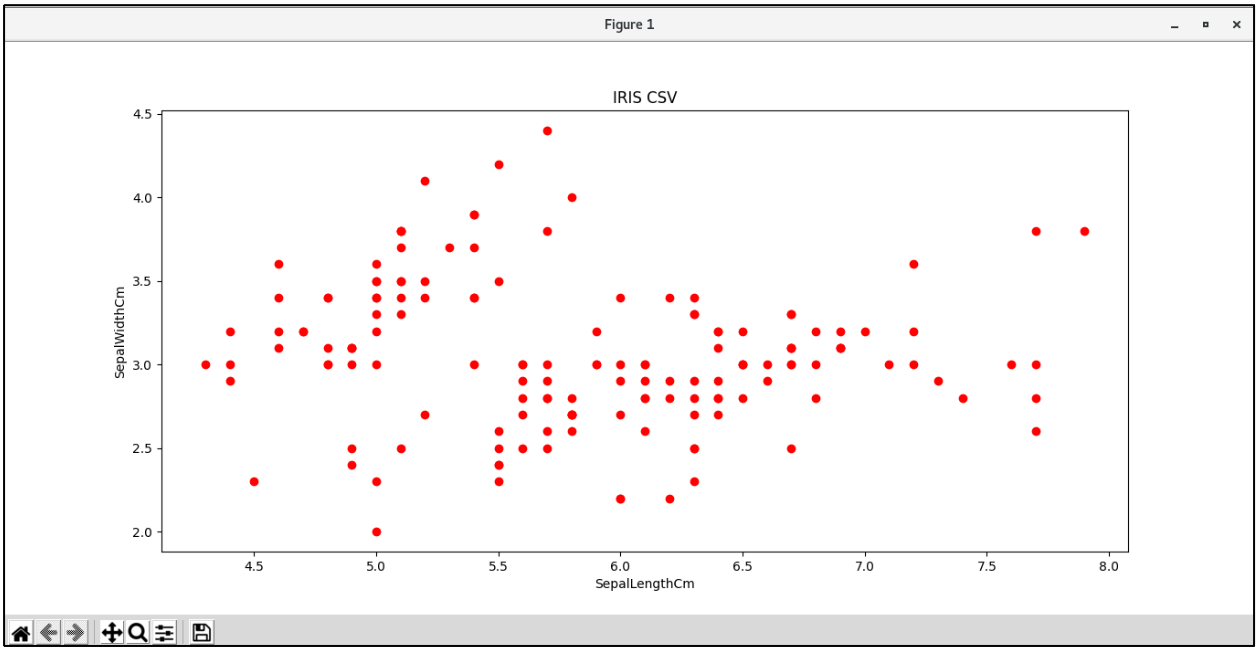
1.Write a python program to Prepare Scatter Plot (Use Forge Dataset / Iris Dataset).

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

data=pd.read_csv("iris.csv")
print(data)

x=data["SepalLengthCm"]
y=data["SepalWidthCm"]
print(x)
print(y)

plt.scatter(x,y,c="red")
plt.title("IRIS CSV")
plt.xlabel("SepalLengthCm")
plt.ylabel("SepalWidthCm")
plt.show()
```

OUTPUT:

```
      Id  SepalLengthCm  ...  PetalWidthCm         Species
0      1            5.1  ...           0.2     Iris-setosa
1      2            4.9  ...           0.2     Iris-setosa
2      3            4.7  ...           0.2     Iris-setosa
3      4            4.6  ...           0.2     Iris-setosa
4      5            5.0  ...           0.2     Iris-setosa
..   ...            ...  ...           ...             ...
145  146            6.7  ...           2.3  Iris-virginica
146  147            6.3  ...           1.9  Iris-virginica
147  148            6.5  ...           2.0  Iris-virginica
148  149            6.2  ...           2.3  Iris-virginica
149  150            5.9  ...           1.8  Iris-virginica

[150 rows x 6 columns]
0      5.1
1      4.9
2      4.7
3      4.6
4      5.0
      ... 
145    6.7
146    6.3
147    6.5
148    6.2
149    5.9
Name: SepalLengthCm, Length: 150, dtype: float64
0      3.5
1      3.0
```

```
2       3.2
3       3.1
4       3.6
       ...
145     3.0
146     2.5
147     3.0
148     3.4
149     3.0
Name: SepalWidthCm, Length: 150, dtype: float64
```



2. Write a python program to find all null values in a given data set and remove them.

```
import pandas as pd
import numpy as np

data=pd.read_csv("ass2_data.csv")
print(data)

print(data.isnull())

print(data.notnull())

data1=data.dropna(axis=0,how="any")
print(data1)

data["m1"]=data["m1"].replace(np.NaN,data["m1"].mean())
data["m2"]=data["m2"].replace(np.NaN,data["m2"].mean())
data["m3"]=data["m3"].replace(np.NaN,data["m3"].mean())
print(data)
```

OUTPUT:

```
     rollno name    m1    m2    m3
0       1  bgs  10.0   NaN  30.0
1       2  cgs  20.0  30.0  40.0
2       3  ngs   NaN  40.0  50.0
3       4  pgs  25.0  35.0  45.0
4       5  ppp  11.0  22.0   NaN
   rollno   name     m1     m2     m3
0   False  False  False   True  False
1   False  False  False  False  False
2   False  False   True  False  False
3   False  False  False  False  False
4   False  False  False  False   True
   rollno  name     m1     m2     m3
0    True  True   True  False   True
1    True  True   True   True   True
2    True  True  False   True   True
3    True  True   True   True   True
4    True  True   True   True  False
   rollno name    m1    m2    m3
1       2  cgs  20.0  30.0  40.0
3       4  pgs  25.0  35.0  45.0
   rollno name    m1     m2     m3
0       1  bgs  10.0  31.75  30.00
1       2  cgs  20.0  30.00  40.00
2       3  ngs  16.5  40.00  50.00
3       4  pgs  25.0  35.00  45.00
4       5  ppp  11.0  22.00  41.25
```

3. Write a python program the Categorical values in numeric format for a given dataset.

```
import pandas as pd
import numpy as np

data=pd.read_csv("ass3_data.csv")
print(data)

x=data.iloc[:,0:1].values
print(x)

from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
x1=le.fit_transform(x)
print(x1)

from sklearn.preprocessing import OneHotEncoder
ohe=OneHotEncoder()
xn=ohe.fit_transform(x).toarray()
print(xn)
```

OUTPUT:

```
      food availbale  price
0  punjabi       yes    100
1  chinese       yes    200
2  punjabi        no    250
3   indian       yes    300
[['punjabi']
 ['chinese']
 ['punjabi']
 ['indian']]

[2 0 2 1]
[[0. 0. 1.]
 [1. 0. 0.]
 [0. 0. 1.]
 [0. 1. 0.]]
```

4. Write a python program to implement simple Linear Regression for predicting house price.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error

data=pd.read_csv("house.csv")
print(data)

x=data[["sqft_living"]]
y=data.price

print(x)
print(y)

plt.scatter(x,y)
plt.xlabel("sqft_living")
plt.ylabel("price")
plt.show()

xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.2)
print(xtrain)
print(xtest)
print(ytrain)
print(ytest)

lr=LinearRegression()
lr.fit(xtrain,ytrain)

print(lr.intercept_)
print(lr.coef_)

print(lr.predict([[1000]]))


ypred=lr.predict(xtest)
cm=mean_absolute_error(ytest,ypred)
print(cm)
```

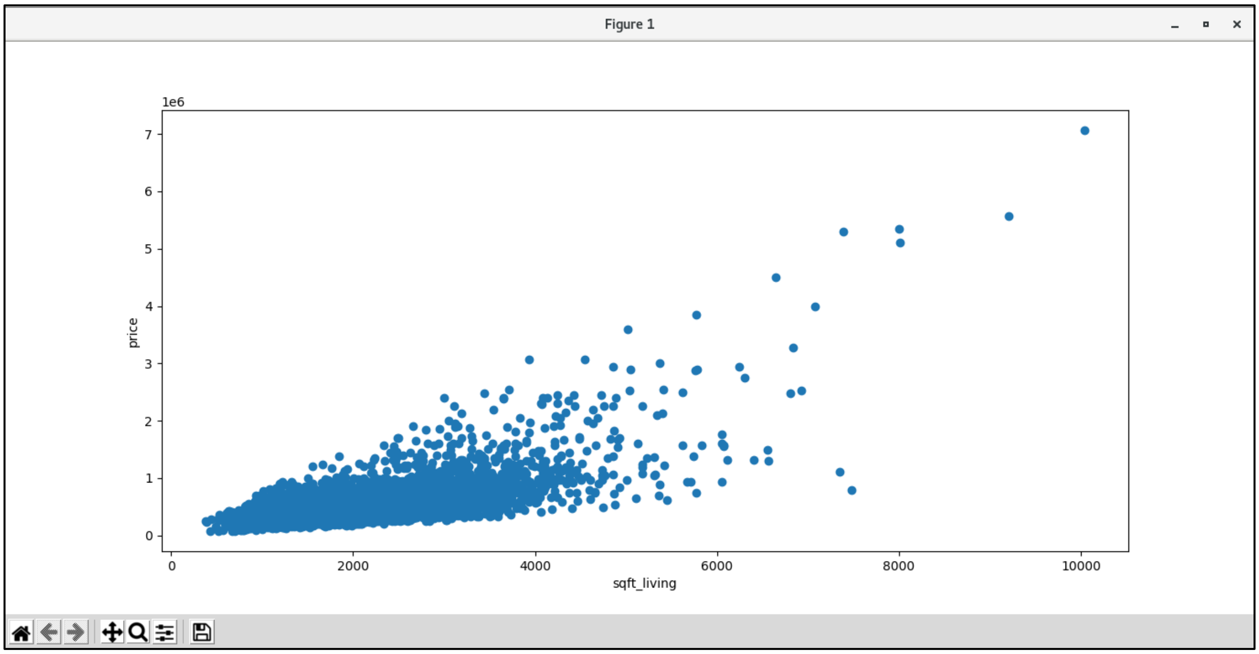
OUTPUT:

```
     id         date     price  ...     long  sqft_living15  sqft_lot15
0     7129300520  20141013T000000  221900.0  ... -122.257           1340
5650
```

```
1     6414100192  20141209T000000  538000.0  ... -122.319           1690
7639
2     5631500400  20150225T000000  180000.0  ... -122.233           2720
8062
3     2487200875  20141209T000000  604000.0  ... -122.393           1360
5000
4     1954400510  20150218T000000  510000.0  ... -122.045           1800
7503
...          ...              ...       ...  ...      ...            ...
...
4995  3583400130  20141014T000000  692500.0  ... -122.256           2290
10700
4996  7230400430  20140930T000000  322400.0  ... -122.100           1990
20359
4997  7140600190  20140905T000000  233500.0  ... -122.214           1400
10658
4998  6817801410  20140624T000000  400000.0  ... -122.034           1570
11517
4999  6430500010  20140620T000000  547000.0  ... -122.350           1300
4080

[5000 rows x 21 columns]
      sqft_living
0            1180
1            2570
2             770
3            1960
4            1680
...           ...
4995         3420
4996         1710
4997         1580
4998         1230
4999         2200

[5000 rows x 1 columns]
0       221900.0
1       538000.0
2       180000.0
3       604000.0
4       510000.0
          ...
4995    692500.0
4996    322400.0
4997    233500.0
4998    400000.0
4999    547000.0
Name: price, Length: 5000, dtype: float64
      sqft_living
1950         1480
480          1700
```

```
2811         3915
677          1120
2589          980
...           ...
4835          970
2070         3240
59           1850
3309          640
1851         2230

[4000 rows x 1 columns]
      sqft_living
2222         2300
4491         4180
1987         2820
4508         1420
950          1410
...           ...
404          1820
1964         1340
477          1050
3559         1270
2788         1620

[1000 rows x 1 columns]
1950    483945.0
480     378500.0
2811    963990.0
677     188000.0
2589    134000.0
          ...
4835    219000.0
2070    370000.0
59      430000.0
3309    426000.0
1851    500000.0
Name: price, Length: 4000, dtype: float64
2222     453000.0
4491     673200.0
1987    1600000.0
4508     413107.0
950      435000.0
          ...
404      322500.0
1964     252000.0
477      438924.0
3559     540000.0
2788     545000.0
Name: price, Length: 1000, dtype: float64
-44954.11263401585
[283.06052059]
```

```
[238106.40795892]
190467.21975274026
```



5. Write a python program to implement multiple Linear Regression for a given dataset.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error

data=pd.read_csv("house.csv")
print(data)

x=data[["bedrooms","sqft_living"]]
y=data.price

print(x)
print(y)


xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.2)
print(xtrain)
print(xtest)
print(ytrain)
print(ytest)

lr=LinearRegression()
lr.fit(xtrain,ytrain)

print(lr.intercept_)
print(lr.coef_)

print(lr.predict([[2,1000]]))


ypred=lr.predict(xtest)
cm=mean_absolute_error(ytest,ypred)
print(cm)
```

OUTPUT:

```
     id       date     price  bedrooms  bathrooms  sqft_living  ...  yr_renovated
zipcode      lat     long  sqft_living15  sqft_lot15
0     7129300520  20141013T000000  221900.0         3       1.00          1180  ...
0    98178  47.5112 -122.257           1340        5650
1     6414100192  20141209T000000  538000.0         3       2.25          2570  ...
1991    98125  47.7210 -122.319           1690        7639
2     5631500400  20150225T000000  180000.0         2       1.00           770  ...
0    98028  47.7379 -122.233           2720        8062
3     2487200875  20141209T000000  604000.0         4       3.00          1960  ...
0    98136  47.5208 -122.393           1360        5000
4     1954400510  20150218T000000  510000.0         3       2.00          1680  ...
0    98074  47.6168 -122.045           1800        7503
...          ...              ...       ...       ...        ...          ...  ...
...      ...      ...      ...            ...         ...
4995  3583400130  20141014T000000  692500.0         3       2.25          3420  ...
2004    98028  47.7412 -122.256           2290       10700
4996  7230400430  20140930T000000  322400.0         3       1.75          1710  ...
0    98059  47.4706 -122.100           1990       20359
4997  7140600190  20140905T000000  233500.0         3       1.50          1580  ...
0    98002  47.2903 -122.214           1400       10658
4998  6817801410  20140624T000000  400000.0         3       2.00          1230  ...
0    98074  47.6321 -122.034           1570       11517
4999  6430500010  20140620T000000  547000.0         5       2.50          2200  ...
0    98103  47.6872 -122.350           1300        4080

[5000 rows x 21 columns]
      bedrooms  sqft_living
0            3         1180
1            3         2570
2            2          770
3            4         1960
4            3         1680
...        ...          ...
4995         3         3420
4996         3         1710
4997         3         1580
4998         3         1230
4999         5         2200

[5000 rows x 2 columns]
0       221900.0
1       538000.0
2       180000.0
3       604000.0
4       510000.0
          ...
4995    692500.0
4996    322400.0
4997    233500.0
4998    400000.0
```

```
4999    547000.0
Name: price, Length: 5000, dtype: float64
      bedrooms  sqft_living
1583         4         2590
1267         3         1240
1816         4         1780
3375         2         1060
3844         3         1540
...        ...          ...
4390         1          820
4309         2         2330
3286         3         1330
2109         3         1790
3853         4         2820

[4000 rows x 2 columns]
      bedrooms  sqft_living
936          4         2790
2331         3          770
2759         3         1350
1536         5         2980
3757         3         2260
...        ...          ...
3975         2          990
179          2         1350
1608         3         2110
1523         3          970
2446         5         3880

[1000 rows x 2 columns]
1583    1175000.0
1267     340000.0
1816     587500.0
3375     356000.0
3844     216650.0
          ...
4390     527550.0
4309     535000.0
3286     180000.0
2109     307000.0
3853    1075000.0
Name: price, Length: 4000, dtype: float64
936      378000.0
2331     307000.0
2759     172000.0
1536     932800.0
3757     625000.0
          ...
3975     210000.0
179      330000.0
1608     285000.0
```

```
1523     170000.0
2446    1126000.0
Name: price, Length: 1000, dtype: float64
85056.52244579763
[-69169.7759704     333.51889927]
[280235.86977759]
173209.9118546618
```

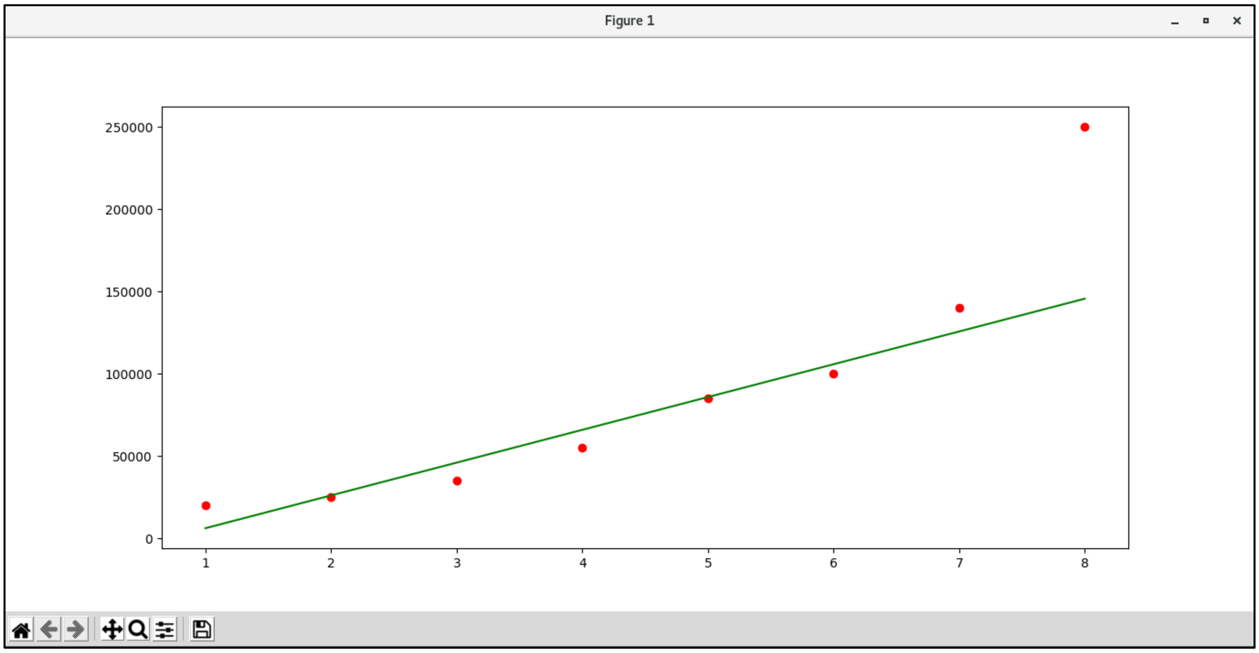
6. Write a python program to implement Polynomial Regression for given dataset.

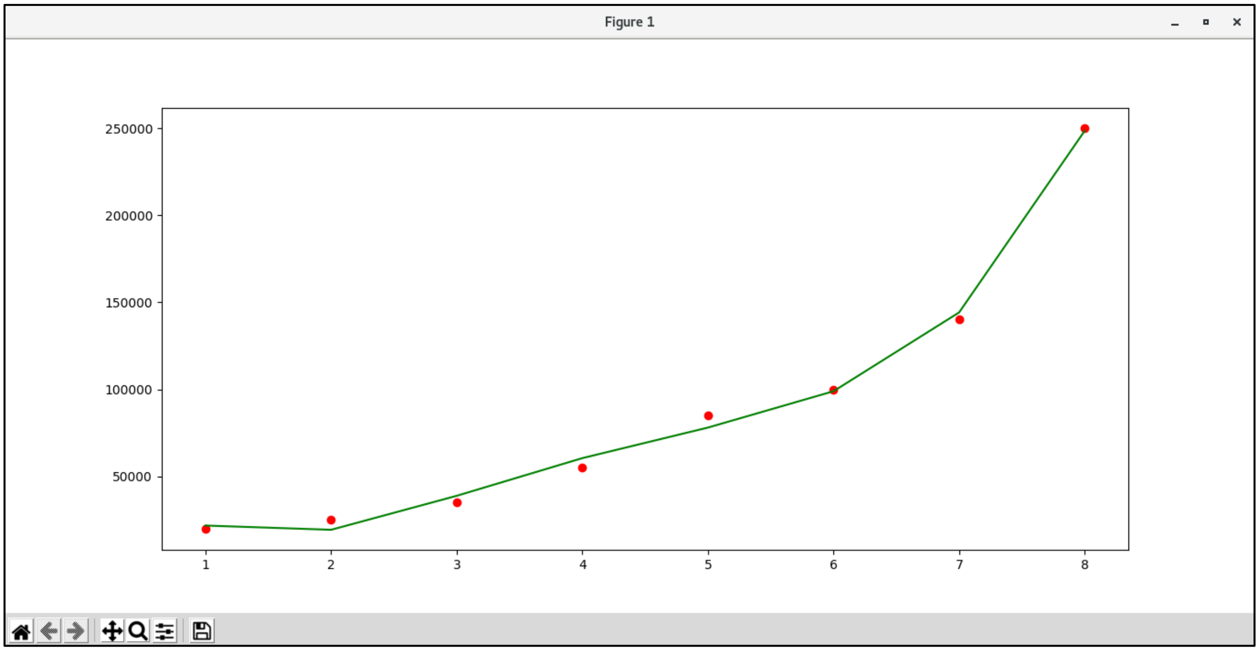
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression

data=pd.read_csv("ass6_data.csv")
print(data)

x=data.iloc[:,1:2].values
y=data.iloc[:,2].values

print(x)
print(y)

from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.25)

lr=LinearRegression()
lr.fit(xtrain,ytrain)
ypred=lr.predict(xtest)

plt.scatter(x,y,c="red")
plt.plot(x,lr.predict(x),c="green")
plt.show()

from sklearn.preprocessing import PolynomialFeatures
pr=PolynomialFeatures(degree=4)
xpoly=pr.fit_transform(x)
poreg=LinearRegression()
poreg.fit(xpoly,y)

plt.scatter(x,y,c="red")
plt.plot(x,poreg.predict(pr.fit_transform(x)),c="green")
plt.show()


print(lr.predict([[5.5]]))
print(poreg.predict(pr.fit_transform([[5.5]])))
```

OUTPUT:

```
     designation  level  salary
0        peon      1   20000
1    jr_clerk      2   25000
2    sr_clerk      3   35000
```

```
3   accountant      4   55000
4           os      5   85000
5      ass_pro      6  100000
6    asso_prof      7  140000
7         prof      8  250000
[[1]
 [2]
 [3]
 [4]
 [5]
 [6]
 [7]
 [8]]
[ 20000  25000  35000  55000  85000 100000 140000 250000]
```





7. Write a python program to Implement Naïve Bayes.

```
import numpy as np
import pandas as pd
data=pd.read_csv("user_data1.csv")
print(data)
x=data.iloc[:,[2,4]].values
y=data.iloc[:,4].values

from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.05)
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
xtrain=sc.fit_transform(xtrain)
xtest=sc.fit_transform(xtest)

from sklearn.naive_bayes import GaussianNB
gb=GaussianNB()
gb.fit(xtrain,ytrain)
ypred=gb.predict(xtest)
print(ytest)
print(ypred)
from sklearn.metrics import confusion_matrix
cm=confusion_matrix(ytest,ypred)
print(cm)
```

OUTPUT:

```
0    15624510    Male   19            19000         0
1    15810944    Male   35            20000         0
2    15668575  Female   26            43000         0
3    15603246  Female   27            57000         0
4    15804002    Male   19            76000         0
..        ...     ...  ...              ...       ...
395  15691863  Female   46            41000         1
396  15706071    Male   51            23000         1
397  15654296  Female   50            20000         1
398  15755018    Male   36            33000         0
399  15594041  Female   49            36000         1

[400 rows x 5 columns]
[0 0 0 1 0 1 0 1 0 0 0 0 0 1 0 1 1 1 1 0]
[0 0 0 1 0 1 0 1 0 0 0 0 0 1 0 1 1 1 1 0]
[[12  0]
 [ 0  8]]
```

8.Write a python program to Implement Decision Tree whether or not to play tennis.

```
import pandas as pd
import numpy as np
from sklearn.tree import DecisionTreeClassifier
from sklearn.preprocessing import LabelEncoder

data=pd.read_csv("tennis.csv")
print(data)

le=LabelEncoder()
data["Outlook"]=le.fit_transform(data["Outlook"])
data["Temprature"]=le.fit_transform(data["Temprature"])
data["Humidity"]=le.fit_transform(data["Humidity"])
data["Wind"]=le.fit_transform(data["Wind"])
data["Play_Tennis"]=le.fit_transform(data["Play_Tennis"])
print(data)

x=data.iloc[:,1:5].values
y=data["Play_Tennis"]
print(x)
print(y)

from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.4)

dc=DecisionTreeClassifier(criterion="entropy")
dc.fit(xtrain,ytrain)
ypred=dc.predict(xtest)

from sklearn.metrics import confusion_matrix
cm=confusion_matrix(ytest,ypred)
print(cm)

from sklearn.tree import export_graphviz
export_graphviz(dc,out_file="abc.dat")

from sklearn.metrics import accuracy_score
print("accuracy:",accuracy_score(ytest,ypred))
```

OUTPUT:

```
    Day   Outlook Temprature Humidity    Wind Play_Tennis
0    D1     Sunny        Hot     High    Weak          No
1    D2     Sunny        Hot     High  Strong          No
2    D3  Overcast        Hot     High    Weak         Yes
3    D4      Rain       Mild     High    Weak         Yes
4    D5      Rain       Cool   Normal    Weak         Yes
5    D6      Rain       Cool   Normal  Strong          No
6    D7  Overcast       Cool   Normal  Strong         Yes
7    D8     Sunny       Mild     High    Weak          No
8    D9     Sunny       Cool   Normal    Weak         Yes
9   D10      Rain       Mild   Normal    Weak         Yes
10  D11     Sunny       Mild   Normal  Strong         Yes
11  D12  Overcast       Mild     High  Strong         Yes
12  D13  Overcast        Hot   Normal    Weak         Yes
13  D14      Rain       Mild     High  Strong          No
    Day  Outlook  Temprature  Humidity  Wind  Play_Tennis
0    D1        2           1         0     1            0
1    D2        2           1         0     0            0
2    D3        0           1         0     1            1
3    D4        1           2         0     1            1
4    D5        1           0         1     1            1
5    D6        1           0         1     0            0
6    D7        0           0         1     0            1
7    D8        2           2         0     1            0
8    D9        2           0         1     1            1
9   D10        1           2         1     1            1
10  D11        2           2         1     0            1
11  D12        0           2         0     0            1
12  D13        0           1         1     1            1
13  D14        1           2         0     0            0
[[2 1 0 1]
 [2 1 0 0]
 [0 1 0 1]
 [1 2 0 1]
 [1 0 1 1]
 [1 0 1 0]
 [0 0 1 0]
 [2 2 0 1]
 [2 0 1 1]
 [1 2 1 1]
 [2 2 1 0]
 [0 2 0 0]
 [0 1 1 1]
 [1 2 0 0]]
0     0
1     0
2     1
3     1
4     1
5     0
```

```
6     1
7     0
8     1
9     1
10    1
11    1
12    1
13    0
Name: Play_Tennis, dtype: int64
[[0 1]
 [2 3]]
accuracy: 0.5
```

9. Write a python program to implement linear SVM.

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

data=pd.read_csv("user_data1.csv")
x=data.iloc[:,2:3].values
y=data.iloc[:,3].values
print(x)
print(y)

from sklearn.preprocessing import StandardScaler
sc_x=StandardScaler()
x=sc_x.fit_transform(x)


from sklearn.svm import SVR
reg=SVR()
reg.fit(x,y)

y_pred=reg.predict(np.array([[35]]))
print(y_pred)

x_grid=np.arange(min(x),max(x),0.01)
x_grid=x_grid.reshape(len(x_grid),1)

plt.scatter(x,y,c="red")
plt.plot(x_grid,reg.predict(x_grid),c="green")
plt.show()
```

OUTPUT:

```
[19] [26] [45] [31] [35] [26] [47] [27] [26] [20] [48] [21] [27] [32] [45] [28]
[19] [18] [46] [27] [29] [47] [27] [47] [49] [32] [45] [47] [25] [46] [29] [35]
[48] [31] [27] [35] [33] [30] [26] [27] [27] [33] [35] [30] [28] [23] [25] [27]
[30] [31] [24] [18] [29] [35] [27] [24] [23] [28] [22] [32] [27] [25] [23] [32]
[59] [24] [24] [23] [22] [31] [25] [24] [20] [33] [32] [34] [18] [22] [28] [26]
[30] [39] [20] [35] [30] [31] [24] [28] [26] [35] [22] [30] [26] [29] [29] [35]
[35] [28] [35] [28] [27] [28] [32] [33] [19] [21] [26] [27] [26] [38] [39] [37]
[38] [37] [42] [40] [35] [36] [40] [41] [36] [37] [40] [35] [41] [39] [42] [26]
[30] [26] [31] [33] [30] [21] [28] [23] [20] [30] [28] [19] [19] [18] [35] [30]
[34] [24] [27] [41] [29] [20] [26] [41] [31] [36] [40] [31] [46] [29] [26] [32]
[32] [25] [37] [35] [33] [18] [22] [35] [29] [29] [21] [34] [26] [34] [34] [23]
[35] [25] [24] [31] [26] [31] [32] [33] [33]][31] [20] [33] [35] [28] [24] [19]
[29] [19] [28] [34] [30] [20] [26] [35] [35] [49] [39] [41] [58] [47] [55] [52]
[40] [46] [48] [52] [59] [35] [47] [60] [49] [40] [46] [59] [41] [35] [37] [60]
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  74000 137000  16000  44000  90000  27000  28000  49000  72000  31000
  17000  51000 108000  15000  84000  20000  79000  54000 135000  89000
  32000  44000  83000  23000  58000  55000  48000  79000  18000 117000
  20000  87000  66000 120000  83000  58000  19000  82000  63000  68000
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  58000  31000  87000  68000  55000  63000  82000 107000  59000  25000
  85000  68000  59000  89000  25000  89000  96000  30000  61000  74000
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 100000  90000  33000  38000  69000  86000  55000  71000 148000  47000
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  16000  71000 117000  43000  60000  66000  82000  41000  72000  32000
  84000  26000  43000  70000  89000  43000  79000  36000  80000  22000
  39000  74000 134000  71000 101000  47000 130000 114000 142000  22000
  96000 150000  42000  58000  43000 108000  65000  78000  96000 143000
  80000  91000 144000 102000  60000  53000 126000 133000  72000  80000
 147000  42000 107000  86000 112000  79000  57000  80000  82000 143000
 149000  59000  88000 104000  72000 146000  50000 122000  52000  97000
  39000  52000 134000 146000  44000  90000  72000  57000  95000 131000
  77000 144000 125000  72000  90000 108000  75000  74000 144000  61000
 133000  76000  42000 106000  26000  74000  71000  88000  38000  36000
  88000  61000  70000  21000 141000  93000  62000 138000  79000  78000
 134000  89000  39000  77000  57000  63000  73000 112000  79000 117000
  38000  74000 137000  79000  60000  54000 134000 113000 125000  50000
  70000  96000  50000 141000  79000  75000 104000  55000  32000  60000
 138000  82000  52000  30000 131000  60000  72000  75000 118000 107000
  51000 119000  65000  65000  60000  54000 144000  79000  55000 122000
 104000  75000  65000  51000 105000  63000  72000 108000  77000  61000
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 129000  34000  50000  79000 104000  29000  47000  88000  71000  26000
  46000  83000  73000 130000  80000  32000  74000  53000  87000  23000
  64000  33000 139000  28000  33000  60000  39000  71000  34000  35000
  33000  23000  45000  42000  59000  41000  23000  20000  33000  36000]
[69993.44915575]
```
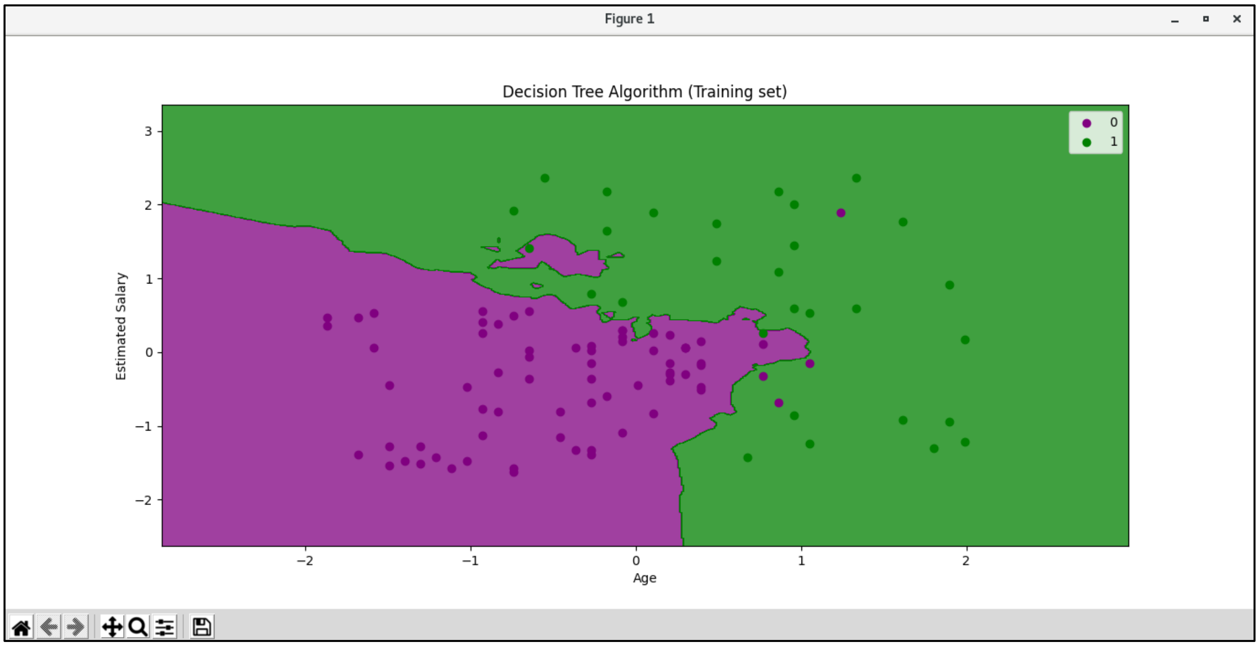

10. Write a python program to implement k-nearest Neighbors ML algorithm to build prediction model (Use Forge Dataset)

```
import pandas as pd
import numpy as nm
import matplotlib.pyplot as mtp

data=pd.read_csv("user_data1.csv")
print(data)

x=data.iloc[:,2:4].values
y=data.iloc[:,4].values

from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.25)

from sklearn.preprocessing import StandardScaler

sc=StandardScaler()
xtrain=sc.fit_transform(xtrain)
xtest=sc.transform(xtest)

from sklearn.neighbors import KNeighborsClassifier
reg1=KNeighborsClassifier(n_neighbors=5)
reg1.fit(xtrain,ytrain)

ypred=reg1.predict(xtest)

from sklearn.metrics import confusion_matrix

cs=confusion_matrix(ytest,ypred)
print(cs)


from matplotlib.colors import ListedColormap
x_set, y_set = xtest, ytest
x1, x2 = nm.meshgrid(nm.arange(start = x_set[:, 0].min() - 1, stop = x_set[:,
0].max() + 1, step  =0.01),
nm.arange(start = x_set[:, 1].min() - 1, stop = x_set[:, 1].max() + 1, step =
0.01))
mtp.contourf(x1, x2, reg1.predict(nm.array([x1.ravel(),
x2.ravel()]).T).reshape(x1.shape),
alpha = 0.75, cmap = ListedColormap(('purple','green' )))
mtp.xlim(x1.min(), x1.max())
mtp.ylim(x2.min(), x2.max())
for i, j in enumerate(nm.unique(y_set)):
     mtp.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1],c
=ListedColormap(('purple', 'green'))(i), label = j)
mtp.title('Decision Tree Algorithm (Training set)')
mtp.xlabel('Age')
mtp.ylabel('Estimated Salary')
mtp.legend()
mtp.show()
```

OUTPUT:

```
   User ID  Gender  Age  EstimatedSalary  Purchased
0    15624510    Male   19            19000          0
1    15810944    Male   35            20000          0
2    15668575  Female   26            43000          0
3    15603246  Female   27            57000          0
4    15804002    Male   19            76000          0
..        ...     ...  ...              ...        ...
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]
[[67  4]
 [ 2 27]]
```



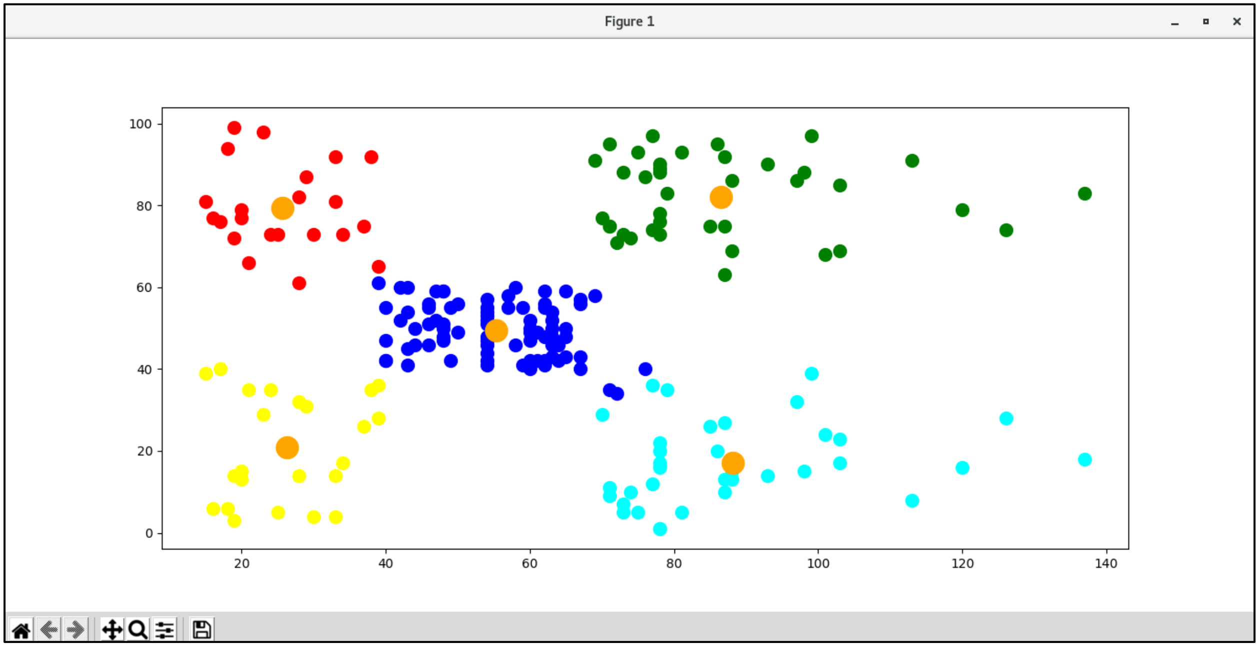
11. Write a python program to implement k-means algorithm on a synthetic dataset.

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
data=pd.read_csv("Mall_data.csv")
print(data)
x=data.iloc[:,[3,4]].values
print(x)
wcss=[]
```

```
for i in range(1,11):
     km=KMeans(n_clusters=i)
     km.fit(x)
     wcss.append(km.inertia_)
plt.plot(range(1,11),wcss)
plt.show()

km=KMeans(n_clusters=5)
y_pred=km.fit_predict(x)

plt.scatter(x[y_pred==0,0],x[y_pred==0,1],s=100,c="blue",label="cluster1")
plt.scatter(x[y_pred==1,0],x[y_pred==1,1],s=100,c="red",label="cluster2")
plt.scatter(x[y_pred==2,0],x[y_pred==2,1],s=100,c="green",label="cluster3")
plt.scatter(x[y_pred==3,0],x[y_pred==3,1],s=100,c="pink",label="cluster4")
plt.scatter(x[y_pred==4,0],x[y_pred==4,1],s=100,c="black",label="cluster5")

plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],s=300,c="yellow",labe
l="centroid")
plt.title("kmenas")
plt.xlabel("Salary")
plt.ylabel("")
plt.show()
```

OUTPUT:

```
     CustomerID  Gender  Age  Annual Income (k$) Spending Score(1-100)
0             1    Male   19                  15                     39
1             2    Male   21                  15                     81
2             3  Female   20                  16                      6
3             4  Female   23                  16                     77
4             5  Female   31                  17                     40
..          ...     ...  ...                 ...                    ...
195         196  Female   35                 120                     79
196         197  Female   45                 126                     28
197         198    Male   32                 126                     74
198         199    Male   32                 137                     18
199         200    Male   30                 137                     83

[200 rows x 5 columns]
     CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100)
0             1    Male   19                  15                      39
1             2    Male   21                  15                      81
2             3  Female   20                  16                       6
3             4  Female   23                  16                      77
4             5  Female   31                  17                      40
..          ...     ...  ...                 ...                     ...
195         196  Female   35                 120                      79
196         197  Female   45                 126                      28
197         198    Male   32                 126                      74
198         199    Male   32                 137                      18
199         200    Male   30                 137                      83

[200 rows x 5 columns]
```



12. Write a python program to implement Agglomerative clustering on a synthetic dataset.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import scipy.cluster.hierarchy as shc

data=pd.read_csv("Mall_data.csv")
print(data)

x=data.iloc[:,[3,4]].values

den=shc.dendrogram(shc.linkage(x,method="ward"))
plt.title("dendogram")
plt.xlabel("cluster")
plt.ylabel("ecludian distance")
plt.show();

from sklearn.cluster import AgglomerativeClustering
ag=AgglomerativeClustering(n_clusters=3)
y_pred=ag.fit_predict(x)

plt.scatter(x[y_pred==0,0],x[y_pred==0,1],s=100,c="red",label="Cluster1")
plt.scatter(x[y_pred==1,0],x[y_pred==1,1],s=100,c="yellow",label="Cluster2")
plt.scatter(x[y_pred==2,0],x[y_pred==2,1],s=100,c="green",label="Cluster3")
plt.show()
```

OUTPUT:

```
     CustomerID  Gender  Age  Annual Income (k$) Spending Score(1-100)
0             1    Male   19                  15                    39
1             2    Male   21                  15                    81
2             3  Female   20                  16                     6
3             4  Female   23                  16                    77
4             5  Female   31                  17                    40
..          ...     ...  ...                 ...                   ...
195         196  Female   35                 120                    79
196         197  Female   45                 126                    28
197         198    Male   32                 126                    74
198         199    Male   32                 137                    18
199         200    Male   30                 137                    83
[200 rows x 5 columns]
```