

20MCA241 – DATA SCIENCE

LABORATORY RECORD

Submitted in partial fulfilment of the requirements for the award of

Masters of Computer Applications

At

COLLEGE OF ENGINEERING POONJAR

Managed by I.H.R.D., A Govt. of Kerala undertaking

(Affiliated to APJ Abdul Kalam Technological University)



SUBMITTED BY

ANGEL BIJU (PJR24MCA-2004)

Department of Computer Science

COLLEGE OF ENGINEERING POONJAR

COLLEGE OF ENGINEERING POONJAR

Managed by I.H.R.D., A Govt. of Kerala undertaking
(Affiliated to APJ Abdul Kalam Technological University)



CERTIFICATE

Certified that this is a Bonafide record of practical work done in Data Science Lab (20MCA241) Laboratory by **ANGEL BIJU** Reg No. **PJR24MCA-2004** of College of Engineering, Poonjar during the academic year 2024- 2026.

Dr. Annie Julie Joseph
Head of the Department

Mary Treesa Thomas
Asst. Professor ,CSE

Submitted to the University Examination held on:

INTERNAL EXAMINER

EXTERNAL EXAMINER

INDEX

SI.no	List Of Programs	Pg.no
1	Numpy Array Basic Operations.	4
2	Arithmetic Operations using Numpy Array	5
3	Numpy Array Operations -(Mean, Standard Deviation)	6
4	Matrix Operation with NumpyIP	7
5	Pandas Basics- Load Data using CSV File.	9
6	Dataframe Operations- Filtering, Sorting, Grouping.	11
7	Scatter plot using scatter() function	14
8	Bar Graph	16
9	Histogram and Quartile Plot	18
10	Distribution Chart and Scatter Plot.	20
11	Bubble Chart and Density Chart.	22
12	KNN-Find Accuracy	24
13	KNN-Determine class of new data point	25
14	Naive Bayes Classifier.	27
15	Simple Linear Regression.	28
16	Multiple Linear Regression.	30
17	Decision Tree Classification.	32
18	K-Means-Classification.	35
19	Part-Of-Speech (Pos) Tagging.	37
20	N-Gram Modelling	38
21	Feed Forward Network using Iris Dataset.	39
22	N-grams with stopwords,sent_tokenize,word_tokenize	41

PROGRAM - 1

AIM

Create a numpy array and perform the following operations

1. Append values to the end of an array.
2. Insert values into an array at a specified position.
3. Delete elements from an array.
4. Find unique elements in an array.
5. Sort an array.

SOURCE CODE

```
import numpy as np
array = np.array([3, 2, 1, 2])
print("Original array: ", array)
print("Append (6,7,8): ", np.append(array, [6, 7, 8]))
print("Insert Specific (10,11) at third second position: ", np.insert(array, 2, [10, 11]))
print("Delete values (1,3): ", np.delete(array, [0, 2]))
print("Unique element: ", np.unique(array))
print("Sorted array: ", np.sort(array))
```

OUTPUT

```
Run Exp1 ×
C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\venv\Scripts\python.exe "C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\DSML Record\Exp1.py"
Original array: [3 2 1 2]
Append (6,7,8): [3 2 1 2 6 7 8]
Insert Specific (10,11) at third second position: [3 2 10 11 1 2]
Delete values (1,3): [2 2]
Unique element: [1 2 3]
Sorted array: [1 2 2 3]
```

RESULT

The program has been executed successfully and output is obtained

PROGRAM – 2

AIM

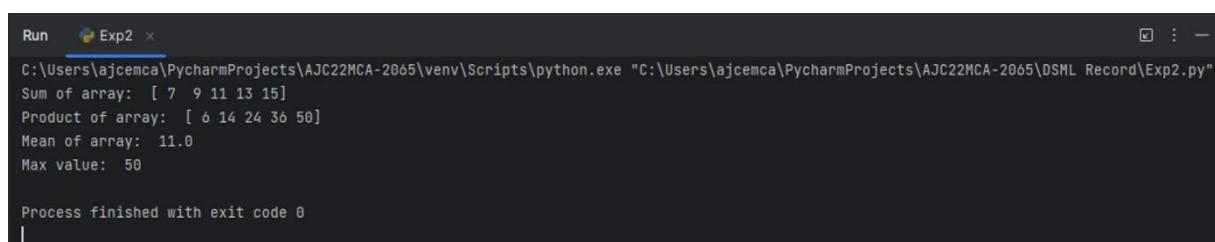
You have two NumPy arrays, arr1 and arr2. Write NumPy code to perform the following operations:

1. Add arr1 and arr2 to create a new array called result_add.
2. Multiply arr1 and arr2 to create a new array called result_multiply.
3. Calculate the mean of result_add.
4. Find the maximum value in result_multiply.

SOURCE CODE

```
import numpy as np  
  
arr1 = np.array([1, 2, 3, 4, 5])  
  
arr2 = np.array([6, 7, 8, 9, 10])  
  
result_add = arr1 + arr2  
  
print("Sum of array: ", result_add)  
  
result_multiply = arr1 * arr2  
  
print("Product of array: ", result_multiply)  
  
print("Mean of array: ", np.mean(result_add))  
  
print("Max value: ", np.max(result_multiply))
```

OUTPUT



```
Run Exp2 x  
C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\venv\Scripts\python.exe "C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\DSML Record\Exp2.py"  
Sum of array: [ 7  9 11 13 15]  
Product of array: [ 6 14 24 36 50]  
Mean of array: 11.0  
Max value: 50  
  
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 3

AIM

You have a NumPy array called grades that represents the scores of students in a class:

Write NumPy code to answer the following questions:

1. What is the average (mean) grade in the class?
2. How many students scored above 90?
3. Calculate the standard deviation of the grades.

SOURCE CODE

```
import numpy as np
grades = np.array([85, 90, 78, 92, 88, 76, 95, 89, 84, 91])
print("Average grade: ", np.mean(grades))
filter_grade = grades[grades > 90]
print("Number of Students scoring above 90: ", len(filter_grade))
std_grade = np.std(grades)
print("Standard deviation of grades: ", np.round(std_grade, decimals=2))
```

OUTPUT



```
Run Exp3 x
C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\venv\Scripts\python.exe "C:/Users/ajcemca/PycharmProjects/AJC22MCA-2065/DSML Record/Exp3.py"
Average grade: 86.8
Number of Students scoring above 90: 3
Standard deviation of grades: 5.78

Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 4

AIM

Perform the following matrix operations:

1. Add matrix_A and matrix_B element-wise to create a new matrix, matrix_sum.
2. Multiply matrix_A and matrix_B element-wise to create a new matrix, matrix_product.
3. Calculate the matrix product of matrix_A and matrix_B (dot product) and store it in matrix_dot.
4. Transpose matrix_A and store it in matrix_A_transpose.

Print the results of each operation.

SOURCE CODE

```
import numpy as np

matrix_A = np.array([[1, 2, 3],[4, 5, 6],[7, 8, 9]])

matrix_B = np.array([[9, 8, 7],[6, 5, 4],[3, 2, 1]])

matrix_sum = matrix_A + matrix_B

print("Sum of matrices: \n", matrix_sum)

matrix_product = matrix_A * matrix_B

print("Product of matrices: \n", matrix_product)

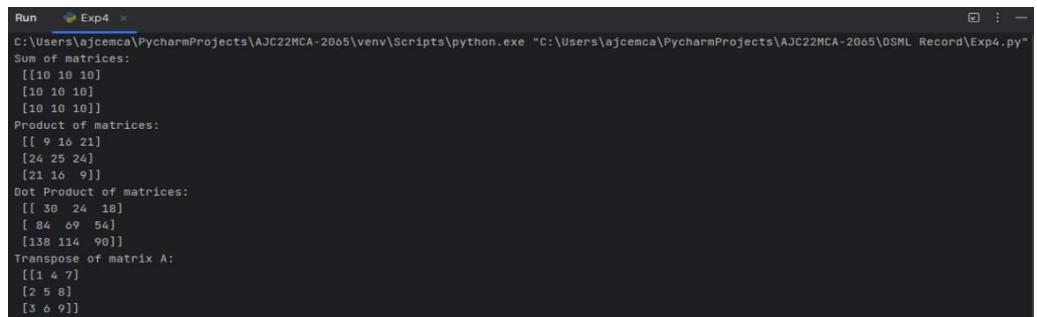
matrix_dot = np.dot(matrix_A, matrix_B)

print("Dot Product of matrices: \n",matrix_dot)

matrix_A_transpose = np.transpose(matrix_A)

print("Transpose of matrix A: \n", matrix_A_transpose)
```

OUTPUT



```
Run Exp4 x
C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\venv\Scripts\python.exe "C:\Users\ajcemca\PycharmProjects\AJC22MCA-2065\DSML Record\Exp4.py"
Sum of matrices:
[[10 10 10]
 [10 10 10]
 [10 10 10]]
Product of matrices:
[[ 9 16 21]
 [24 25 24]
 [21 16  9]]
Dot Product of matrices:
[[ 30 24 18]
 [ 84 69 54]
 [138 114 90]]
Transpose of matrix A:
[[1 4 7]
 [2 5 8]
 [3 6 9]]
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 5

AIM

You have a CSV file named "sales_data.csv" containing sales data with columns for "Date", "Product", "Quantity" and "Revenue". Load this data using Pandas and answer the following questions:

1. How many rows and columns are there in the dataset?
2. What is the total revenue for all the sales?

SOURCE CODE

```
import pandas as pd  
df=pd.read_csv("sales_data.csv")  
print(df.head())  
print("Number of Rows:",len(df))  
print("Number of columns:",len(df.columns))  
print("Total revenue:",sum(df['revenue']))
```

```
//sales_data.csv  
date,product,quantity,revenue  
2024-05-09,book,5,500  
2024-07-12,pencil,5,10  
2024-03-11,eraser,12,50  
2024-08-23,scale,6,30  
2024-11-23,pen,20,200
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/files.py  
      date product  quantity  revenue  
0  2024-05-09    book        5     500  
1  2024-07-12   pencil        5      10  
2  2024-03-11   eraser       12      50  
3  2024-08-23    scale        6      30  
4  2024-11-23     pen       20     200  
Number of Rows: 5  
Number of columns: 4  
Total revenue: 790  
  
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 6

AIM

You have a DataFrame called "student_data" with columns "Student_ID," "Name," "Age," and "GPA." Perform the following operations using Pandas:

1. Filter and display the rows of students who are 20 years old or older.
2. Calculate the average GPA of the students in the DataFrame.
3. Sort the DataFrame in descending order of GPA and display the top 5 students with the highest GPAs.
4. Group the students by their ages and calculate the average GPA for each age group.

SOURCE CODE

```
import pandas as pd
df=pd.read_csv("students_data.csv")
print(df)
print("no of students who are 20 years old or older:")
age_df=df[df['age'] >=20]
print(age_df)
avggpa=df['GPA'].mean()
print("Average GPA: ")
print(avggpa)
sorted_df=df.sort_values(by='GPA',ascending=False)
print("descending order of GPA: ")
print(sorted_df)
top_five=sorted_df.head(5)
print("Top 5 students with highest GPA: ")
print(top_five)
avg_grp=df.groupby('age')['GPA'].mean().reset_index()
print("Average GPA of Each age group : ")
print(avg_grp)
```

```
//student_data.csv
student_id,name,age,GPA
1001,Amal,23,9.8
1002,athul,18,8.8
1003,mathew,20,7.9
1004,thoma,21,8.9
1005,aby,19,6.8
1006,john,20,6.9
1007,robin,22,9.5
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/p6_student.py
   student_id      name    age   GPA
0        1001     Amal    23  9.8
1        1002    athul    18  8.8
2        1003   mathew    20  7.9
3        1004    thoma    21  8.9
4        1005      aby    19  6.8
5        1006     john    20  6.9
6        1007    robin    22  9.5
no of students who are 20 years old or older:
   student_id      name    age   GPA
0        1001     Amal    23  9.8
2        1003   mathew    20  7.9
3        1004    thoma    21  8.9
5        1006     john    20  6.9
6        1007    robin    22  9.5
Average GPA:
8.37142857142857
descending order of GPA:
   student_id      name    age   GPA
0        1001     Amal    23  9.8
6        1007    robin    22  9.5
3        1004    thoma    21  8.9
1        1002    athul    18  8.8
2        1003   mathew    20  7.9
5        1006     john    20  6.9
4        1005      aby    19  6.8
```

```
Top 5 students with highest GPA:
```

```
    student_id      name  age  GPA
0          1001     Amal  23  9.8
6          1007    robin  22  9.5
3          1004   thoma  21  8.9
1          1002   athul  18  8.8
2          1003  matthew  20  7.9
```

```
Average GPA of Each age group :
```

```
    age  GPA
0   18  8.8
1   19  6.8
2   20  7.4
3   21  8.9
4   22  9.5
5   23  9.8
```

```
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM - 7

AIM

Create scatter plot for the below data:(use Scatter function)

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Affordable Segment	173	153	195	147	120	144	148	109	174	130	172	131
Luxuary Segment	189	189	105	112	173	109	151	197	174	145	177	161
Super Luxury Segment	185	185	126	134	196	153	112	138	200	145	167	110

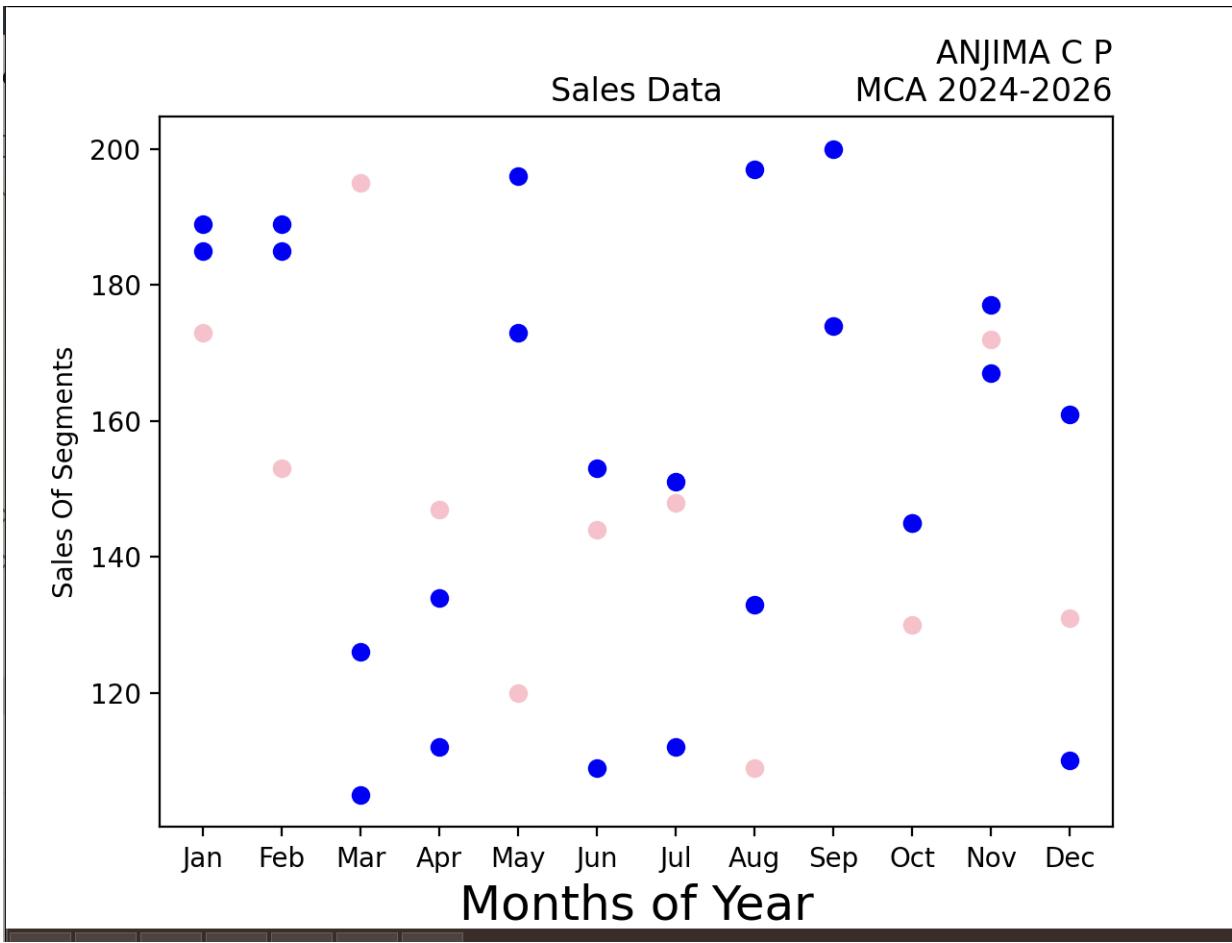
Create scatter plot for each Segment with following properties within one graph

- X Label -Month of Year with font size 18
- Y Label-Sales of Segments
- Title-Sales Data
- Color for Affordable segment-pink
- Color For Luxury segment

SOURCE CODE

```
import matplotlib.pyplot as plt
import numpy as np
month=np.array(['Jan','Feb','Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec'])
AS=np.array([173,153,195,147,120,144,148,109,174,130,172,131])
LS=np.array([189,189,105,112,173,109,151,197,174,145,177,161])
SLS=np.array([185,185,126,134,196,153,112,133,200,145,167,110])
plt.xlabel("Months of Year",fontsize=18)
plt.ylabel('Sales Of Segments')
plt.title('Sales Data')
plt.title('ANJIMA C P\n MCA 2024-2026',loc='right')
plt.scatter(month,AS,label='Affordable Segment',color='pink')
plt.scatter(month,LS,label=' Luxury Segment',color='blue')
plt.scatter(month,SLS,label='Super Luxury Segment',color='blue')
plt.savefig("months.png")
plt.show()
```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

PROGRAM - 8

AIM

100 students were asked what their primary mode of transport for getting to school was. The results of this survey are recorded in the table below. Construct a bar graph representing this information.

Mode of Transport	Frequency
Walking	29
Cycling	15
Car	35
Bus	18
Train	3

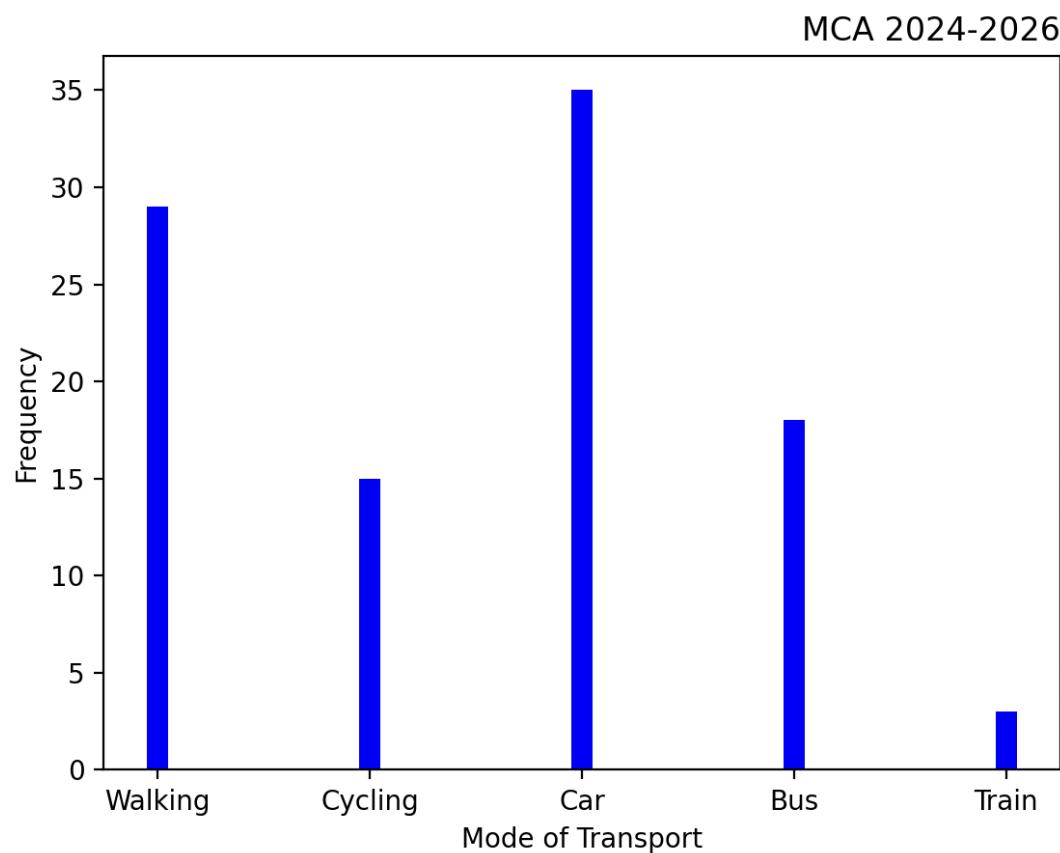
Create a bar graph

- X axis-mode of Transport and Y axis -frequency
- Provide appropriate labels and title
- Width.1,color blue

SOURCE CODE

```
import matplotlib.pyplot as plt
import numpy as np
mode_transport=np.array(["Walking",'Cycling','Car','Bus','Train'])
feq=np.array([29,15,35,18,3])
plt.xlabel('Mode of Transport')
plt.ylabel('Frequency')
plt.title('MCA 2024-2026',loc='right')
plt.bar(mode_transport,feq,width=0.1,color='blue')
plt.savefig("Transport.png")
plt.show()
```

OUTPUT



PROGRAM – 9

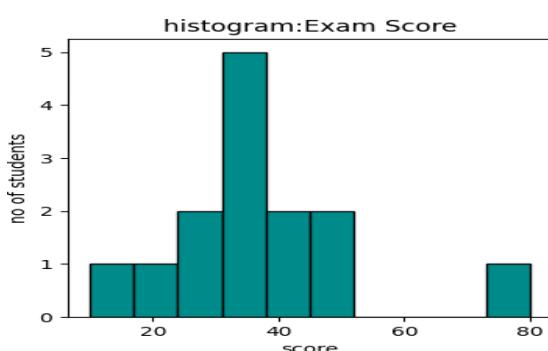
AIM

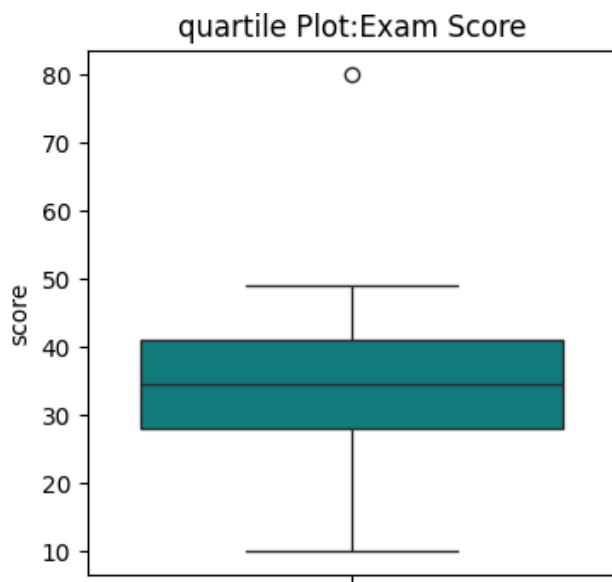
Use a dataset of your choice (e.g., exam scores of students, employee salaries, or any other numerical data). Create a histogram to visualize the data's distribution. Afterward, plot quartiles (e.g., Q1, Q2, Q3) on the same graph.

SOURCE CODE

```
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
marks=np.array([10,18,34,37,33,38,24,80,45,49,27,31,35,42])
fig, ax=plt.subplots(figsize=(4,4))
ax.hist(marks, color="darkcyan",ec="black",lw=1)
plt.title('histogram:Exam Score')
plt.ylabel('no of students')
plt.xlabel('score')
plt.savefig('histogram.png')
plt.figure(figsize=(4,4))
sns.boxplot(y=marks,color="darkcyan")
plt.title('quartile Plot:Exam Score')
plt.ylabel('score')
plt.savefig('quartile_plot.png')
```

OUTPUT





RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 10

AIM

Choose a dataset that contains two numerical variables (e.g., income vs. education level, temperature vs. ice cream sales). Create a distribution chart for each variable and a scatter plot to visualize their relationship.

SOURCE CODE

```
import matplotlib
matplotlib.use('Agg') # Use non-interactive backend

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Define the data
x_values = [1, 2, 3, 4, 5]
y_values = [10, 15, 13, 18, 20]
data_values = [10, 15, 13, 18, 20]

# Create DataFrame
df = pd.DataFrame({'x': x_values, 'y': y_values, 'value': data_values})

# Create a pivot table for the heatmap
heatmap_data = df.pivot_table(index='x', columns='y', values='value')

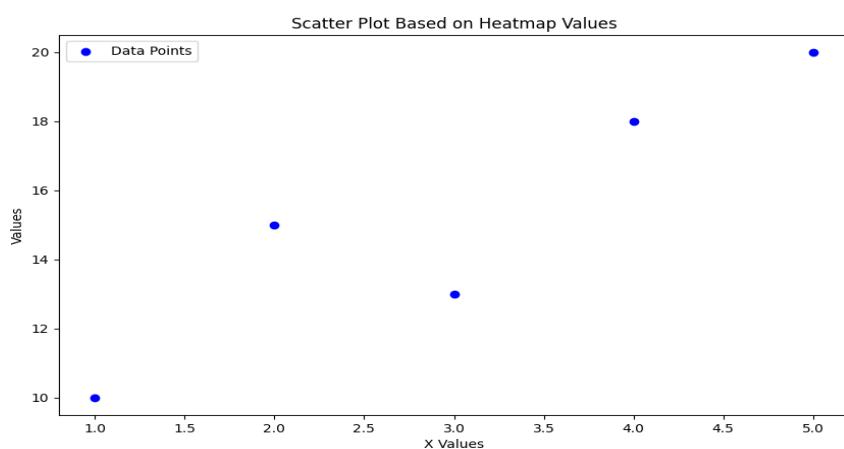
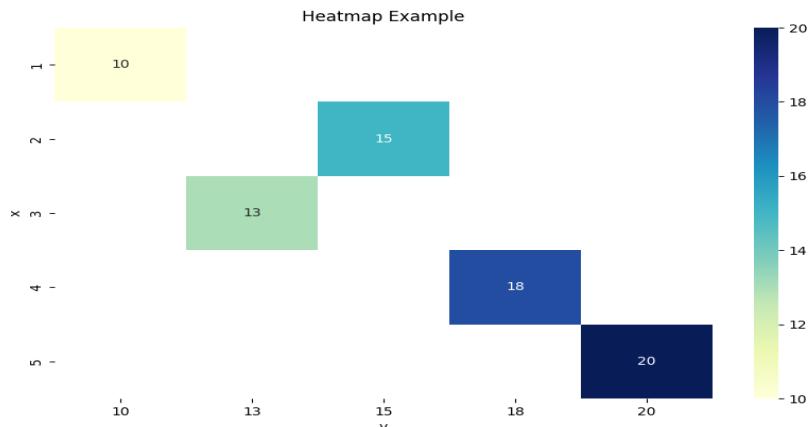
# Plot the heatmap
fig, ax = plt.subplots(figsize=(10, 6))
sns.heatmap(heatmap_data, annot=True, cmap='YlGnBu', cbar=True)
plt.title('Heatmap Example')
plt.savefig('heatmap_example.png') # Save to file
plt.close()
```

```

# Scatter Plot
plt.figure(figsize=(10, 6))
plt.scatter(df['x'], df['value'], marker='o', color='blue', label='Data Points')
plt.xlabel('X Values')
plt.ylabel('Values')
plt.title('Scatter Plot Based on Heatmap Values')
plt.legend()
plt.savefig('scatter_plot_example.png') # Save to file
plt.close()

```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 11

AIM

Select a dataset with at least three numerical variables (e.g., population, income, and education level by city). Create a bubble chart that represents the data by using bubble sizes and colors to encode information. Additionally, create a density chart (e.g., a 2D density plot) to show the concentration of data points.

SOURCE CODE

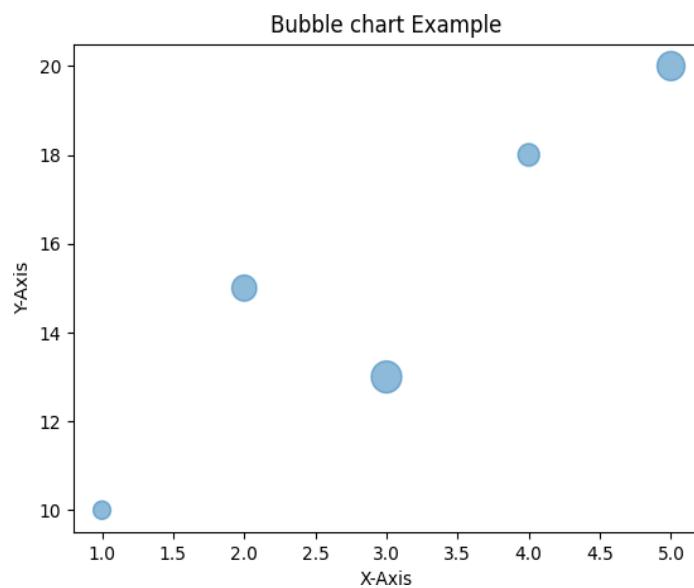
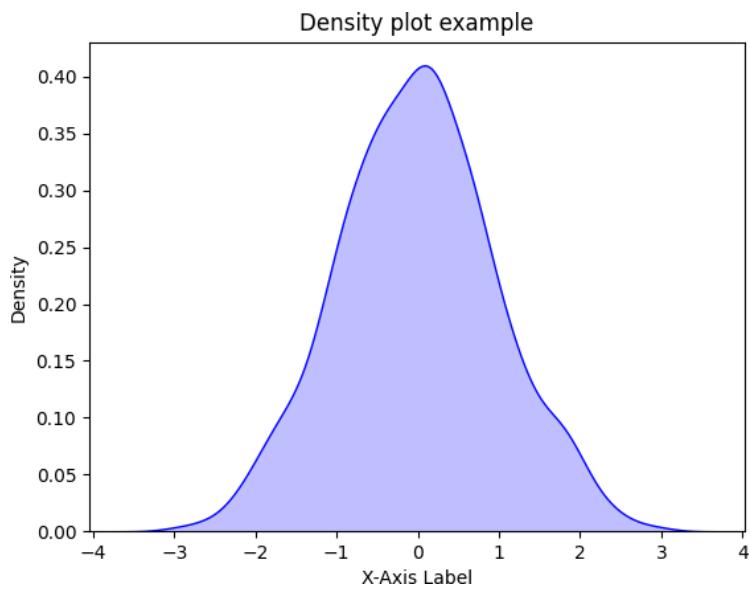
```
//DensityChart.py
```

```
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
data = np.random.randn(1000)
sns.kdeplot(data, fill=True, color='blue', label='Density Plot')
plt.xlabel('X-Axis Label')
plt.ylabel('Density')
plt.title('Density plot example')
plt.savefig('Density_plot.png')
```

```
//BubbleDiagram.py
```

```
import matplotlib.pyplot as plt
x=[1,2,3,4,5]
y=[10,15,13,18,20]
sizes=[100,200,300,150,250]
plt.scatter(x,y,s=sizes,alpha=0.5)
plt.xlabel('X-Axis')
plt.ylabel('Y-Axis')
plt.title('Bubble chart Example')
plt.savefig('bubblechart.png')
```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 12

AIM

Program to implement K-Nearest Neighbour Classification and find the accuracy of algorithm.

SOURCE CODE

```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score,classification_report
data = pd.read_csv("iris.csv")
X = data.drop("species",axis=1)
y = data["species"]
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.3,random_state=42)
knn_classifier = KNeighborsClassifier(n_neighbors=3)
knn_classifier.fit(X_train,y_train)
y_pred = knn_classifier.predict(X_test)
accuracy = accuracy_score(y_test,y_pred)
print("Accuracy:",accuracy)
report = classification_report(y_test,y_pred,target_names=data["species"].unique())
print("Classification Report:\n",report)
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/Knearest.py
Accuracy: 1.0
Classification Report:
 precision    recall    f1-score   support
Setosa       1.00     1.00     1.00      19
Versicolor   1.00     1.00     1.00      13
Virginica    1.00     1.00     1.00      13

accuracy                  1.00      45
macro avg       1.00     1.00     1.00      45
weighted avg    1.00     1.00     1.00      45

Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 13

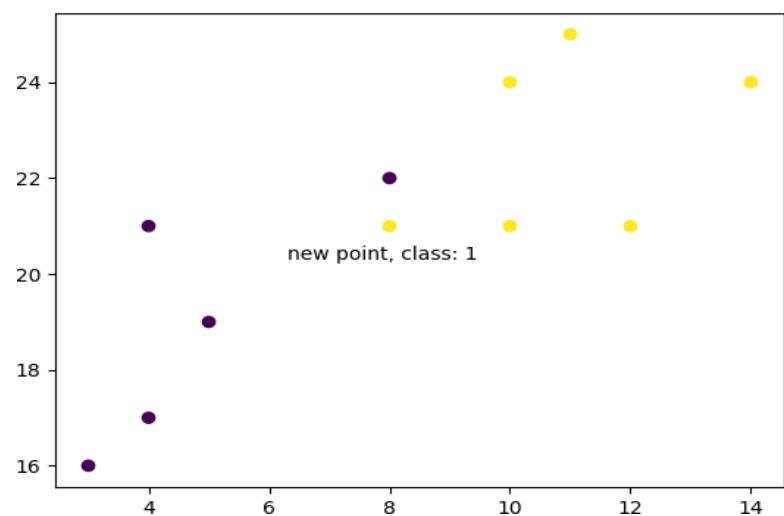
AIM

Program to demonstrate how the K-Nearest Neighbors (KNN) algorithm determines the class of a new data point.

SOURCE CODE

```
import matplotlib.pyplot as plt
from sklearn.neighbors import KNeighborsClassifier
x = [4, 5, 10, 4, 3, 11, 14 , 8, 10, 12]
y = [21, 19, 24, 17, 16, 25, 24, 22, 21, 21]
classes = [0, 0, 1, 0, 0, 1, 1, 0, 1, 1]
data = list(zip(x, y))
knn = KNeighborsClassifier(n_neighbors=5)
knn.fit(data, classes)
new_x = 8
new_y = 21
new_point = [(new_x, new_y)]
prediction = knn.predict(new_point)
plt.scatter(x + [new_x], y + [new_y], c=classes + [prediction[0]])
plt.text(x=new_x-1.7, y=new_y-0.7, s=f'new point, class: {prediction[0]}')
plt.savefig("knn.png")
```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

⁴
PROGRAM – 14

AIM

Program to implement Naive Bayes Classifier.

SOURCE CODE

```
from sklearn.datasets import load_iris  
iris=load_iris()  
X=iris.data  
y=iris.target  
from sklearn.model_selection import train_test_split  
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size=0.4,random_state=1)  
from sklearn.naive_bayes import GaussianNB  
gnb= GaussianNB()  
gnb.fit(X_train,y_train)  
y_pred=gnb.predict(X_test)  
from sklearn import metrics  
print("GaussNaive bayes model accuracy(in%):",metrics.accuracy_score(y_test,y_pred)*100)
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/naivebayes.py  
GaussNaive bayes model accuracy(in %): 95.0  
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 15

AIM

Program to implement Simple Linear Regression and find r2 score.

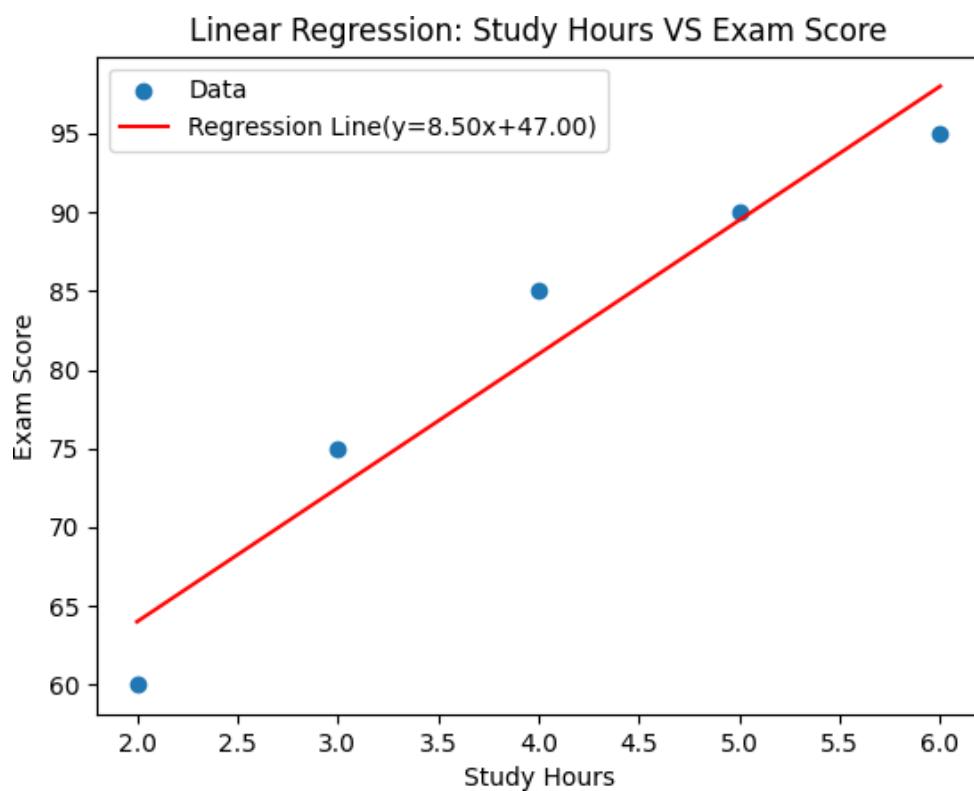
SOURCE CODE

```
import numpy as np
from fontTools.subset import intersect
from sklearn.feature_selection import f_regression
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
X=np.array([2,3,4,5,6]).reshape(-1,1)
Y=np.array([60,75,85,90,95])
model=LinearRegression()
model.fit(X,Y)
Y_pred=model.predict(X)
slope=model.coef_[0]
intercept=model.intercept_
plt.scatter(X,Y,label='Data')
plt.plot(X,Y_pred,color='red',label=f'Regression Line(y={slope:.2f}x+{intercept:.2f})')
plt.xlabel('Study Hours')
plt.ylabel('Exam Score')
plt.legend()
plt.title('Linear Regression: Study Hours VS Exam Score')
plt.savefig('Simple_Linear_Regression.png')
new_SH=int(input("Enter the number of hours:"))
pred_Sc=model.predict(np.array([[new_SH]]))
print(f'Predicted Exam Score for {new_SH} study hours: {pred_Sc[0]:.2f}')
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/simpleLR.py
Enter the number of hours:8
Predicted Exam Score for 8 study hours: 115.00

Process finished with exit code 0
```



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 16

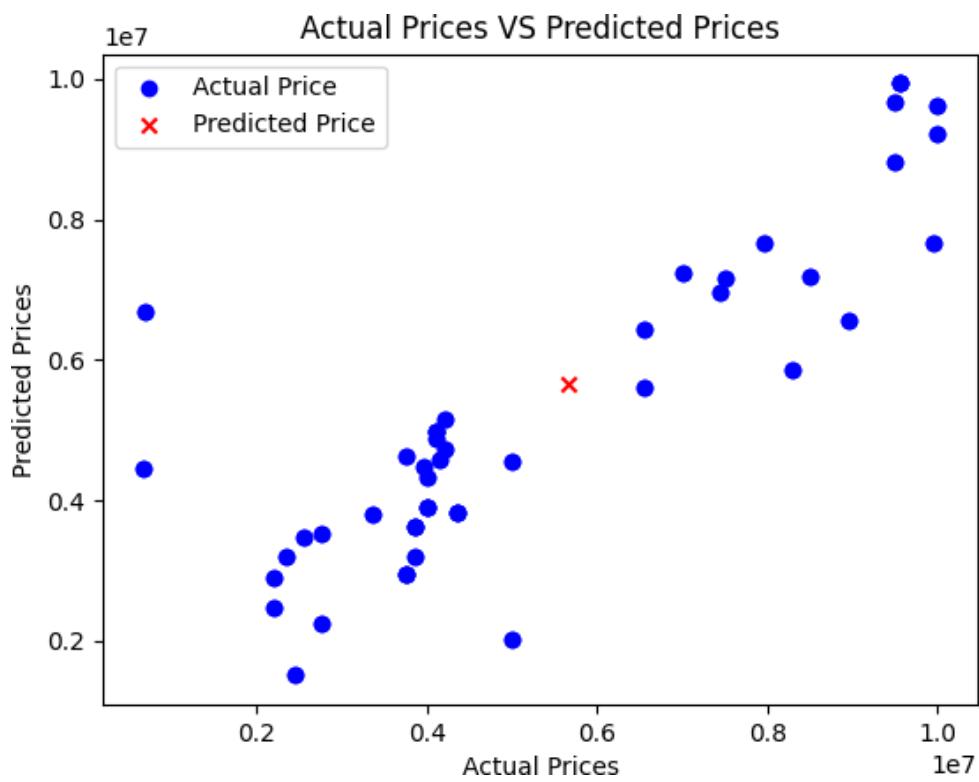
AIM

Program to implement Multiple Linear Regression and evaluate its performance.

SOURCE CODE

```
import pandas as pd
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
data = pd.read_csv("house-price.csv")
X = data[['No_Rooms','Sq_Foot','Age']].values
Y = data['Price'].values
model = LinearRegression()
model.fit(X,Y)
Y_pred=model.predict(X)
plt.scatter(Y,Y_pred,color='blue')
plt.xlabel('Actual Prices')
plt.ylabel('Predicted Prices')
plt.title('Actual Prices VS Predicted Prices')
input_values=[int(input("Enter the number of rooms :")),
             int(input("Enter the square footage :")),
             int(input("Enter the Age :"))]
predicted_price=model.predict([input_values])
print("Predicted Price: ",predicted_price[0])
plt.scatter(Y,Y_pred,color='blue',label='Actual Price')
plt.scatter(predicted_price,predicted_price,color='red',marker='x',label='Predicted Price')
plt.legend()
plt.savefig("MultipleLR.png")
```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 17

AIM

Program to implement Decision Tree Classification.

SOURCE CODE

```
import sys
import matplotlib
matplotlib.use('Agg')
import pandas as pd
from sklearn.tree import DecisionTreeClassifier, plot_tree
import matplotlib.pyplot as plt

# Load the dataset
df = pd.read_csv('decision_data.csv')

# Print initial DataFrame info
print("Initial DataFrame:")
print(df.info())
print(df.head())

# Map categorical variables to numerical values
nationality_map = {'UK': 0, 'USA': 1, 'N': 2}
df['Nationality'] = df['Nationality'].map(nationality_map)
d = {'YES': 1, 'NO': 0}
df['Go'] = df['Go'].map(d)

# Check for NaN values in the target variable
print("Checking for NaN values in 'Go' column...")
print(df['Go'].isnull().sum())

if df['Go'].isnull().any():
```

```

print("NaN values found in 'Go' column. Dropping rows with NaN values.")
df = df.dropna(subset=['Go'])

# Print DataFrame info after dropping NaN values
print("DataFrame after dropping NaN values:")
print(df.info())
print(df.head())

# Check if there's enough data
if df.shape[0] == 0:
    print("No data available for training. Please check your dataset.")
    sys.exit(1)

# Define features and target variable
features = ['Age', 'Experience', 'Rank', 'Nationality']
X = df[features]
y = df['Go']

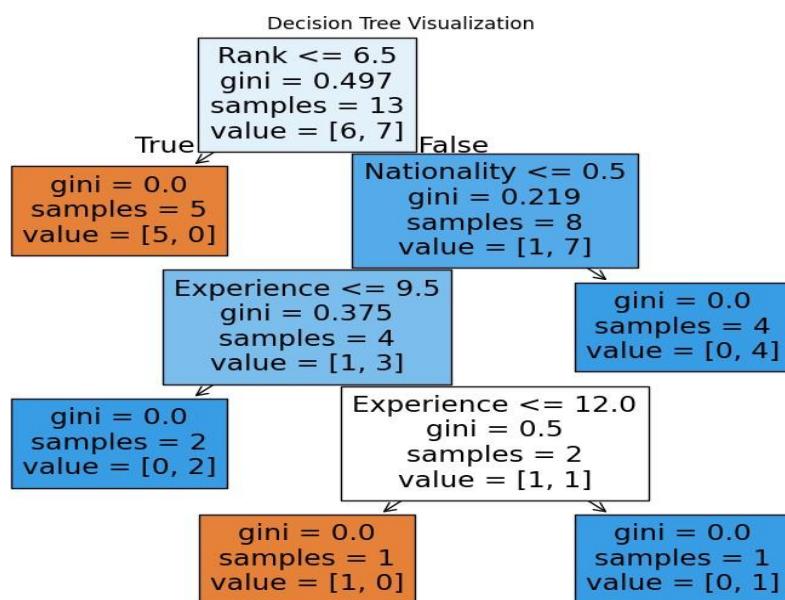
# Fit the Decision Tree Classifier
dtree = DecisionTreeClassifier()
dtree.fit(X, y)

# Plot the decision tree
plt.figure(figsize=(10, 8))
plot_tree(dtree, feature_names=features, filled=True)
plt.title('Decision Tree Visualization')
plt.savefig('decision_tree.png')
plt.close()
sys.stdout.flush()

```

```
//decision_data.csv
"Age","Experience","Rank","Nationality","Go"
36,10,9,UK,NO
42,12,4,USA,NO
23,4,6,N,NO
52,4,4,USA,NO
43,21,8,USA,YES
44,14,5,UK,NO
66,3,7,N,YES
35,14,9,UK,YES
52,13,7,N,YES
35,5,9,N,YES
24,3,5,USA,NO
18,3,7,UK,YES
45,9,9,UK,YES
```

OUTPUT



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 18

AIM

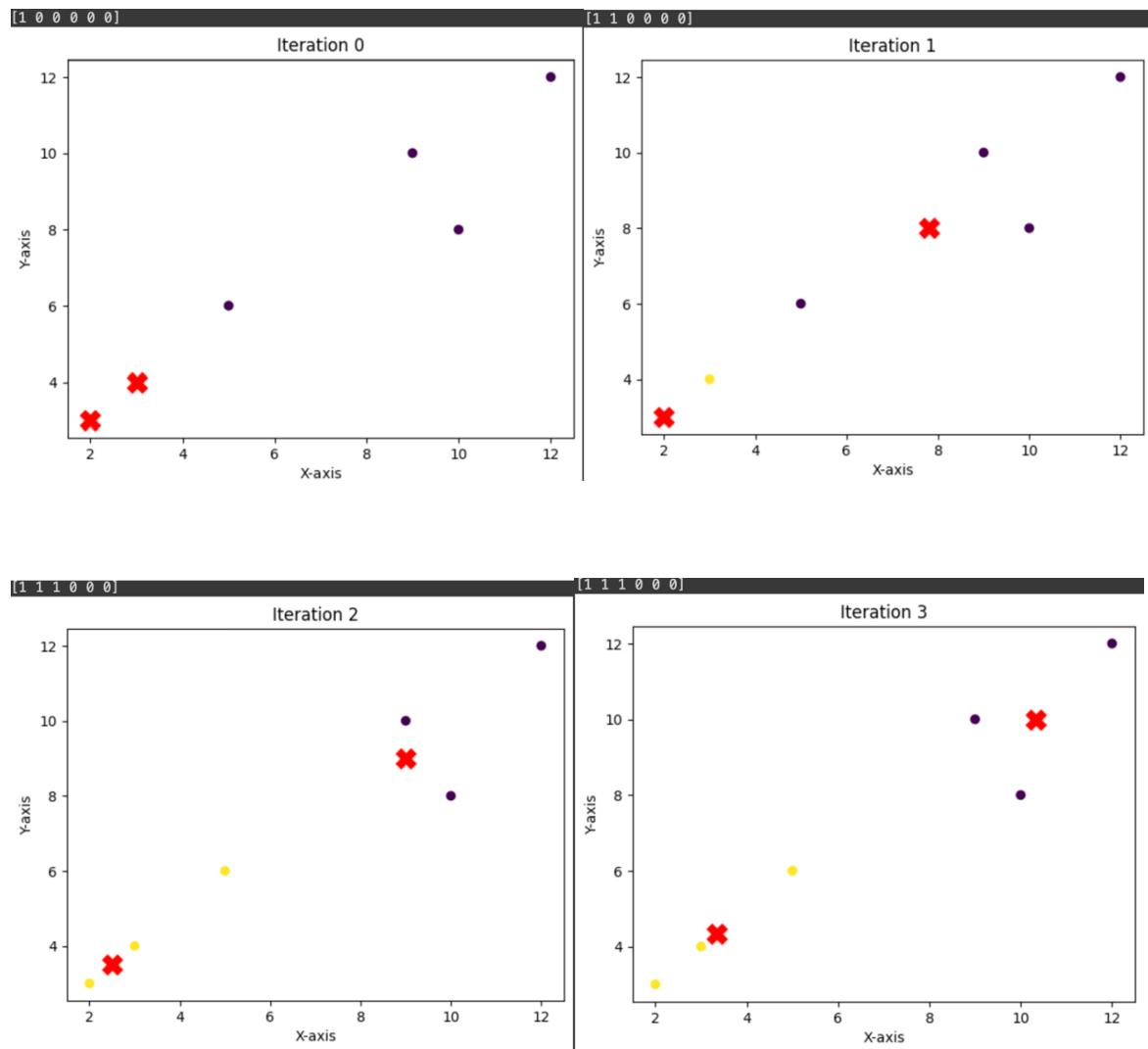
Program to implement K-Means Classification.

SOURCE CODE

```
import numpy as np
import matplotlib.pyplot as plt
data = np.array([[2, 3], [3, 4], [5, 6], [9, 10], [10, 8], [12, 12]])
k = 2
centroids = data[np.random.choice(data.shape[0], k, replace=False)]
num_iterations = 100
for iteration in range(num_iterations):
    distances = np.linalg.norm(data[:, np.newaxis] - centroids, axis=2)
    labels = np.argmin(distances, axis=1)
    print(labels)
    plt.scatter(data[:, 0], data[:, 1], c=labels)
    plt.scatter(centroids[:, 0], centroids[:, 1], c='red', marker='X', s=200)
    plt.xlabel("X-axis")
    plt.ylabel("Y-axis")
    plt.title(f"Iteration {iteration}")
    plt.show()
    new_centroids = np.array([data[labels == i].mean(axis=0) for i in range(k)])
    if np.array_equal(centroids, new_centroids):
        break
    centroids = new_centroids
print("Final Cluster Assignments:", labels)
print("Final Cluster Centroids:", centroids)
```

OUTPUT

```
[[10.88321848  1.88561808]
 [ 9.4751136   0.47140452]
 [ 6.66666667  2.3570226]
 [ 1.33333333  8.01387685]
 [ 2.02758751  7.60847481]
 [ 2.60341656  11.57103664]]
Final Cluster Assignments: [1 1 1 0 0 0]
Final Cluster Centroids: [[10.33333333 10.
 [ 3.33333333  4.33333333]]]
```



RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 19

AIM

Program to implement Part-Of-Speech (POST) Tagging.

SOURCE CODE

```
import nltk  
from nltk import pos_tag  
from nltk.tokenize import word_tokenize  
sentence = "part-of-speech tagging is important for natural language processing"  
words = word_tokenize(sentence)  
pos_tags = pos_tag(words)  
print (pos_tags)
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/p15_POSTtagging.py  
[('part-of-speech', 'JJ'), ('tagging', 'NN'), ('is', 'VBZ'), ('important', 'JJ'), ('for', 'IN'), ('natural', 'JJ'), ('language', 'NN'), ('processing', 'NN')]  
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 20

AIM

Program to implement N-Gram Modeling.

SOURCE CODE

```
from nltk import bigrams, word_tokenize  
sentence = " Natural language processing is fascinating."  
words = word_tokenize(sentence)  
bigrams_list = list(bigrams(words))  
print (bigrams_list)
```

OUTPUT

```
/home/cep/PycharmProjects/pythonProject/.venv/bin/python /home/cep/Desktop/pythonProject/P16_NGram.py  
[('Natural', 'language'), ('language', 'processing'), ('processing', 'is'), ('is', 'fascinating'), ('fascinating', '.')]  
Process finished with exit code 0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM – 21

AIM

Program to implement a Feed Forward Network using Iris Data Set.

SOURCE CODE

```
from scipy.signal import impulse
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.datasets import load_iris
from tensorflow.keras import models,layers
from Knearest import X_train, X_test, y_train, y_test
iris = load_iris()
X=iris.data
y=iris.target
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)
scaler=StandardScaler()
X_train=scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
label_encoder = LabelEncoder()
y_train = label_encoder.fit_transform(y_train)
y_test = label_encoder.transform(y_test)
model = models.Sequential()
model.add(layers.Dense(64,activation='relu',input_shape=(4,)))
model.add(layers.Dense(32,activation='relu'))
model.add(layers.Dense(3,activation='softmax'))
model.compile(optimizer='adam', loss='sparse_categorical_crossentropy',
metrics=['accuracy'])
model.fit(X_train,y_train,epochs=50,batch_size=8,validation_split=0.1)
test_loss,test_acc = model.evaluate(X_test,y_test)
print(f'Test accuracy: {test_acc}')
```

OUTPUT

```
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9645 - loss: 0.0613 - val_accuracy: 0.9167 - val_loss: 0.3557
Epoch 37/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9922 - loss: 0.0450 - val_accuracy: 0.9167 - val_loss: 0.3319
Epoch 38/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9836 - loss: 0.0638 - val_accuracy: 0.9167 - val_loss: 0.3516
Epoch 39/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9588 - loss: 0.0805 - val_accuracy: 0.9167 - val_loss: 0.3342
Epoch 40/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9605 - loss: 0.0626 - val_accuracy: 0.9167 - val_loss: 0.3325
Epoch 41/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9561 - loss: 0.0700 - val_accuracy: 0.9167 - val_loss: 0.3370
Epoch 42/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9875 - loss: 0.0676 - val_accuracy: 0.9167 - val_loss: 0.3182
Epoch 43/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9814 - loss: 0.0536 - val_accuracy: 0.9167 - val_loss: 0.3574
Epoch 44/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9719 - loss: 0.0699 - val_accuracy: 0.9167 - val_loss: 0.3827
Epoch 45/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9796 - loss: 0.0570 - val_accuracy: 0.9167 - val_loss: 0.3512
Epoch 46/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9948 - loss: 0.0439 - val_accuracy: 0.9167 - val_loss: 0.3713
Epoch 47/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9838 - loss: 0.0576 - val_accuracy: 0.9167 - val_loss: 0.3596
Epoch 48/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9683 - loss: 0.0713 - val_accuracy: 0.9167 - val_loss: 0.3529
Epoch 49/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9780 - loss: 0.0555 - val_accuracy: 0.9167 - val_loss: 0.3783
Epoch 50/50
14/14 ━━━━━━━━ 0s 2ms/step - accuracy: 0.9901 - loss: 0.0508 - val_accuracy: 0.9167 - val_loss: 0.3655
1/1 ━━━━━━━━ 0s 13ms/step - accuracy: 1.0000 - loss: 0.0399
Test accuracy: 1.0
```

RESULT

The program has been executed successfully and output is obtained.

PROGRAM - 22

AIM

For given text

- Perform word
- Sentence tokenization
- Remove the stop words from the given text
- Create n-grams

SOURCE CODE

```
import nltk
nltk.download('punkt')
nltk.download('punkt_tab')
nltk.download('stopwords')
from nltk import ngrams
from nltk.corpus import stopwords
from nltk.tokenize import sent_tokenize,word_tokenize
print("PJR24MCA-2005:ANJIMA C P ")
print("BATCH: MCA 2024-2026")
text1="The data given satisfies the requirements for model generation.This is used in Data
Science Lab"
print("Sentence Tokenization")
print(sent_tokenize(text1))
print("Word Tokenization:")
print(word_tokenize(text1))
text=word_tokenize(text1)
text2=[word for word in text if word not in stopwords.words('english')]
print("Removing stop_words:")
print(text2)
print("")
print("n grams")
unigrams=ngrams(text2,3)
for grams in unigrams:
    print(grams)
```

OUTPUT

```
/Users/anjimacp/PycharmProjects/PythonProject5/.venv1/bin/python /Users/anjimacp/PycharmProjects/PythonProject5/ngrams.py
PJR24MCA-2005:ANJIMA C P
BATCH: MCA 2024-2026
Sentence Tokenization
['The data given satisfies the requirements for model generation.This is used in Data Science Lab']
Word Tokenization:
['The', 'data', 'given', 'satisfies', 'the', 'requirements', 'for', 'model', 'generation.This', 'is', 'used', 'in', 'Data', 'Science', 'Lab']
Removing stop_words:
['The', 'data', 'given', 'satisfies', 'requirements', 'model', 'generation.This', 'used', 'Data', 'Science', 'Lab']

n grams
('The', 'data', 'given')
('data', 'given', 'satisfies')
('given', 'satisfies', 'requirements')
('satisfies', 'requirements', 'model')
('requirements', 'model', 'generation.This')
('model', 'generation.This', 'used')
('generation.This', 'used', 'Data')
('used', 'Data', 'Science')
('Data', 'Science', 'Lab')
```

RESULT

The program has been executed successfully and output is obtained

OUTPUT