

**FEDERAL INSTITUTE OF
SCIENCE AND TECHNOLOGY
(FISAT)TM**

HORMIS NAGAR, MOOKKANNOOR

ANGAMALY-683577

‘FOCUS ON EXCELLENCE’

DATA SCIENCE

.....
LABORATORY RECORD

Name: SAFEELA K A

Branch: MASTER OF COMPUTER APPLICATION

Semester: 3

Batch: B

Roll No: 37

**FEDERAL INSTITUTE OF
SCIENCE AND TECHNOLOGY
(FISAT)TM**

HORMIS NAGAR, MOOKKANNOOR

ANGAMALY-683577



‘FOCUS ON EXCELLENCE’

Name : SAFEELA K A

Branch : MASTER OF COMPUTER APPLICATION

Semester : 3

Roll No: 37

University Exam.Reg. N0: FIT20MCA-2095

CERTIFICATE

*This is to certify that this is a Bonafide record of the Practical work done and submitted to Kerala Technological University in partial fulfillment for the award of the Master Of Computer Applications is a record of the original research work done by **SAFEELA K A** in the **DATA SCIENCE** Laboratory of the Federal Institute of Science and Technology during the academic year 2021-2022.*

Signature of Staff in Charge

Name:

Date:

Signature of H.O.D

Name:

Date of University practical examination

Signature of

Internal Examiner

Signature of

External Examiner

CONTENT

SI No	Date :	Name of Experiment:	Page No:	Signature of Staff –In – Charge:
1	19/11/2021	Matrix operations (using vectorization) and transformation using python and SVD using Python	1	
2	30/11/2021	Programs using matplotlib / plotly / bokeh / seaborn for data visualisation.	4	
3	26/11/2021	Programs to handle data using pandas	15	
4	07/12/2021	Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm.	22	
5	14/12/2021	Program to implement Naïve Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm	28	
6	04/01/2022	Program to implement linear and multiple regression techniques using any standard dataset available in the public domain and evaluate its performance.	31	
7	14/01/2022	Program to implement text classification using Support vector machine.	34	

8	21/12/2022	Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm	38	
9	25/01/2022	Program to implement k-means clustering technique using any standard dataset available in the public domain	40	
10	28/01/2022	Programs on feedforward network to classify any standard dataset available in the public domain	45	
11	28/01/2022	Programs on convolutional neural network to classify images from any standard dataset in the public domain.	47	

AIM

1: Matrix operations(using vectorixation) and transformation using python and SVD

CODE:

```
a = np.arange(0,4).reshape((2,2))
b = np.eye(2)
print(np.dot(a,b)) ##Matrix multiplication
```

OUTPUT:

```
[[0. 1.]
 [2. 3.]]
```

CODE:

```
x = np.arange(1,10).reshape(3,3)
print(x)
```

OUTPUT:

```
[[1 2 3]
 [4 5 6]
 [7 8 9]]
```

CODE:

#SVD image compresion

```
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
import numpy as np

img_eg = mpimg.imread("rose.jpg")
plt.imshow(img_eg)
print(img_eg.shape) #Operation results: (800, 1280,3)

#Converting image data into two-dimensional matrix and singular value decomposition
img_temp = img_eg.reshape(800, 1280 * 3)
U,Sigma,VT = np.linalg.svd(img_temp)

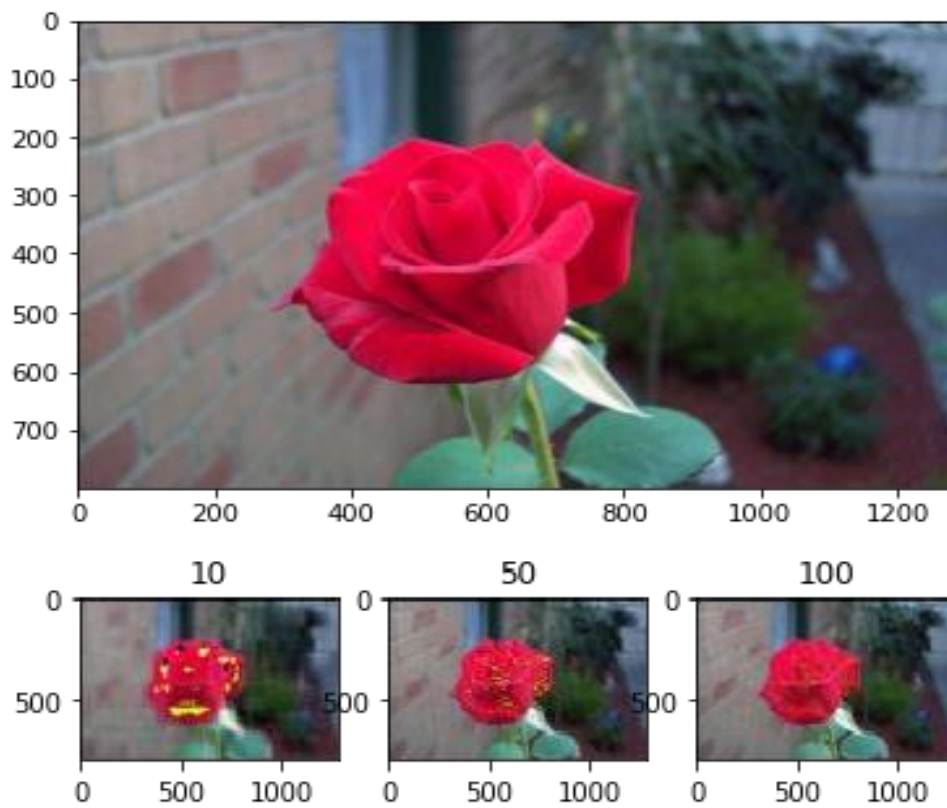
# Take the first 10 singular values
sval_nums = 10
```

```
img_re-
struct1 = (U[:,0:sval_nums]).dot(np.diag(Sigma[0:sval_nums])).dot(VT[0:
sval_nums,:])
img_restruct1 = img_restruct1.reshape(800, 1280, 3)
img_restruct1.tolist()

# Take the first 50 singular values
sval_nums = 50
img_re-
struct2 = (U[:,0:sval_nums]).dot(np.diag(Sigma[0:sval_nums])).dot(VT[0:
sval_nums,:])
img_restruct2 = img_restruct2.reshape(800, 1280, 3)

# Take the first 100 singular values
sval_nums = 100
img_re-
struct3 = (U[:,0:sval_nums]).dot(np.diag(Sigma[0:sval_nums])).dot(VT[0:
sval_nums,:])
img_restruct3 = img_restruct3.reshape(800, 1280, 3)

#Exhibition
fig, ax = plt.subplots(nrows=1, ncols=3)
ax[0].imshow(img_restruct1.astype(np.uint8))
ax[0].set(title = "10")
ax[1].imshow(img_restruct2.astype(np.uint8))
ax[1].set(title = "50")
ax[2].imshow(img_restruct3.astype(np.uint8))
ax[2].set(title = "100")
plt.show()
```


OUTPUT:

AIM

2. Programs using matplotlib / plotly / bokeh / seaborn for data visualisation.

Dataset used: iris.csv

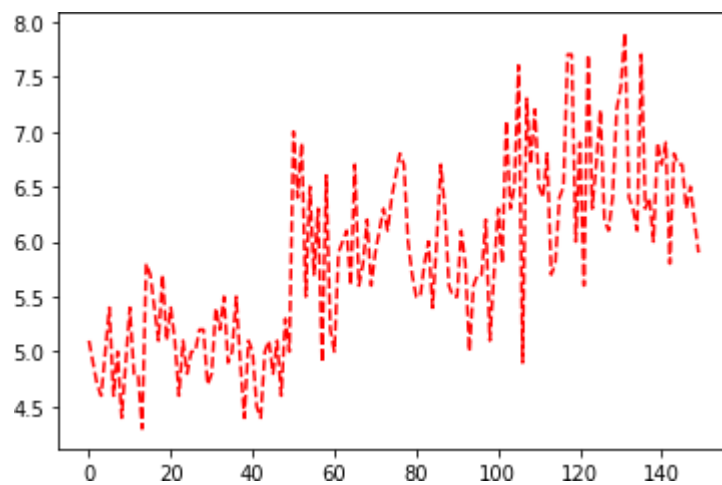
CODE:

```
import pandas as pd
iris = pd.read_csv('iris.csv')
```

```
## Plotting Using Matplotlib
```

```
import matplotlib.pyplot as plt
plt.plot(iris["sepal.length"], "r--")
plt.show
```

OUTPUT:

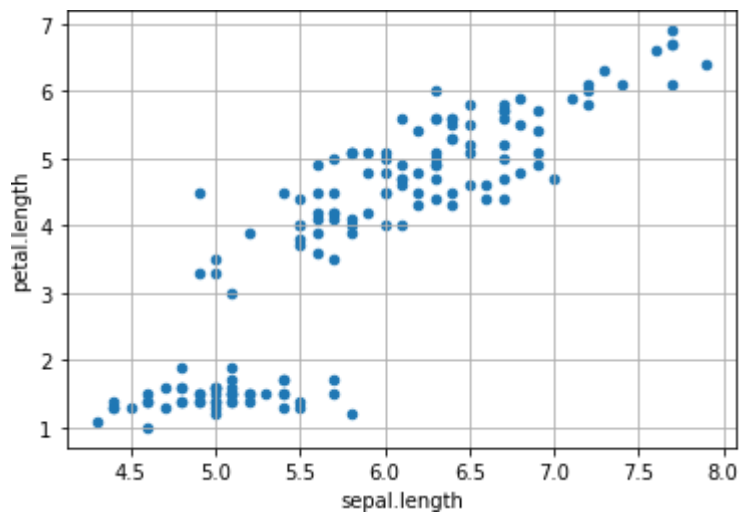


CODE:

```
## Scatter Plot
```

```
iris.plot(kind="scatter",
          x='sepal.length',
          y='petal.length')
plt.grid()
```

OUTPUT:

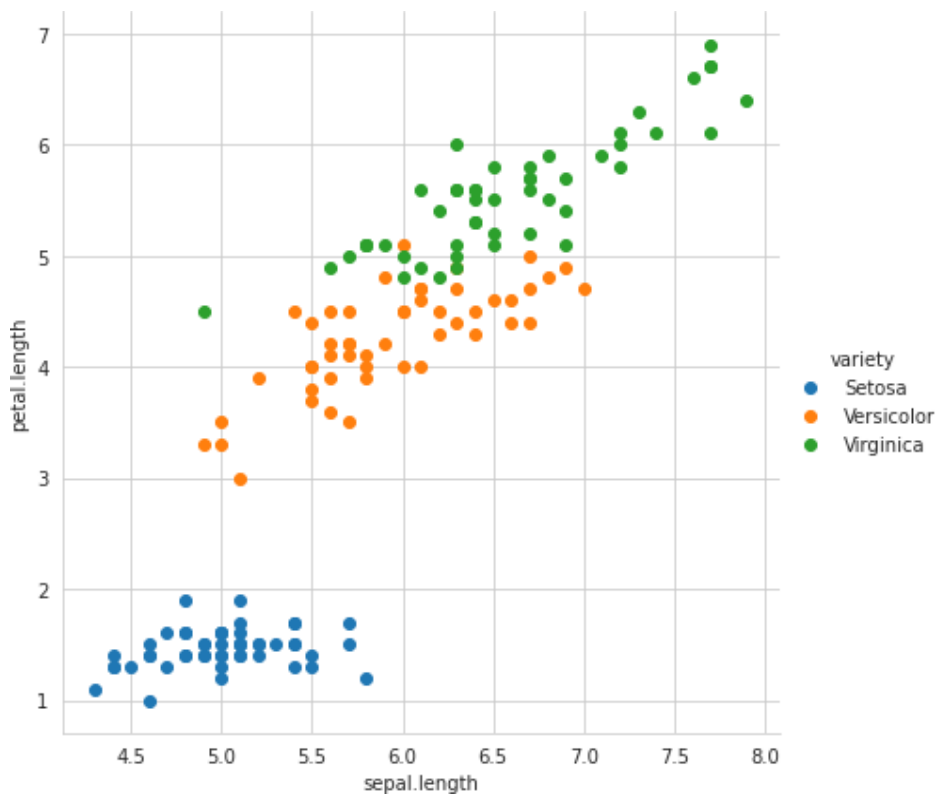


CODE:

```
## Plotting using Seaborn
```

```
import seaborn as sns
sns.set_style("whitegrid")
sns.FacetGrid(iris, hue = "variety", height = 6).map(plt.scatter, 'sepal.length',
'petal.length').add_legend()
```

OUTPUT:

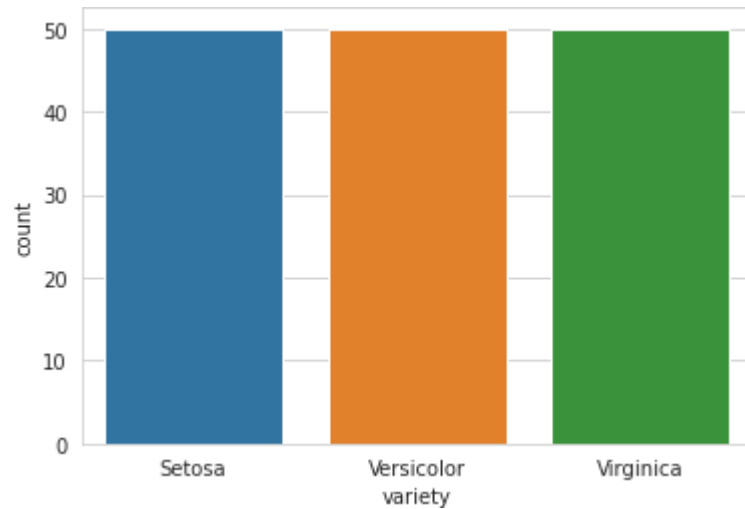


CODE:

```
# Distribution Chart  
#Visualizing the target(class label) column
```

```
sns.countplot(x='variety', data=iris, )  
plt.show()
```

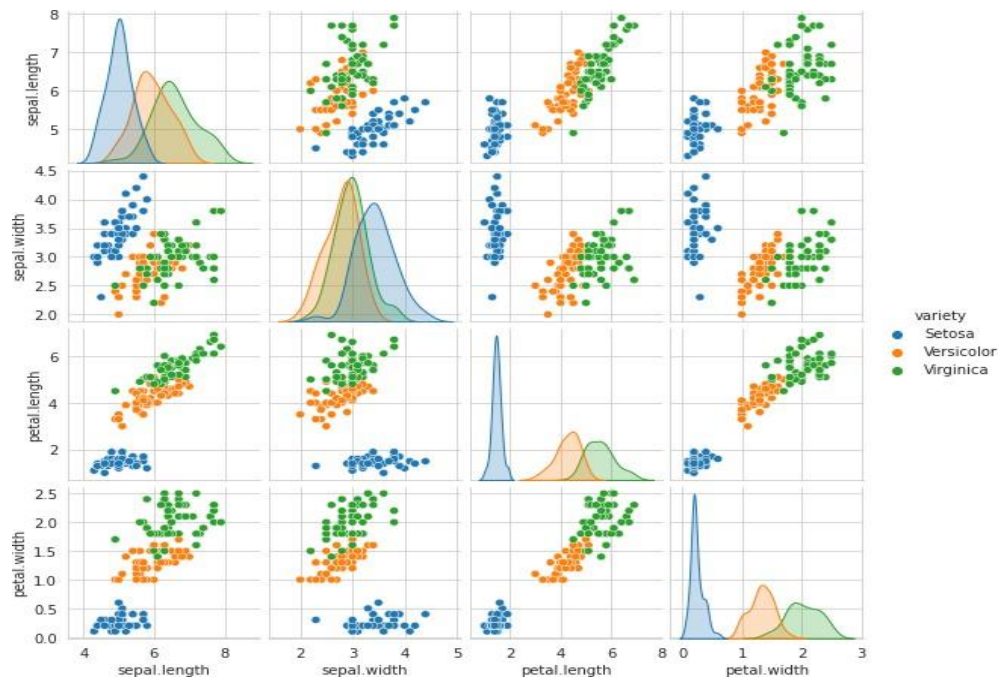
OUTPUT:



CODE:

```
#plotting all the column's relationships using a pairplot. It can be used for multivariate analysis.  
sns.pairplot(iris,hue='variety', height=2)
```

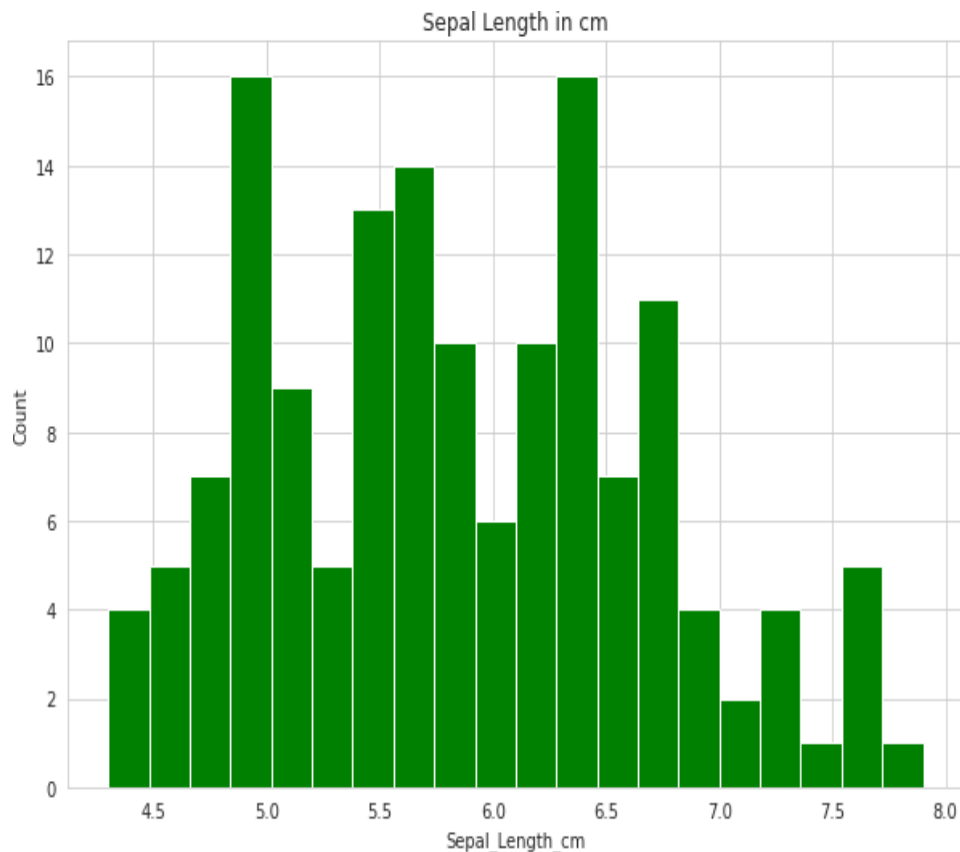
OUTPUT:



#Histogram for Sepal Length

```
plt.figure(figsize = (10, 7))
x = iris["sepal.length"]
plt.hist(x, bins = 20, color = "green")
plt.title("Sepal Length in cm")
plt.xlabel("Sepal_Length_cm")
plt.ylabel("Count")
```

OUTPUT:

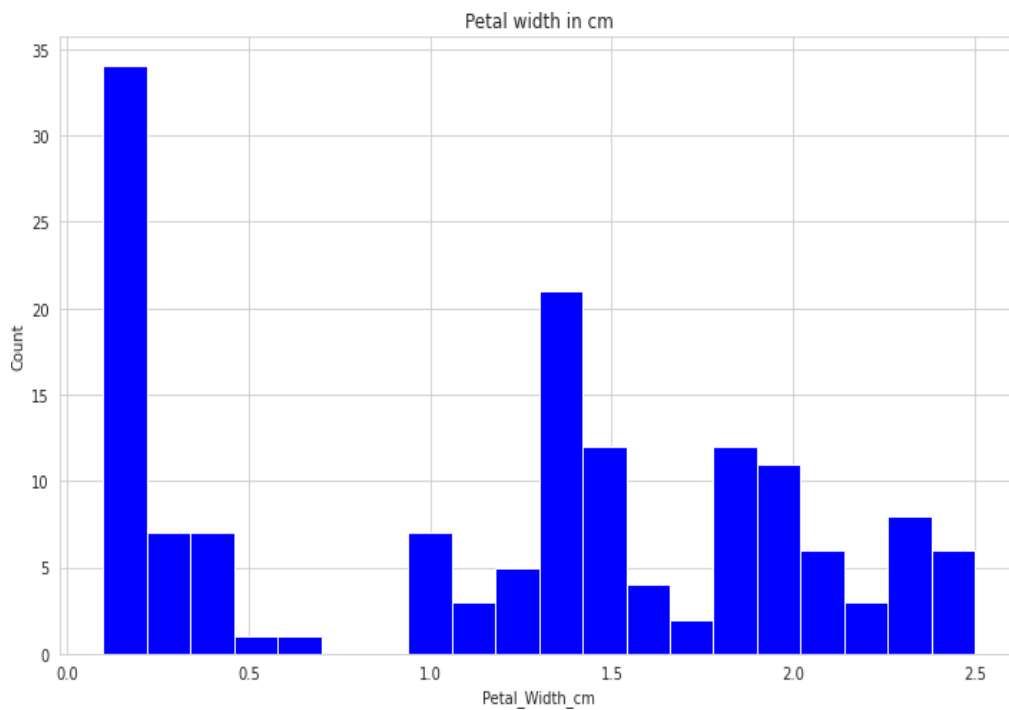


CODE:

```
#Histogram for Petal Width
plt.figure(figsize = (12, 7))
x = iris["petal.width"]

plt.hist(x, bins =20, color = "blue")
plt.title("Petal width in cm")
plt.xlabel("Petal_Width_cm")
plt.ylabel("Count")
```

OUTPUT:



CODE:

```
#Histograms allow seeing the distribution of data for various columns.  
# It can be used for uni as well as bi-variate analysis.
```

```
fig, axes = plt.subplots(2, 2, figsize=(10,10))
```

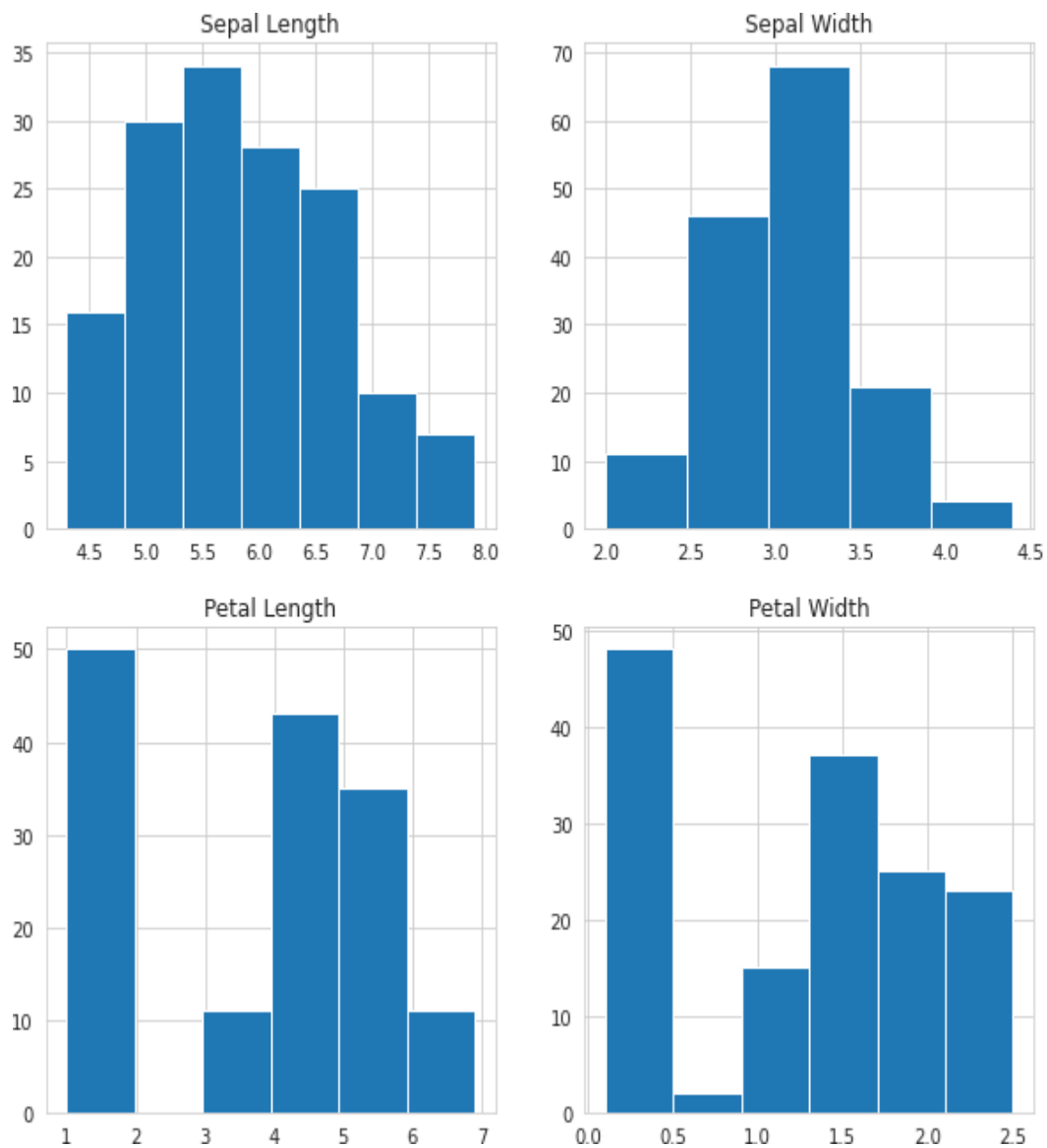
```
axes[0,0].set_title("Sepal Length")  
axes[0,0].hist(iris['sepal.length'], bins=7)
```

```
axes[0,1].set_title("Sepal Width")  
axes[0,1].hist(iris['sepal.width'], bins=5);
```

```
axes[1,0].set_title("Petal Length")  
axes[1,0].hist(iris['petal.length'], bins=6);
```

```
axes[1,1].set_title("Petal Width")  
axes[1,1].hist(iris['petal.width'], bins=6);
```

OUTPUT:



CODE:

#Histograms with Distplot Plot

```
plot = sns.FacetGrid(iris, hue="variety")  
plot.map(sns.distplot, "sepal.length").add_legend()
```

```
plot = sns.FacetGrid(iris, hue="variety")  
plot.map(sns.distplot, "sepal.width").add_legend()
```

```
plot = sns.FacetGrid(iris, hue="variety")  
plot.map(sns.distplot, "petal.length").add_legend()
```

```
plot = sns.FacetGrid(iris, hue="variety")
```

```
plot.map(sns.distplot, "petal.width").add_legend()
```

```
plt.show()
```

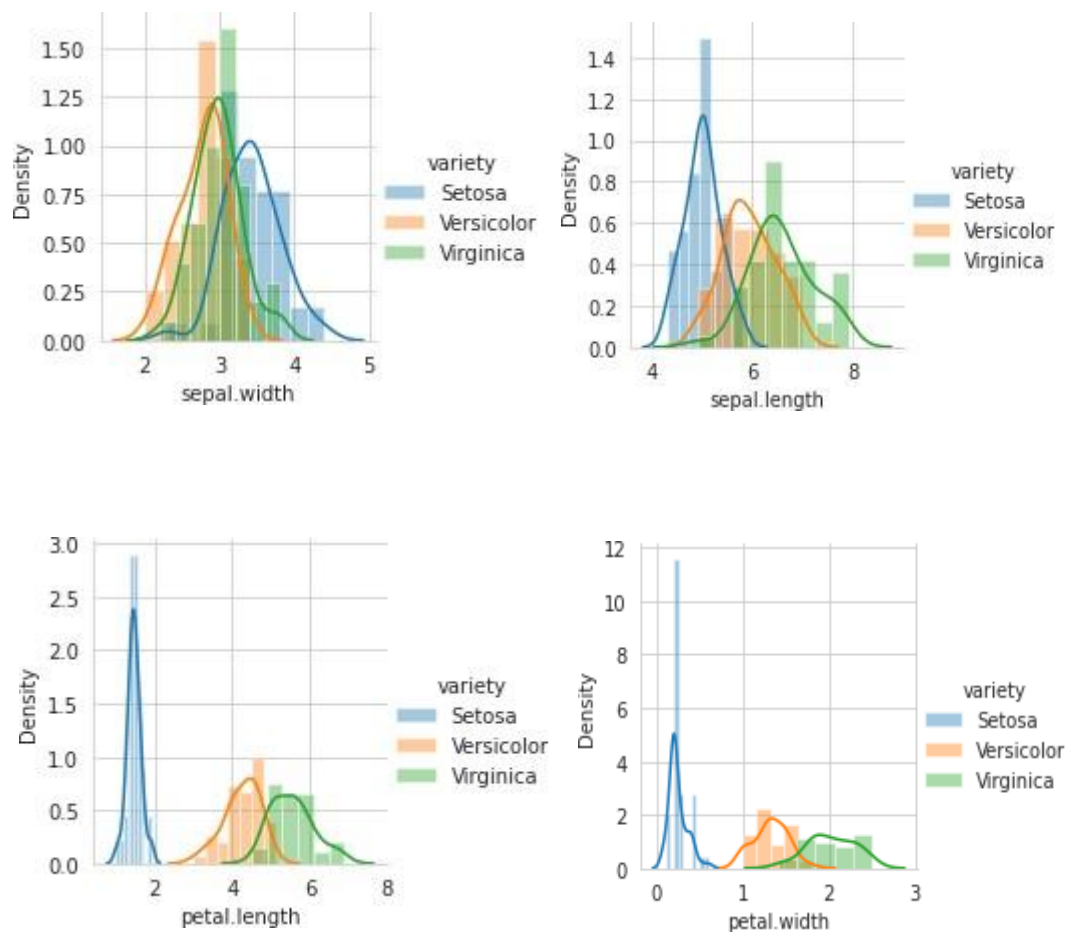
#In the case of Sepal Length, there is a huge amount of overlapping.

#In the case of Sepal Width also, there is a huge amount of overlapping.

#In the case of Petal Length, there is a very little amount of overlapping.

#In the case of Petal Width also, there is a very little amount of overlapping.

OUTPUT:

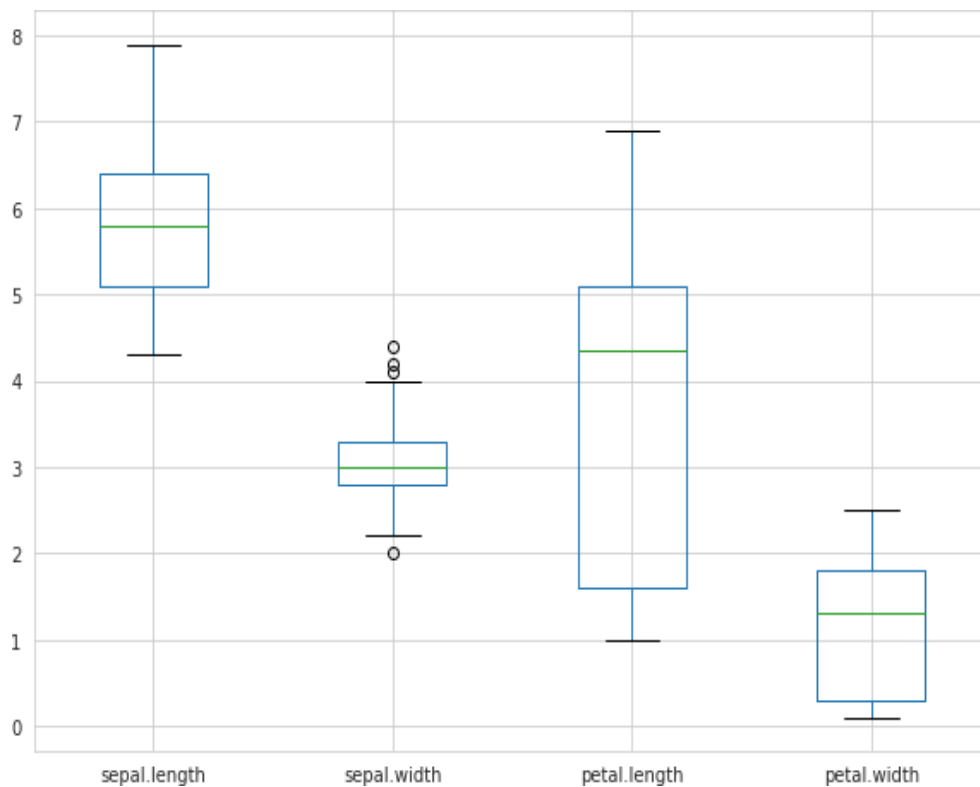


CODE:

```
# Box Plot for Iris Data
```

```
plt.figure(figsize = (10, 7))  
iris.boxplot()
```

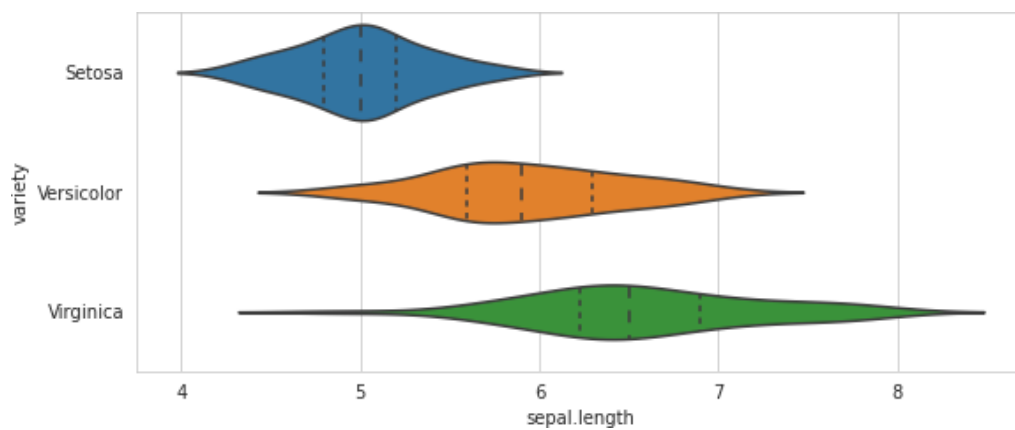
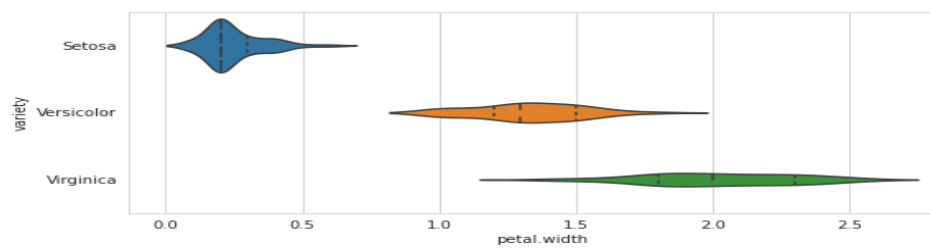
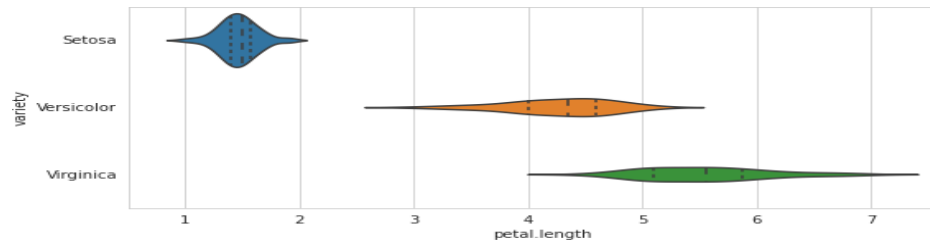
OUTPUT:

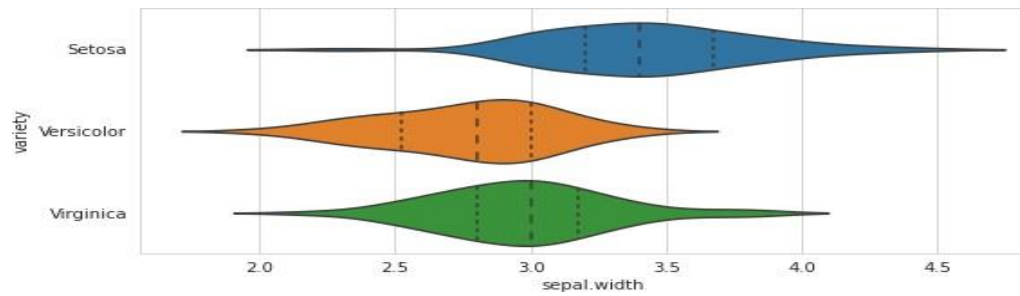


CODE:

```
import matplotlib.gridspec as gridspec  
fig = plt.figure(figsize=(9, 40))  
outer = gridspec.GridSpec(4, 1, wspace=0.2, hspace=0.2)  
for i, col in enumerate(iris.columns[:-1]):  
    inner = gridspec.GridSpecFromSubplotSpec(2, 1, subplot_spec=outer[i], wspace=0.2,  
hspace=0.4)  
    ax = plt.Subplot(fig, inner[1])  
    _ = sns.violinplot(y="variety", x=f"{col}", data=iris, inner='quartile', ax=ax)  
    fig.add_subplot(ax)  
fig.show()
```

OUTPUT:

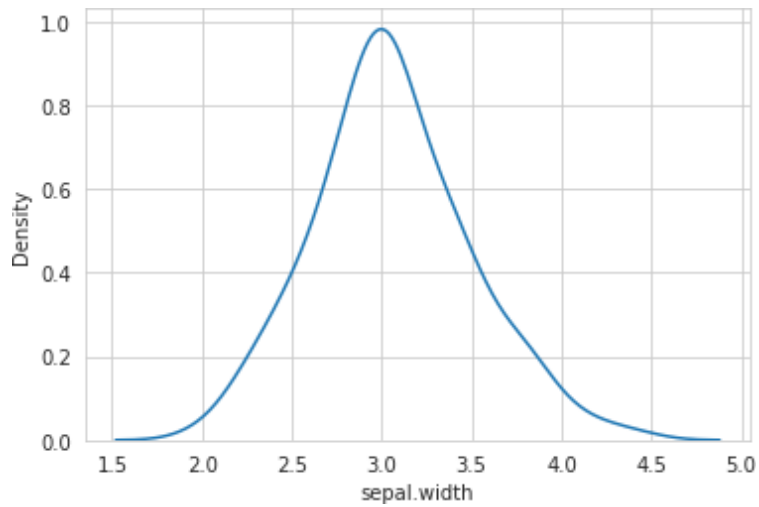




CODE:

```
# Make default density plot  
sns.kdeplot(iris['sepal.width'])
```

OUTPUT:



AIM**3. Programs to handle data using pandas****CODE:**

```
#Pandas is a Python library.
```

```
#Pandas is used to analyze data.
```

```
import numpy as np
```

```
import pandas as pd
```

```
s = pd.Series([1, 3, 5, 6, 8])  
print(s)
```

OUTPUT:

```
0    1  
1    3  
2    5  
3    6  
4    8  
dtype: int64
```

CODE:

```
dict = {"country": ["Brazil", "Russia", "India", "China", "South Africa"],  
        "capital": ["Brasilia", "Moscow", "New Dehli", "Beijing", "Pretoria"],  
        "area": [8.516, 17.10, 3.286, 9.597, 1.221],  
        "population": [200.4, 143.5, 1252, 1357, 52.98] }  
b = pd.DataFrame(dict)  
print(b)
```

OUTPUT

	country	capital	area	population
0	Brazil	Brasilia	8.516	200.40
1	Russia	Moscow	17.100	143.50
2	India	New Dehli	3.286	1252.00
3	China	Beijing	9.597	1357.00
4	South Africa	Pretoria	1.221	52.98

CODE:

```
b.index = ["BR", "RU", "IN", "CH", "SA"]
```

```
print(b)
```

OUTPUT:

	country	capital	area	population
BR	Brazil	Brasilia	8.516	200.40
RU	Russia	Moscow	17.100	143.50
IN	India	New Dehli	3.286	1252.00
CH	China	Beijing	9.597	1357.00
SA	South Africa	Pretoria	1.221	52.98

CODE:

```
import pandas as pd
cars = pd.read_csv('cars1.csv')
print(cars)
```

OUTPUT:

	Car	Model	Volume	Weight	CO2
0	Toyoty	Aygo	1000	790	99
1	Mitsubishi	Space Star	1200	1160	95
2	Skoda	Citigo	1000	929	95
3	Fiat	500	900	865	90
4	Mini	Cooper	1500	1140	105
5	VW	Up!	1000	929	105
6	Skoda	Fabia	1400	1109	90
7	Mercedes	A-Class	1500	1365	92
8	Ford	Fiesta	1500	1112	98
9	Audi	A1	1600	1150	99
10	Hyundai	I20	1100	980	99
11	Suzuki	Swift	1300	990	101
12	Ford	Fiesta	1000	1112	99
13	Honda	Civic	1600	1252	94
14	Hundai	I30	1600	1326	97
15	Opel	Astra	1600	1330	97
16	BMW	1	1600	1365	99
17	Mazda	3	2200	1280	104
18	Skoda	Rapid	1600	1119	104
19	Ford	Focus	2000	1328	105
20	Ford	Mondeo	1600	1584	94
21	Opel	Insignia	2000	1428	99
22	Mercedes	C-Class	2100	1365	99
23	Skoda	Octavia	1600	1415	99
24	Volvo	S60	2000	1415	99
25	Mercedes	CLA	1500	1465	102
26	Audi	A4	2000	1490	104
27	Audi	A6	2000	1725	114
28	Volvo	V70	1600	1523	109
29	BMW	5	2000	1705	114
30	Mercedes	E-Class	2100	1605	115
31	Volvo	XC70	2000	1746	117
32	Ford	B-Max	1600	1235	104
33	BMW	216	1600	1390	108

CODE:

```
import pandas as pd
cars = pd.read_csv('cars1.csv')
cars = pd.read_csv('/cars1.csv')
print(cars)

# Print out first 4 observations
print(cars[0:4])

# Print out fifth and sixth observation
print(cars[4:6])

import pandas as pd
cars = pd.read_csv('cars1.csv', index_col = 0) #first column is taen as index column

print(cars.iloc[2])
```

OUTPUT:

```
Model      Citigo
Volume      1000
Weight       929
CO2         95
Name: Skoda, dtype: object
```

CODE:

```
#Slicing dataframe
import pandas as pd

df = pd.DataFrame([[ 'Jay','M',18],[ 'Jennifer','F',17],
                  [ 'Preity','F',19],[ 'Neil','M',17]],
                  columns = ['Name','Gender','Age'])

print(df)
df1 = df.iloc[2,: ]
df2 = df.iloc[:2, ]
print(df1)
print(df2)
```

OUTPUT

```
      Name Gender  Age
0      Jay      M   18
1 Jennifer      F   17
2  Preity      F   19
3     Neil      M   17
```

	Name	Gender	Age
2	Preity	F	19
3	Neil	M	17

	Name	Gender	Age
0	Jay	M	18
1	Jennifer	F	17

CODE:

```
import pandas as pd
import numpy as np

#Create a series with 4 random numbers
s = pd.Series(np.random.randn(4))
print(s)

print ("The actual data series is:")
print( s.values)
```

OUTPUT:

```
0 -1.138968
1 -1.097746
2  0.109717
3  1.159537
dtype: float64
The actual data series is:
[-1.13896826 -1.09774589  0.10971687  1.15953676]
CodeText
```

CODE:

```
print (s.head(2))
```

OUTPUT:

```
0    -1.138968
1    -1.097746
dtype: float64
```

CODE:

```
print(s.tail(3))
```


OUTPUT:

```
1    -1.097746
2     0.109717
3     1.159537
dtype: float64
```

CODE:

```
d = {'Name':pd.Series(['Tom','James','Ricky','Vin','Steve','Smith','Jack']),
     'Age':pd.Series([25,26,25,23,30,29,23]),
     'Rating':pd.Series([4.23,3.24,3.98,2.56,3.20,4.6,3.8])}
```

```
# Create a DataFrame
df = pd.DataFrame(d)
print(df)
print ("The transpose of the data series is:")
print(df.T)
```

OUTPUT:

```
   Name  Age  Rating
0   Tom   25    4.23
1  James  26    3.24
2  Ricky  25    3.98
3   Vin   23    2.56
4  Steve  30    3.20
5  Smith  29    4.60
6   Jack  23    3.80
The transpose of the data series is:
      0      1      2      3      4      5      6
Name   Tom  James  Ricky   Vin  Steve  Smith  Jack
Age     25     26     25     23     30     29     23
Rating 4.23  3.24  3.98  2.56  3.2  4.6  3.8
```

CODE:

```
import pandas as pd
import numpy as np

#Create a Dictionary of series
d = {'Name':pd.Series(['Tom','James','Ricky','Vin','Steve','Smith','Jack']),
     'Age':pd.Series([25,26,25,23,30,29,23]),
     'Rating':pd.Series([4.23,3.24,3.98,2.56,3.20,4.6,3.8])}
#Create a DataFrame
df = pd.DataFrame(d)
print(df)
print ("Row axis labels and column axis labels are:")
print (df.axes)
```

OUTPUT:

	Name	Age	Rating
0	Tom	25	4.23
1	James	26	3.24
2	Ricky	25	3.98
3	Vin	23	2.56
4	Steve	30	3.20
5	Smith	29	4.60
6	Jack	23	3.80

Row axis labels and column axis labels are:

```
[RangeIndex(start=0, stop=7, step=1), Index(['Name', 'Age',  
'Rating'], dtype='object')]
```

CODE:

```
import pandas as pd  
import numpy as np  
  
#Create a Dictionary of series  
d = {'Name':pd.Series(['Tom','James','Ricky','Vin','Steve','Smith','Jack']),  
     'Age':pd.Series([25,26,25,23,30,29,23]),  
     'Rating':pd.Series([4.23,3.24,3.98,2.56,3.20,4.6,3.8])  
     }  
  
#Create a DataFrame  
df = pd.DataFrame(d)  
print ("Our object is:")  
print (df)  
print ("The dimension of the object is:")  
print (df.ndim)
```

OUTPUT:

	Name	Age	Rating
0	Tom	25	4.23
1	James	26	3.24
2	Ricky	25	3.98
3	Vin	23	2.56
4	Steve	30	3.20
5	Smith	29	4.60
6	Jack	30	3.80

Our object is:

The shape of the object is:

```
(7, 3)
```

CODE:

```
print (df.size)
```

OUTPUT:

```
21
```

CODE:

```
print(df.values)
```

OUTPUT:

```
[['Tom' 25 4.23]
 ['James' 26 3.24]
 ['Ricky' 25 3.98]
 ['Vin' 23 2.56]
 ['Steve' 30 3.2]
 ['Smith' 29 4.6]
 ['Jack' 30 3.8]]
```

CODE:

```
df.isnull().sum() #sum returns the number of missing values
```

OUTPUT:

```
Name      0
Age        0
Rating     0
dtype: int64
```

CODE:

```
df = pd.DataFrame(np.arange(12).reshape(3, 4), columns=['A', 'B', 'C', 'D'])
print(df)
```

OUTPUT:

```
   A  B  C  D
0  0  1  2  3
1  4  5  6  7
2  8  9 10 11
```

AIM

4: Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm.

CODE:

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report
import pandas as pd
```

```
df = pd.read_csv("iris.csv")
print(df)
```

OUTPUT:

```
      sepal.length  sepal.width  petal.length  petal.width  variety
0              5.1           3.5           1.4           0.2    Setosa
1              4.9           3.0           1.4           0.2    Setosa
2              4.7           3.2           1.3           0.2    Setosa
3              4.6           3.1           1.5           0.2    Setosa
4              5.0           3.6           1.4           0.2    Setosa
..            ...           ...           ...           ...      ...
145             6.7           3.0           5.2           2.3  Virginica
146             6.3           2.5           5.0           1.9  Virginica
147             6.5           3.0           5.2           2.0  Virginica
148             6.2           3.4           5.4           2.3  Virginica
149             5.9           3.0           5.1           1.8  Virginica

[150 rows x 5 columns]
```

CODE:

```
df['variety'].value_counts()
```

OUTPUT:

```
Setosa      50
Versicolor  50
Virginica   50
Name: variety, dtype: int64
```

CODE:

```
X = df.drop('variety', axis=1)
```

```
y = df['variety']
```

```
# splitting to trainset and Test set in the ratio 70:30
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.30)
```

```
print(X_train)
```

```
print(" ")
```

```
print(X_test)
```

OUTPUT:

```

    sepal.length  sepal.width  petal.length  petal.width
46             5.1           3.8           1.6           0.2
95             5.7           3.0           4.2           1.2
67             5.8           2.7           4.1           1.0
45             4.8           3.0           1.4           0.3
143            6.8           3.2           5.9           2.3
..            ...           ...           ...           ...
116            6.5           3.0           5.5           1.8
41             4.5           2.3           1.3           0.3
62             6.0           2.2           4.0           1.0
91             6.1           3.0           4.6           1.4
123            6.3           2.7           4.9           1.8

```

```
[105 rows x 4 columns]
```

```

    sepal.length  sepal.width  petal.length  petal.width
25             5.0           3.0           1.6           0.2
141            6.9           3.1           5.1           2.3
125            7.2           3.2           6.0           1.8
102            7.1           3.0           5.9           2.1
128            6.4           2.8           5.6           2.1
122            7.7           2.8           6.7           2.0
76             6.8           2.8           4.8           1.4
103            6.3           2.9           5.6           1.8
14             5.8           4.0           1.2           0.2
37             4.9           3.6           1.4           0.1
100            6.3           3.3           6.0           2.5
63             6.1           2.9           4.7           1.4
64             5.6           2.9           3.6           1.3
61             5.9           3.0           4.2           1.5
17             5.1           3.5           1.4           0.3
74             6.4           2.9           4.3           1.3
111            6.4           2.7           5.3           1.9
120            6.9           3.2           5.7           2.3
79             5.7           2.6           3.5           1.0
85             6.0           3.4           4.5           1.6
49             5.0           3.3           1.4           0.2
21             5.1           3.7           1.5           0.4
110            6.5           3.2           5.1           2.0
149            5.9           3.0           5.1           1.8
72             6.3           2.5           4.9           1.5
11             4.8           3.4           1.6           0.2
36             5.5           3.5           1.3           0.2
6              4.6           3.4           1.4           0.3
68             6.2           2.2           4.5           1.5
144            6.7           3.3           5.7           2.5
43             5.0           3.5           1.6           0.6
80             5.5           2.4           3.8           1.1
32             5.2           4.1           1.5           0.1
7              5.0           3.4           1.5           0.2
55             5.7           2.8           4.5           1.3

129            7.2           3.0           5.8           1.6
117            7.7           3.8           6.7           2.2

```

12

4.8

3.0

1.4

0.1

CODE:

```
print("Number transactions X_train dataset: ", X_train.shape)
print("Number transactions y_train dataset: ", y_train.shape)
print("Number transactions X_test dataset: ", X_test.shape)
print("Number transactions y_test dataset: ", y_test.shape)
```

OUTPUT:

```
Number transactions X_train dataset: (105, 4)
Number transactions y_train dataset: (105,)
Number transactions X_test dataset: (45, 4)
Number transactions y_test dataset: (45,)
```

CODE:

```
classifier = KNeighborsClassifier(n_neighbors=5)
classifier.fit(X_train, y_train)
y_pred = classifier.predict(X_test)
print(y_pred)
print(' ')
print(y_test)
```

OUTPUT:

```
['Setosa' 'Virginica' 'Virginica' 'Virginica' 'Virginica' 'Virginica'
 'Versicolor' 'Virginica' 'Setosa' 'Setosa' 'Virginica' 'Versicolor'
 'Versicolor' 'Versicolor' 'Setosa' 'Versicolor' 'Virginica' 'Virginica'
 'Versicolor' 'Versicolor' 'Setosa' 'Setosa' 'Virginica' 'Virginica'
 'Virginica' 'Setosa' 'Setosa' 'Setosa' 'Versicolor' 'Virginica' 'Setosa'
 'Setosa' 'Virginica' 'Versicolor' 'Setosa' 'Setosa' 'Virginica'
 'Versicolor' 'Virginica' 'Versicolor' 'Virginica' 'Setosa' 'Virginica'
 'Virginica' 'Setosa']
```

```
63    Versicolor
64    Versicolor
```

```
61    Versicolor
17      Setosa
74    Versicolor
111    Virginica
120    Virginica
79    Versicolor
85    Versicolor
49      Setosa
21      Setosa
110    Virginica
149    Virginica
72    Versicolor
11      Setosa
36      Setosa
6       Setosa
```

```
68    Versicolor
```

```

144     Virginica
43       Setosa
47       Setosa
77     Versicolor
80     Versicolor
32       Setosa
7       Setosa
148     Virginica
88     Versicolor
137     Virginica
55     Versicolor
112     Virginica
29       Setosa
129     Virginica
117     Virginica
12       Setosa
Name: variety, dtype: object

```

CODE:

```

from sklearn.metrics import confusion_matrix
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, y_pred))

```

OUTPUT:

```

[[15  0  0]
 [ 0 11  2]
 [ 0  0 17]]

```

	precision	recall	f1-score	support
Setosa	1.00	1.00	1.00	15
Versicolor	1.00	0.85	0.92	13
Virginica	0.89	1.00	0.94	17
accuracy			0.96	45
macro avg	0.96	0.95	0.95	45
weighted avg	0.96	0.96	0.95	45

CODE:

```

weather=['Sunny','Sunny','Overcast','Rainy','Rainy','Rainy',
'Over cast','Sunny','Sunny','Rainy','Sunny','Overcast','Over-
cast','Rainy']

# Second Feature
temp=['Hot','Hot','Hot','Mild','Cool','Cool','Cool','Mild',
'Cool',
'Mild','Mild','Mild','Hot','Mild']

# Label or target variable

play=['No','No','Yes','Yes','Yes','No','Yes','No','Yes','Yes',
'Ye s','Yes','Yes','No']

```

```
from sklearn import preprocessing
#creating labelEncoder
le = preprocessing.LabelEncoder()
# Converting string labels into numbers.
weather_encoded=le.fit_transform(weather)
print(weather_encoded)
```

OUTPUT:

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

CODE:

```
temp_encoded=le.fit_transform(temp) print(temp_en-
coded)
print(" ") la-
bel=le.fit_transform(play)
print(label)
```


OUTPUT:

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

```
[0 0 1 1 1 0 1 0 1 1 1 1 1 0]
```

CODE:

```
features=list(zip(weather_encoded,temp_encoded))  
print(features)
```

OUTPUT:

```
[(2, 1), (2, 1), (0, 1), (1, 2), (1, 0), (1, 0), (0, 0), (2, 2),  
(2, 0), (1, 2), (2, 2), (0, 2), (0, 1), (1, 2)]
```

CODE:

```
from sklearn.neighbors import KNeighborsClassifier  
  
model = KNeighborsClassifier(n_neighbors=3)  
  
from sklearn.neighbors import KNeighborsClassifier  
  
model = KNeighborsClassifier(n_neighbors=3)  
  
# Train the model using the training sets  
model.fit(features,label)  
predicted= model.predict([[0,1]]) # 0:Overcast, 1:Hot  
print(predicted)
```

OUTPUT:

```
[1]
```

AIM

5: Program to implement Naïve Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm.

CODE:

Dataset used: Social_Network_Ads.csv

```
import pandas as pd
dataset = pd.read_csv("/content/Social_Network_Ads.csv")
print(dataset.describe())
print(dataset.head())
X = dataset.iloc[:, [1, 2, 3]].values
y = dataset.iloc[:, -1].values
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
X[:,0] = le.fit_transform(X[:,0])
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size = 0.20, random_state = 0)
```

OUTPUT:

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.357500
std	7.165832e+04	10.482877	34096.960282	0.479864
min	1.556669e+07	18.000000	15000.000000	0.000000
25%	1.562676e+07	29.750000	43000.000000	0.000000
50%	1.569434e+07	37.000000	70000.000000	0.000000
75%	1.575036e+07	46.000000	88000.000000	1.000000
max	1.581524e+07	60.000000	150000.000000	1.000000

	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

CODE:

```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)

from sklearn.naive_bayes import GaussianNB
classifier = GaussianNB()
classifier.fit(X_train, y_train)
```

OUTPUT:

```
GaussianNB()
```

CODE:

```
y_pred = classifier.predict(X_test)

y_pred
```

OUTPUT:

```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0,
0, 1,
      0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0,
0, 0,
      1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0,
0, 1,
      0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1])
```

CODE:

```
y_pred = classifier.predict(X_test)

y_test
```

OUTPUT:

```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0,
0, 1,
      0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0,
0, 0,
      1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1,
0, 1,
      0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1])
```

CODE:

```
from sklearn.metrics import confusion_matrix, accuracy_score
cm = confusion_matrix(y_test, y_pred)
ac = accuracy_score(y_test, y_pred)
print(cm)
print(ac)
```

OUTPUT:

```
[[56  2]
 [ 4 18]]
0.925
```

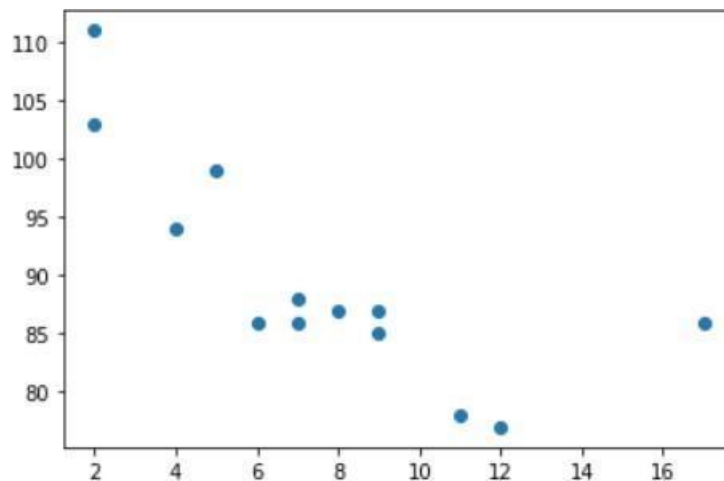
AIM

6: Program to implement linear and multiple regression techniques using any standard dataset available in the public domain and evaluate its performance.

CODE:

```
import matplotlib.pyplot as plt
x = [5,7,8,7,2,17,2,9,4,11,12,9,6]
y = [99,86,87,88,111,86,103,87,94,78,77,85,86]

plt.scatter(x, y)
plt.show()
```

OUTPUT:**CODE:**

```
import matplotlib.pyplot as plt
from scipy import stats

x = [5,7,8,7,2,17,2,9,4,11,12,9,6]
y = [99,86,87,88,111,86,103,87,94,78,77,85,86]

+slope, intercept, r, p, std_err = stats.linregress(x, y) # r
correlation coefficient # p probability of hypothesis

def myfunc(x):
```

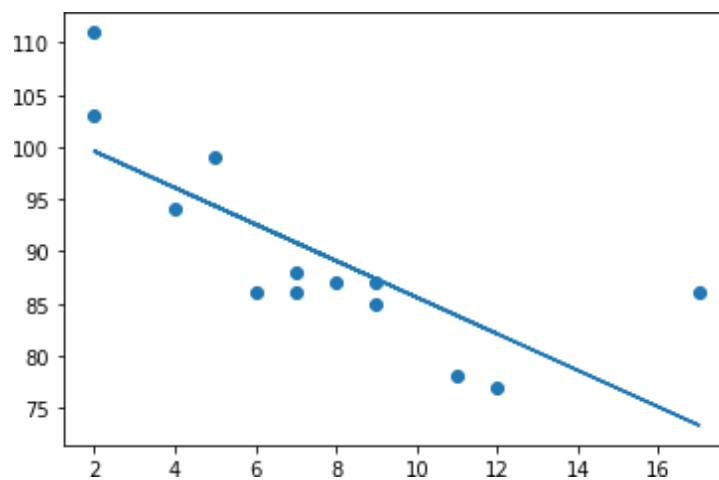
```
return slope * x + intercept

mymodel = list(map(myfunc, x))

plt.scatter(x, y)
plt.plot(x, mymodel)
plt.show()
```

OUTPUT:

-0.758591524376155



CODE:

```
import pandas
import warnings
warnings.filterwarnings("ignore")

df = pandas.read_csv("cars1.csv")

X = df[['Weight', 'Volume']]
y = df['CO2']
```

```
from sklearn import linear_model  
regr = linear_model.LinearRegression()  
regr.fit(X, y)
```

OUTPUT:

```
LinearRegression()
```

CODE:

```
predictedCO2 = regr.predict([[2300, 1000]])  
print(predictedCO2)
```

OUTPUT:

```
[104.86715554]
```

AIM

7. Program to implement text classification using Support vector machine.

CODE:

Dataset used: iris.csv

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn import svm, datasets

# import some data to play with
iris = datasets.load_iris()
X = iris.data[:, :2] # we only take the first two features.
# We could
# avoid this ugly slicing by using a two-dim dataset
y = iris.target

# we create an instance of SVM and fit out data. We do not
# scale our
# data since we want to plot the support vectors
C = 1.0 # SVM regularization parameter

svc = svm.SVC(kernel='linear', C=1, gamma='auto').fit(X, y)

# create a mesh to plot in
#x_min, x_max = X[:, 0].min() - 1, X[:, 0].max() + 1
#y_min, y_max = X[:, 1].min() - 1, X[:, 1].max() + 1
#h = (x_max - x_min)/100
#xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
#np.arange(y_min, y_max, h))

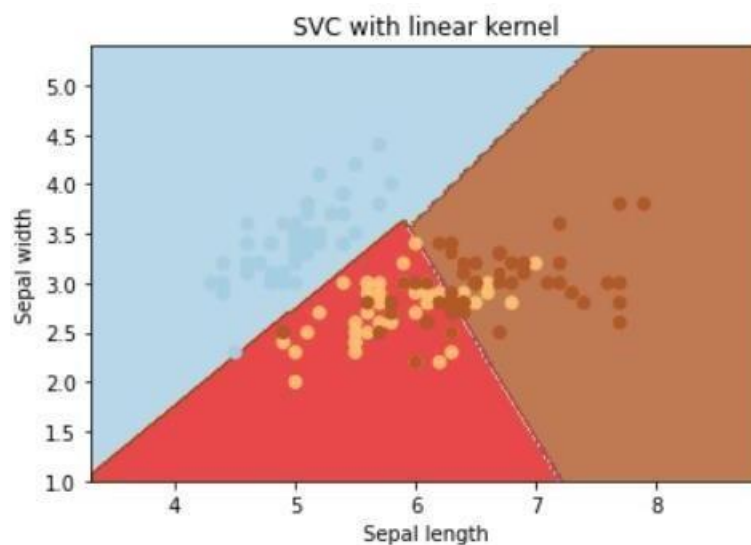
plt.subplot(1, 1, 1)
Z = svc.predict(np.c_[xx.ravel(), yy.ravel()])
Z = Z.reshape(xx.shape)
plt.contourf(xx, yy, Z, cmap=plt.cm.Paired, alpha=0.8)

plt.scatter(X[:, 0], X[:, 1], c=y, cmap=plt.cm.Paired)
plt.xlabel('Sepal length')
plt.ylabel('Sepal width')
plt.xlim(xx.min(), xx.max())
```



```
plt.title('SVC with linear kernel')  
plt.show()
```

OUTPUT:



CODE:

Dataset used: True.csv, Fake.csv

```
#Importing Libraries  
import pandas as pd  
import numpy as np  
from sklearn.model_selection import train_test_split  
from sklearn.pipeline import Pipeline  
from sklearn.feature_extraction.text import CountVectorizer  
from sklearn.feature_extraction.text import TfidfTransformer  
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report  
  
from sklearn.svm import LinearSVC  
  
import csv  
true = pd.read_csv("True.csv")  
fake = pd.read_csv("Fake.csv")
```

```

fake['target'] = 'fake'
true['target'] = 'true'
#News dataset
news = pd.concat([fake, true]).reset_index(drop = True)
news.head()
news.dropna()

```

OUTPUT:

	title	text	subject	date	target
0	you were wrong! 70-year-old men don t change ...	News	"December 31	2017"	fake
165	look at me! I m violating the U.S. flag code ...	News	"October 29	2017"	fake
277	particularly those where people are dying. Ob...	News	"September 29	2017"	fake
294	utterly and completely misunderstanding it. T...	News	"September 25	2017"	fake
379	I salute you.Featured image via David Becker/...	News	"September 10	2017"	fake
...
39998	rescuers pulled Maria s body from the rubble....	worldnews	"September 21	2017 "	true
40742	adding she had a Spanish passport but chose t...	worldnews	"September 14	2017 "	true
40788	adding the Rohingya belong in camps for displ...	worldnews	"September 14	2017 "	true
40824	said Reick. "	worldnews	"September 14	2017 "	true
41394	in general. "	worldnews	"September 7	2017 "	true

236 rows × 5 columns

CODE:

```

#Train-test split
x_train,x_test,y_train,y_test = train_test_split(news['text'], new
s.target, test_size=0.2, random_state=1)

#Term frequency (TF)=count (word) /total (words) 6+ 0ZXCVBNM, ./
#TF-
IDF: we can even reduce the weightage of more common words like (t
he, is, an etc.) which occurs in all document.
#This is called as TF-
IDF i.e Term Frequency times inverse document frequency.
#count vectorizer : involves counting the number of occurrences ea
ch word appears in a document

```

```

pipe2 = Pipeline([('vect', CountVectorizer()), ('tfidf', TfidfTransformer()), ('model', LinearSVC())])

model_svc = pipe2.fit(x_train.astype('U'), y_train.astype('U'))
svc_pred = model_svc.predict(x_test.astype('U'))

print("Accuracy of SVM Classifier: {}".format(round(accuracy_score(y_test, svc_pred)*100,2)))
print("\nConfusion Matrix of SVM Classifier:\n")
print(confusion_matrix(y_test, svc_pred))
print("\nClassification Report of SVM Classifier:\n")
print(classification_report(y_test, svc_pred))

```

OUTPUT:

Accuracy of SVM Classifier: 51.43%

Confusion Matrix of SVM Classifier:

```

[[4302   3]
 [4085  26]]

```

Classification Report of SVM Classifier:

	precision	recall	f1-score	support
fake	0.51	1.00	0.68	4305
true	0.90	0.01	0.01	4111
accuracy			0.51	8416
macro avg	0.70	0.50	0.35	8416
weighted avg	0.70	0.51	0.35	8416

AIM

8. Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm.

CODE:

Dataset used: iris

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris

data=load_iris()
X=data.data
y=data.target
print(X.shape,y.shape)
```

OUTPUT:

```
(150, 4) (150,)
```

CODE:

```
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier#for checking testing results
from sklearn.metrics import classification_report, confusion_matrix#for visualizing tree
from sklearn.tree import plot_tree
X_train, X_test, y_train, y_test = train_test_split(X , y, test_size = 25, random_state = 10)

clf=DecisionTreeClassifier()
clf.fit(X_train,y_train)
```

OUTPUT:

```
DecisionTreeClassifier()
```

CODE:

```
y_pred =clf.predict(X_test)
print("Classification report - \n", classification_report(y_test,y_pred))
```


AIM

9. Program to implement k-means clustering technique using any standard dataset available in the public domain.

CODE:

Dataset used: GENERAL.csv

```
# importing the libraries
import numpy as np
import pandas as pd
%matplotlib inline
import matplotlib.pyplot as plt da-

taset= pd.read_csv('./CC GENERAL.csv')

# checking the presence of null values
print(dataset.isnull().sum())

#CREDIT_LIMIT                                1
#MINIMUM_PAYMENTS                           313
```

OUTPUT:

```
CUST_ID                                0
BALANCE                                0
BALANCE_FREQUENCY                      0
PURCHASES                              0
ONEOFF_PURCHASES                      0
INSTALLMENTS_PURCHASES                0
CASH_ADVANCE                          0
PURCHASES_FREQUENCY                   0
ONEOFF_PURCHASES_FREQUENCY            0
PURCHASES_INSTALLMENTS_FREQUENCY     0
CASH_ADVANCE_FREQUENCY                0
CASH_ADVANCE_TRX                      0
PURCHASES_TRX                        0
CREDIT_LIMIT                          1
PAYMENTS                              0
MINIMUM_PAYMENTS                      313
PRC_FULL_PAYMENT                      0
TENURE                                0
dtype: int64
```

CODE:

```
dataset['CREDIT_LIMIT'].fillna(dataset.CREDIT_LIMIT.mean(), inplace = True)
dataset['MINIMUM_PAYMENTS'].fillna(dataset.MINIMUM_PAYMENTS.mean(),
inplace = True) # unfilled vaues replaced using mean

print(dataset.isnull().sum()) print(dataset.describe())
```

OUTPUT:

```
CUST_ID          0
BALANCE          0
BALANCE_FREQUENCY 0
PURCHASES        0
ONEOFF_PURCHASES 0
INSTALLMENTS_PURCHASES 0
CASH_ADVANCE      0
PURCHASES_FREQUENCY 0
ONEOFF_PURCHASES_FREQUENCY 0
PURCHASES_INSTALLMENTS_FREQUENCY 0
CASH_ADVANCE_FREQUENCY 0
CASH_ADVANCE_TRX  0
PURCHASES_TRX     0
CREDIT_LIMIT      0
PAYMENTS          0
MINIMUM_PAYMENTS  0
PRC_FULL_PAYMENT  0
TENURE            0
dtype: int64
```

	BALANCE	BALANCE_FREQUENCY	...	PRC_FULL_PAYMENT	TENURE
count	8950.000000	8950.000000	...	8950.000000	8950.000000
mean	1564.474828	0.877271	...	0.153715	11.517318
std	2081.531879	0.236904	...	0.292499	1.338331
min	0.000000	0.000000	...	0.000000	6.000000
25%	128.281915	0.888889	...	0.000000	12.000000
50%	873.385231	1.000000	...	0.000000	12.000000
75%	2054.140036	1.000000	...	0.142857	12.000000
max	19043.138560	1.000000	...	1.000000	12.000000

CODE:

```
dataset.drop(['CUST_ID'], axis= 1, inplace = True) #no relevance f
or custid

# No Categorical Values found
X = dataset.iloc[:,:].values
```

```
# Using standard scaler
from sklearn.preprocessing import StandardScaler
standardscaler= StandardScaler()
X = standardscaler.fit_transform(X) #scaling the values
print(X)
```

OUTPUT:

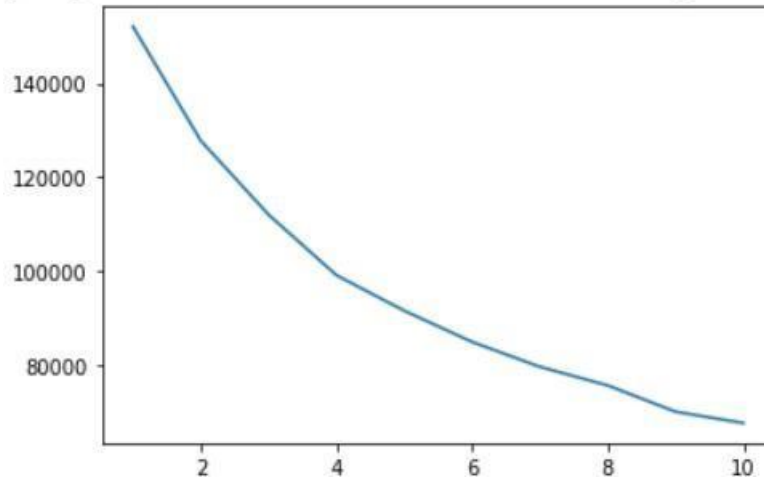
```
[[ -0.73198937 -0.24943448 -0.42489974 ... -0.31096755 -0.52555097
   0.36067954]
 [  0.78696085  0.13432467 -0.46955188 ...  0.08931021  0.2342269
   0.36067954]
 [  0.44713513  0.51808382 -0.10766823 ... -0.10166318 -0.52555097
   0.36067954]
 ...
 [-0.7403981  -0.18547673 -0.40196519 ... -0.33546549  0.32919999
  -4.12276757]
 [-0.74517423 -0.18547673 -0.46955188 ... -0.34690648  0.32919999
  -4.12276757]
 [-0.57257511 -0.88903307  0.04214581 ... -0.33294642 -0.52555097
  -4.12276757]]
```

CODE:

```
"""K MEANS CLUSTERING """
#Inertia, or the within-
cluster sum of squares criterion, can be recognized as a measure o
f how internally coherent clusters are
from sklearn.cluster import KMeans
wss= []
for i in range(1, 11):
    kmeans= KMeans(n_clusters = i, init = 'k-
means++', random_state = 0)
    kmeans.fit(X) wss.ap-
    pend(kmeans.inertia_)
plt.plot(range(1,11), wss) # selecting 4
```


OUTPUT:

```
[<matplotlib.lines.Line2D at 0x7f74661e8a90>]
```

**CODE:**

```
wss_mean=np.array(wss).mean()
print(wss)
print(wss_mean)
print([abs(wss_mean-x) for x in wss])
k=np.argmin([abs(wss_mean-x) for x in wss])+1
```

OUTPUT:

```
[152149.99999999983, 127784.92103208725, 111986.41162208859,
99073.93826774803, 91502.98328256077, 84851.13240432573,
79532.40237691796, 75568.97609993909, 69954.91393943134,
67546.56302862825]
95995.22420537268
[56154.775794627145, 31789.69682671457, 15991.187416715911,
3078.714062375351, 4492.240922811907, 11144.091801046947,
16462.82182845472, 20426.248105433595, 26040.31026594134,
28448.661176744426]
```

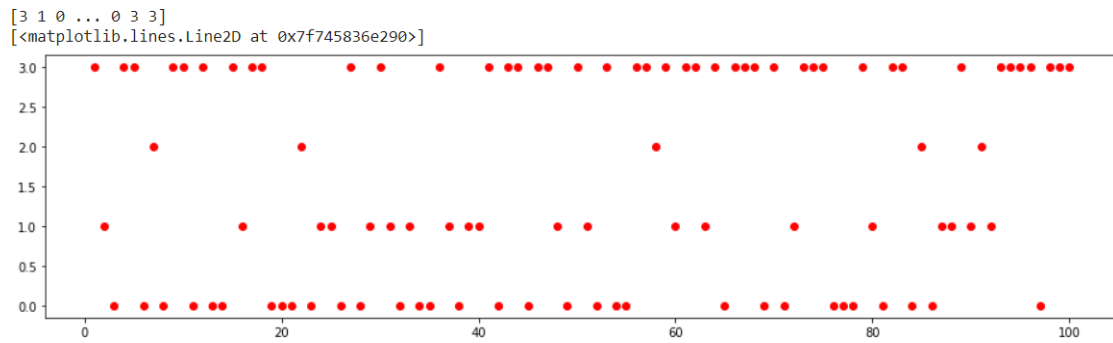
CODE:

```
kmeans = KMeans(n_clusters = k, init= 'k-
means++', random_state = 0)
kmeans.fit(X)

Y_pred_K= kmeans.predict(X)
print(Y_pred_K)
```

```
#showing the clusters of first 100 persons  
plt.figure(figsize=(16,4))  
plt.plot(range(1,100+1),Y_pred_K[:100], 'ro')
```

OUTPUT:



AIM

10:Programs on feedforward network to classify any standard dataset available in the public domain.

Dataset used: HR_comma_sep.csv

CODE:

```
import numpy as np
import pandas as pd

# Load data
data=pd.read_csv('HR_comma_sep.csv')
data.head()
```

OUTPUT:

	satisfaction_level	last_evaluation	number_project	average_monthly_hours	time_spend_company	Work_accident	left	promotion_last_5years	sales	salary
0	0.38	0.53	2	157	3	0	1	0	sales	low
1	0.80	0.86	5	262	6	0	1	0	sales	medium
2	0.11	0.88	7	272	4	0	1	0	sales	medium
3	0.72	0.87	5	223	5	0	1	0	sales	low
4	0.37	0.52	2	159	3	0	1	0	sales	low

CODE:

```
from sklearn import preprocessing
# Creating labelEncoder
le = preprocessing.LabelEncoder()
# Converting string labels into numbers.
data['salary']=le.fit_transform(data['salary'])
data['sales']=le.fit_transform(data['sales'])
```

```
X=data[['satisfaction_level', 'last_evaluation', 'number_project', 'average_monthly_hours', 'time_spend_company', 'Work_accident', 'promotion_last_5years', 'sales', 'salary']]
```

```
y=data['left']
```

```
# Import train_test_split function
```

```
from sklearn.model_selection import train_test_split
```

```
# Split dataset into training set and test set
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42
```

```
) # 70% training and 30% test
```

```
from sklearn.neural_network import MLPClassifier
```

```
# Create model object
```

```
clf = MLPClassifier(hidden_layer_sizes=(6,5),
```

```
                    random_state=5,
```

```
                    verbose=False,
```

```
                    learning_rate_init=0.01)
```

```
# Fit data onto the model
```

```
clf.fit(X_train,y_train)
```

OUTPUT:

```
MLPClassifier(hidden_layer_sizes=(6, 5), learning_rate_init=0.01,  
              random_state=5)
```

CODE:

```
ypred=clf.predict(X_test)
```

```
# Import accuracy score
```

```
from sklearn.metrics import accuracy_score
```

```
# Calculate accuracy
```

```
accuracy_score(y_test,ypred)
```

OUTPUT:

```
0.9386666666666666
```

Aim:

11:Programs on convolutional neural network to classify images from any standard dataset in the public domain.

CODE:

```
import numpy as np
import pandas as pd

# Load data
data=pd.read_csv('HR_comma_sep.csv')

data.head()
```

Output:

	satis- fac- tion_l evel	last_e valu- ation	num- ber_p ro- ject	aver- age_monthly _hours	time_spen d_com- pany	Work _acci- dent	le ft	promo- tion_last_ 5years	sal es	sal ary
0	0.38	0.53	2	157	3	0	1	0	sal es	lo w
1	0.80	0.86	5	262	6	0	1	0	sal es	me diu m
2	0.11	0.88	7	272	4	0	1	0	sal es	me diu m
3	0.72	0.87	5	223	5	0	1	0	sal es	lo w
4	0.37	0.52	2	159	3	0	1	0	sal es	lo w

CODE:

```
from sklearn import preprocessing

# Creating labelEncoder
le = preprocessing.LabelEncoder()

# Converting string labels into numbers.
data['salary']=le.fit_transform(data['salary'])
data['sales']=le.fit_transform(data['sales'])

X=data[['satisfaction_level', 'last_evaluation', 'number_project', 'average_monthly_hours',
```

```
'time_spend_company', 'Work_accident', 'promotion_last_5years', 'sales', 'salary']]
y=data['left']

# Import train_test_split function
from sklearn.model_selection import train_test_split

# Split dataset into training set and test set
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42) #
70% training and 30% test

from sklearn.neural_network import MLPClassifier

# Create model object
clf = MLPClassifier(hidden_layer_sizes=(6,5),
                    random_state=5,
                    verbose=False,
                    learning_rate_init=0.01)

# Fit data onto the model
clf.fit(X_train,y_train)

ypred=clf.predict(X_test)
```

OUTPUT:

```
MLPClassifier(hidden_layer_sizes=(6, 5), learning_rate_init=0.01,
              random_state=5)
```

CODE:

```
# Import accuracy score
from sklearn.metrics import accuracy_score
# Calculate accuracy
print ("Accuracy:",accuracy_score(y_test,ypred))
```

OUTPUT:

```
Accuracy: 0.9386666666666666
```

CODE:

```
from sklearn.metrics import classification_report, confusion_matrix
print(confusion_matrix(y_test, ypred))
print(classification_report(y_test, ypred))
```

OUTPUT:

```
[[3248 180]
 [ 96 976]]
```

	precision	recall	f1-score	support
0	0.97	0.95	0.96	3428
1	0.84	0.91	0.88	1072
accuracy			0.94	4500
macro avg	0.91	0.93	0.92	4500
weighted avg	0.94	0.94	0.94	4500

