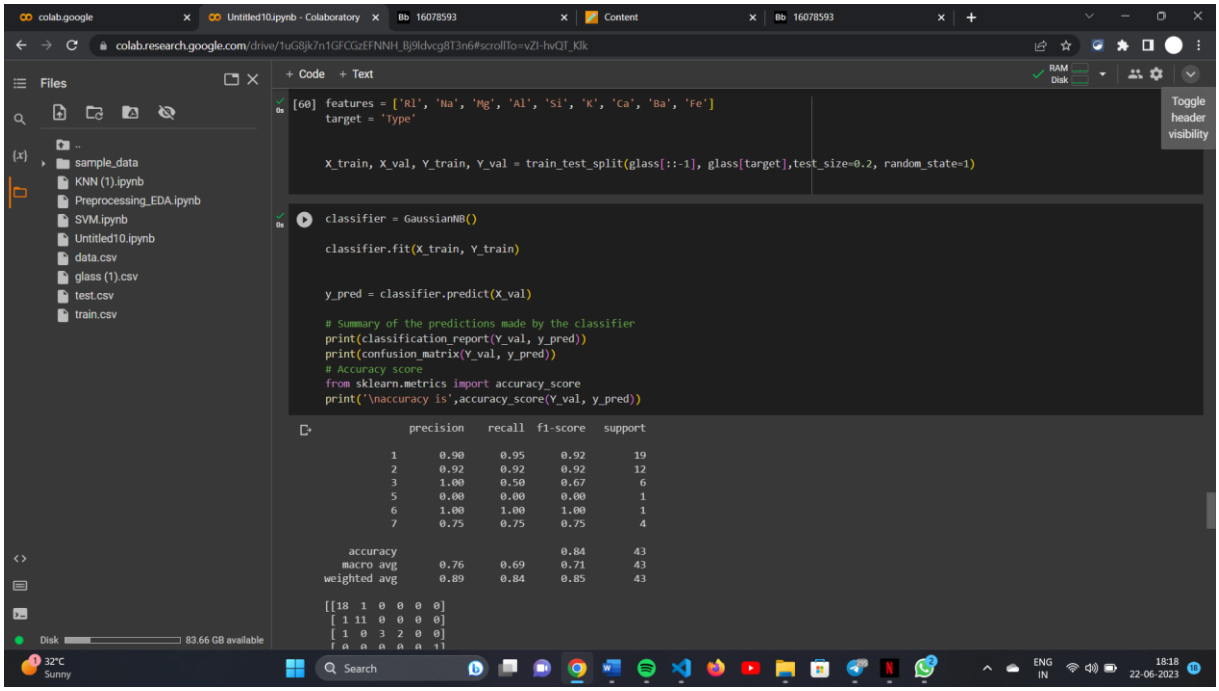
Files
sample_data
KNN (1).ipynb
Preprocessing_EDA.ipynb
SVM.ipynb
Untitled10.ipynb
data.csv
glass (1).csv
test.csv
train.csv
[55] classifier = GaussianNB()
classifier.fit(X_train, Y_train)
GaussianNB
GaussianNB()
[56] y_pred = classifier.predict(X_val)
# Summary of the predictions made by the classifier
print(classification_report(Y_val, y_pred))
print(confusion_matrix(Y_val, y_pred))
# Accuracy score
from sklearn.metrics import accuracy_score
print('accuracy is',accuracy_score(Y_val, y_pred))
precision recall f1-score support
0.0 0.79 0.80 0.80 85
1.0 0.70 0.69 0.70 58
accuracy 0.76 143
macro avg 0.75 0.74 0.75 143
weighted avg 0.75 0.76 0.75 143
[[68 17]
[18 40]]
accuracy is 0.7552447552447552
[57] glass=pd.read_csv("/content/glass (1).csv")


[57] glass=pd.read_csv("/content/glass (1).csv")
glass.head()
RI Na Mg Al Si K Ca Ba Fe Type
0 1.52101 13.64 4.49 1.10 71.78 0.06 8.75 0.0 0.0 1
1 1.51761 13.89 3.60 1.36 72.73 0.48 7.83 0.0 0.0 1
2 1.51618 13.53 3.55 1.54 72.99 0.39 7.78 0.0 0.0 1
3 1.51766 13.21 3.69 1.29 72.61 0.57 8.22 0.0 0.0 1
4 1.51742 13.27 3.62 1.24 73.08 0.55 8.07 0.0 0.0 1
[59] des=glass.corr()
glass.corr().style.background_gradient(cmap="pink")
RI Na Mg Al Si K Ca Ba Fe Type
RI 1.000000 -0.191885 -0.122274 -0.407326 -0.542052 -0.289833 0.810403 -0.000386 0.143010 -0.164237
Na -0.191885 1.000000 -0.273732 0.156794 -0.069809 -0.266087 -0.275442 0.326603 -0.241346 0.502898
Mg -0.122274 -0.273732 1.000000 -0.481799 -0.165927 0.005396 -0.443750 -0.492262 0.083060 -0.744993
Al -0.407326 0.156794 -0.481799 1.000000 -0.005524 0.325958 -0.259592 0.479404 -0.074402 0.598829
Si -0.542052 -0.069809 -0.165927 -0.005524 1.000000 -0.193331 -0.208732 -0.102151 -0.094201 0.151565
K -0.289833 -0.266087 0.005396 0.325958 -0.193331 1.000000 -0.317836 -0.042618 -0.007719 -0.010054
Ca 0.810403 -0.275442 -0.443750 -0.259592 -0.208732 -0.317836 1.000000 -0.112841 0.124968 0.000952
Ba -0.000386 0.326603 -0.492262 0.479404 -0.102151 -0.042618 -0.112841 1.000000 -0.058692 0.575161
Fe 0.143010 -0.241346 0.083060 -0.074402 -0.094201 -0.007719 0.124968 -0.058692 1.000000 -0.188278
Type -0.164237 0.502898 -0.744993 0.598829 0.151565 -0.010054 0.000952 0.575161 -0.188278 1.000000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Files
sample_data
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SVM.ipynb
Untitled10.ipynb
data.csv
glass (1).csv
test.csv
train.csv
+ Code
+ Text
[60] features = ['RI', 'Na', 'Mg', 'Al', 'Si', 'K', 'Ca', 'Ba', 'Fe']
target = 'Type'
X_train, X_val, Y_train, Y_val = train_test_split(glass[::-1], glass[target],test_size=0.2, random_state=1)
classifier = GaussianNB()
classifier.fit(X_train, Y_train)
y_pred = classifier.predict(X_val)
# Summary of the predictions made by the classifier
print(classification_report(Y_val, y_pred))
print(confusion_matrix(Y_val, y_pred))
# Accuracy score
from sklearn.metrics import accuracy_score
print('\naccuracy is',accuracy_score(Y_val, y_pred))
precision recall f1-score support
1 0.90 0.95 0.92 19
2 0.92 0.92 0.92 12
3 1.00 0.50 0.67 6
5 0.00 0.00 0.00 1
6 1.00 1.00 1.00 1
7 0.75 0.75 0.75 4
accuracy 0.84 43
macro avg 0.76 0.69 0.71 43
weighted avg 0.89 0.84 0.85 43
[[18 1 0 0 0 0]
[1 11 0 0 0 0]
[1 0 3 2 0 0]
Disk
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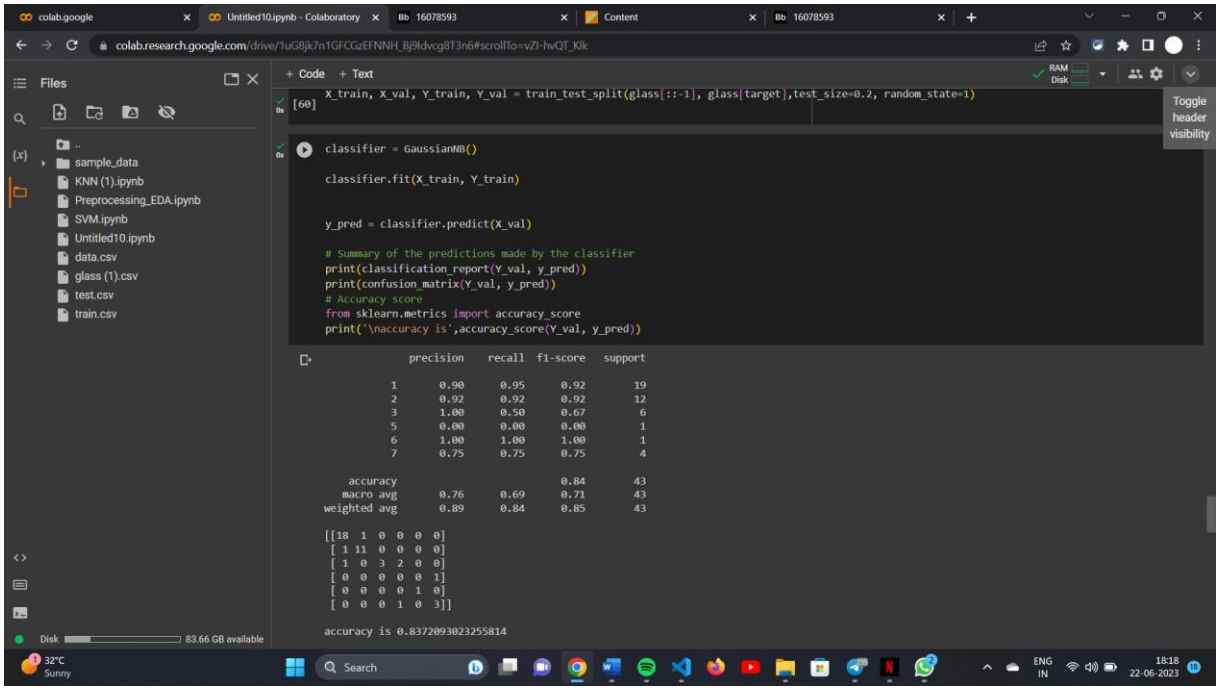
22-06-2023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colab.research.google.com/drive/1uG8jk7n1GFCGzEFNNH_Bj9ldvcg8T3n6#scrollTo=vZI-hvQT_Klk
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2 0.92 0.92 0.92 12
3 1.00 0.50 0.67 6
5 0.00 0.00 0.00 1
6 1.00 1.00 1.00 1
7 0.75 0.75 0.75 4
accuracy 0.84 43
macro avg 0.76 0.69 0.71 43
weighted avg 0.89 0.84 0.85 43
[[18 1 0 0 0 0]
[1 11 0 0 0 0]
[1 0 3 2 0 0]
[0 0 0 0 0 1]
[0 0 0 0 1 0]
[0 0 0 1 0 3]]
accuracy is 0.8372093023255814
Disk
83.66 GB available
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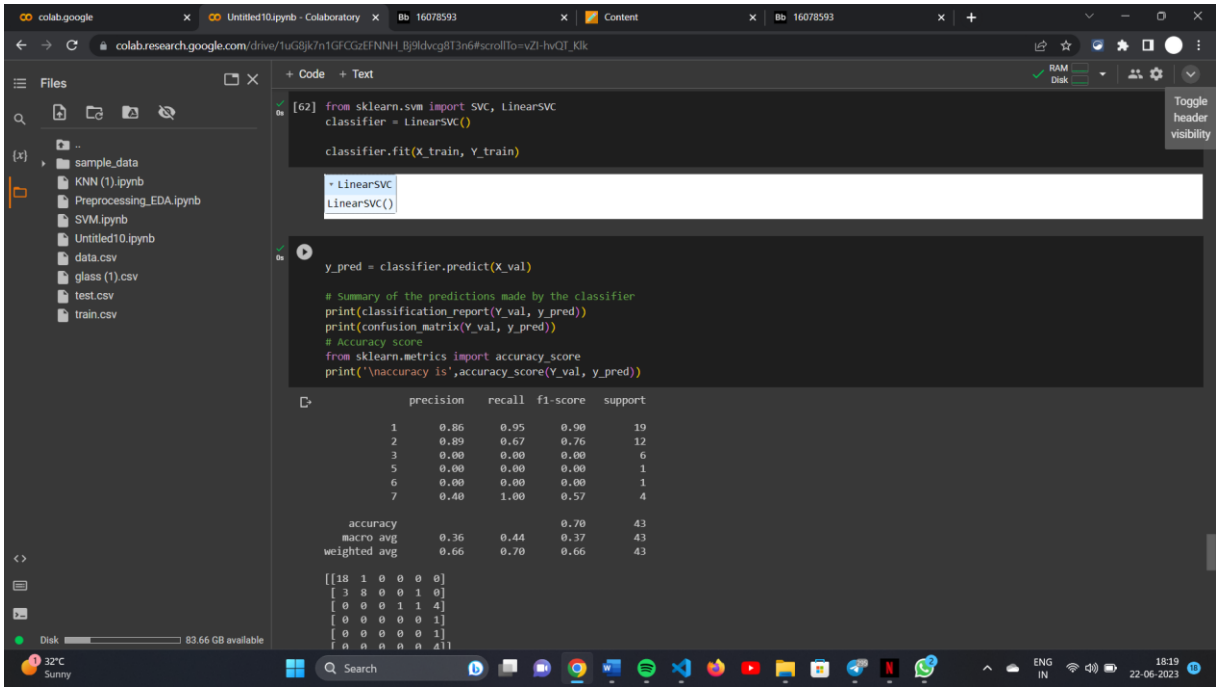
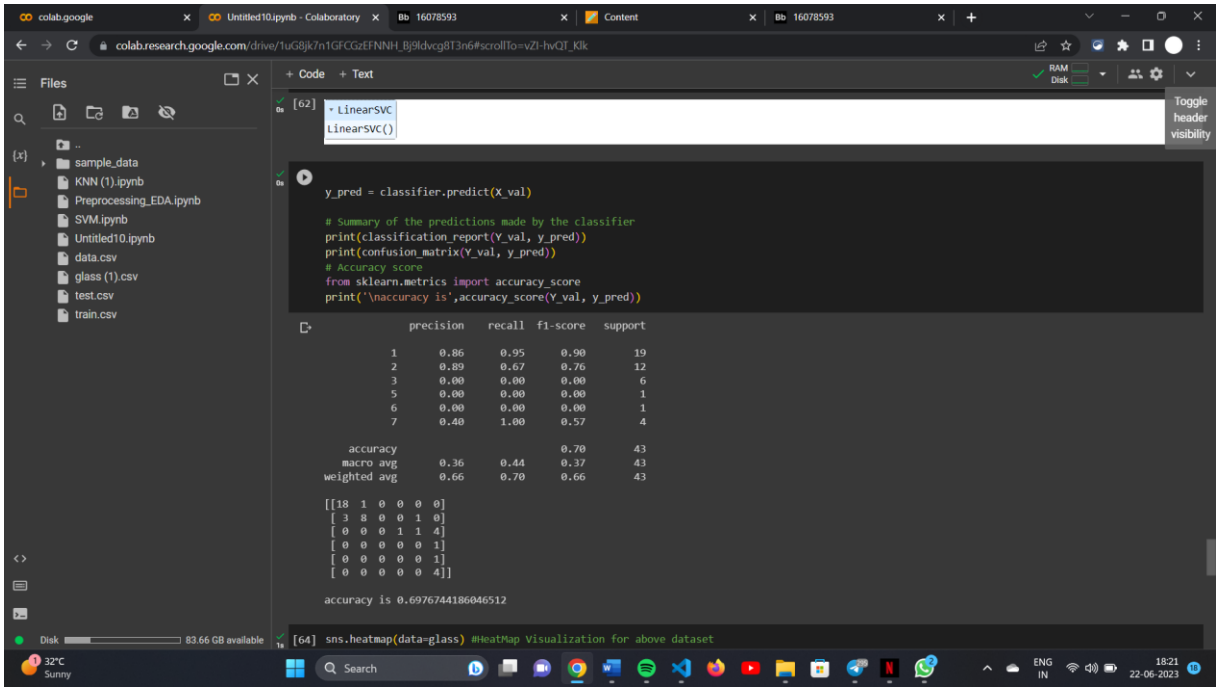
1. Implement linear SVM method using scikit library

a. Use the glass dataset available in Link also provided in your assignment.

b. Use train_test_split to create training and testing part. 2. Evaluate the model on testing part using score and

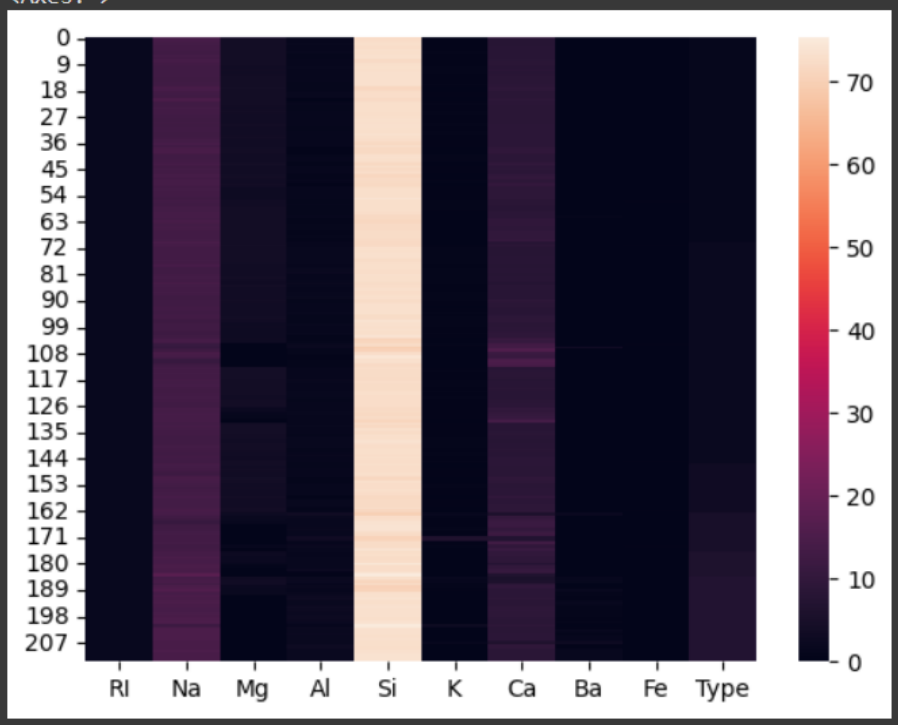




Do at least two visualizations to describe or show correlations in the Glass Dataset

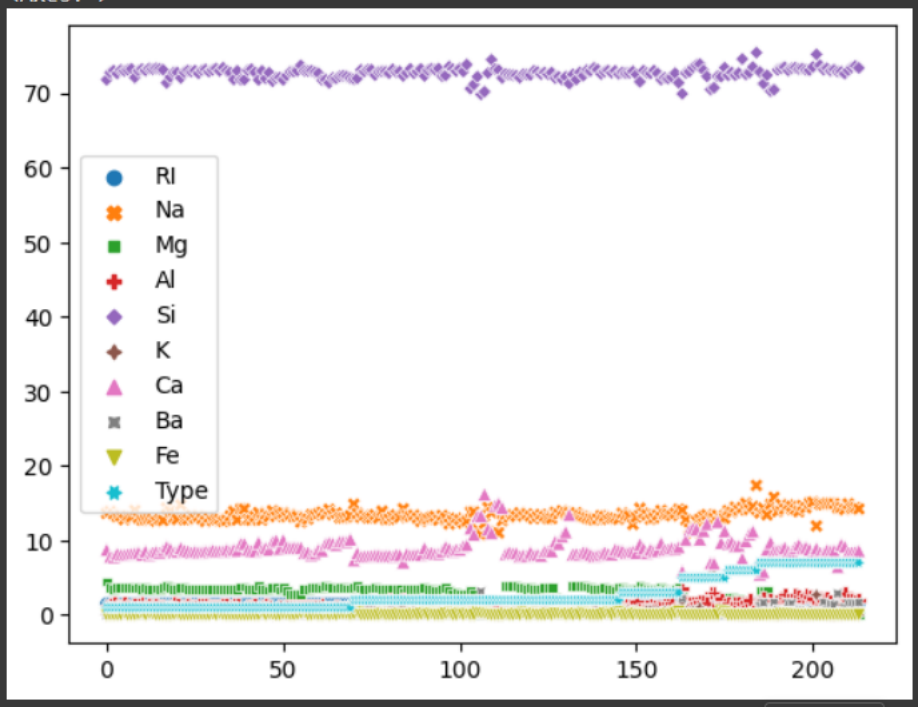
```
[64] sns.heatmap(data=glass) #HeatMap Visualization for above dataset
```

```
<Axes: >
```




```
sns.scatterplot(data=glass)  #ScatterPlot Visualization for above dataset
```

```
<Axes: >
```



- Naïve Bayes classifier got the better accuracy
- Naïve Bayes classifier gives better accuracy because it is fast and space efficient
- It is Not sensitive to irrelevant features.
- On the other side SVM is not efficient on large data.