Experiment No.: 1

Aim: Write a program to perform matrix operations. Use Numpy as the python library and perform the operations using built in functions in Numpy.

CO1: Use different python packages to perform numerical calculations, statistical computations and data visualization

Procedure:

```
import numpy as np
def input_matrix(matrix_name):
  rows = int(input(f"Enter the no of rows of {matrix_name}: "))
  cols = int(input(f"Enter the no of columns of {matrix_name}: "))
  matrix=[]
  print("Enter the elements:")
  for i in range(rows):
     rows=[]
     for j in range(cols):
        element=int(input(f"Enter the element at row {i+1},column {j+1}:"))
        rows.append(element)
     matrix.append(rows)
  return np.array(matrix)
matrix1 = input_matrix("matrix1")
matrix2 = input_matrix("matrix2")
sum = np.add(matrix1, matrix2)
print("Addition=", sum)
diff = np.subtract(matrix1, matrix2)
print("Subtraction=", diff)
prod = np.multiply(matrix1, matrix2)
print("Multiplication=", prod)
div = np.divide(matrix1, matrix2)
print("Division=", div)
transp = np.transpose(matrix1)
print("Transpose=", transp)
dot = np.dot(matrix1, matrix2)
print("Dot product=", dot)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
Enter the no of rows of matrix1: 2
Enter the no of columns of matrix1: 2
Enter the elements:
Enter the element at row 1,column 1:1
Enter the element at row 1,column 2:2
Enter the element at row 2,column 1:3
Enter the element at row 2,column 2:4
Enter the no of rows of matrix2: 2
Enter the no of columns of matrix2: 2
Enter the elements:
Enter the element at row 1,column 1:5
Enter the element at row 1,column 2:6
Enter the element at row 2,column 1:7
Enter the element at row 2,column 2:8
Addition:
 [[ 6  8]
 [10 12]]
Subtraction:
 [[-4 -4]
 [-4 -4]]
Multiplication:
 [[ 5 12]
 [21 32]]

Division:
 [[0.2        0.33333333]
 [0.42857143 0.5       ]]
Transpose:
 [[1 3]
 [2 4]]
Dot product:
 [[19 22]
 [43 50]]
```

Result: The program was executed successfully and the output was obtained. Thus, CO1 has been attained.

Experiment No.: 2

Aim: Program to perform single value decomposition(SVD) using python Numpy.

CO1: Use different python packages to perform numerical calculations, statistical computations and data visualization

Procedure:

```
import numpy as np
matrix = np.array([[5, 6, 4],
                   [2, 5, 6],
                   [3, 5, 6]])
U, S, VT = np.linalg.svd(matrix)
print("Matrix U: ")
print(U)
print("Matrix S: ")
print(np.diag(S))
print("Matrix VT: ")
print(VT)
recnstrct = np.dot(U,np.dot(np.diag(S),VT))
print("Old Matrix: ")
print(recnstrct)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
U Matrix:
 [[-0.59482308  0.7878662  -0.15953794]
 [-0.55395727 -0.54556995 -0.6288758 ]
 [-0.58250909 -0.28569264  0.76096181]]
S Matrix:
 [[14.28896808  0.          0.        ]
 [ 0.          2.76798539  0.        ]
 [ 0.          0.          0.40453427]]
VT Matrix:
 [[-0.40797608 -0.64744146 -0.64371972]
 [ 0.71933659  0.2062454  -0.6633383 ]
 [ 0.56223695 -0.73367731  0.38158514]]
Reconstructed Matrix:
 [[5. 6. 4.]
 [2. 5. 6.]
 [3. 5. 6.]]

Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO1 has been attained.

Experiment No.: 3

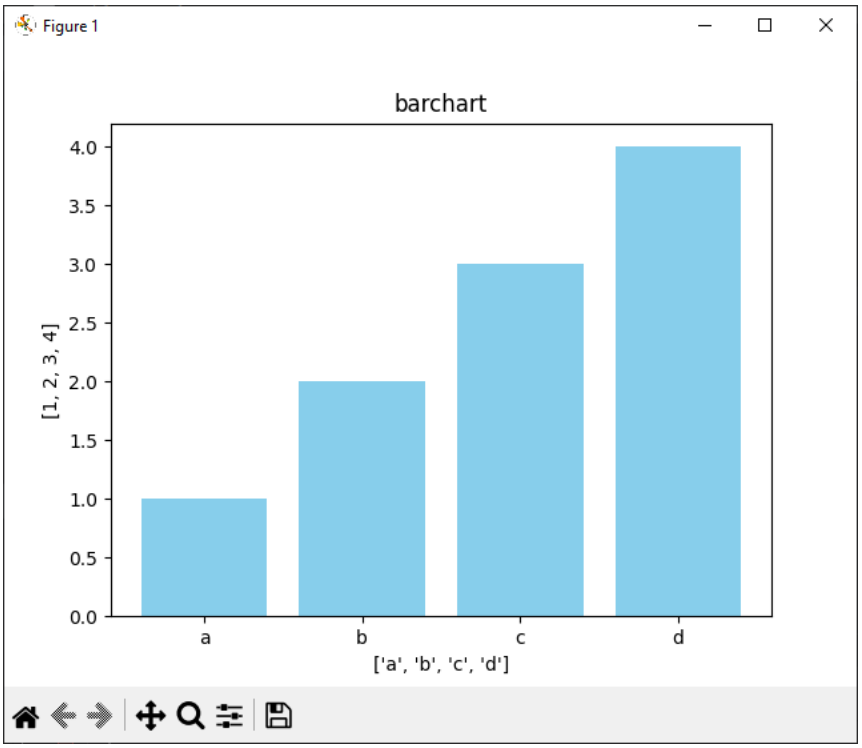
Aim: Program to perform data visualisation using the python library matplotlib.

CO1: Use different python packages to perform numerical calculations, statistical computations and data visualization.

Procedure:

```
import matplotlib.pyplot as plt
categories=["a","b","c","d"]
values=[1,2,3,4]
plt.bar(categories,values,color='skyblue')
plt.xlabel(categories)
plt.ylabel(values)
plt.title("barchart")
plt.show()
```

Output Screenshot



Result: The program was executed successfully and the output was obtained. Thus, CO1 has been attained.

Experiment No.: 4

Aim: Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm. (Iris Dataset).

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.datasets import load_iris
from sklearn.metrics import accuracy_score
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)
knn=KNeighborsClassifier(n_neighbors=7)
knn.fit(x_train,y_train)
print(knn.predict(x_test))
V=knn.predict(x_test)
result=accuracy_score(y_test,V)
print("Accuracy= ",result)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\DSML\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\DSML\Exp4.py
[1 0 2 1 1 0 1 2 2 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0]
accuracy: 0.9666666666666667

Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 5

Aim: Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm. (Load Digits)

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.datasets import load_digits
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
digits=load_digits()
x=digits.data
y=digits.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
knn=KNeighborsClassifier(n_neighbors=7)
knn.fit(x_train,y_train)
print((knn.predict(x_test)))
P=knn.predict(x_test)
R=accuracy_score(y_test,P)
print("Accuracy= ",R)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\DSML\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\DSML\KNNsample.py
[6 9 3 7 2 1 5 2 5 2 1 9 4 0 4 2 3 7 8 8 4 3 9 7 5 6 3 5 6 3 4 9 1 4 4 6 9
 4 7 6 6 9 1 3 6 1 3 0 6 5 5 1 9 5 6 0 9 0 0 1 0 4 5 2 4 5 7 0 7 5 9 9 5 4
 7 0 4 5 5 9 9 0 2 3 8 0 6 4 4 9 1 2 8 3 5 2 9 0 4 4 4 3 5 3 1 3 5 9 4 2 7
 7 4 4 1 9 2 7 8 7 2 6 9 4 0 7 2 7 5 8 7 5 7 7 0 6 6 4 2 8 0 9 4 6 9 9 6 9
 0 3 5 6 6 0 6 4 3 9 3 4 7 2 9 0 4 5 3 6 5 9 9 8 4 2 1 3 7 7 2 2 3 9 8 0 3
 2 2 5 6 9 9 4 1 5 4 2 3 6 4 8 5 9 5 7 1 9 4 8 1 5 4 4 9 6 1 8 6 0 4 5 2 7
 4 6 4 5 6 0 3 2 3 6 7 1 5 1 4 7 6 8 8 5 5 1 6 2 8 8 9 5 7 6 2 2 2 3 4 8 8
 3 6 0 9 7 7 0 1 0 4 5 1 5 3 6 0 4 1 0 0 3 6 5 9 7 3 5 5 9 9 8 5 3 3 2 0 5
 8 3 4 0 2 4 6 4 3 4 5 0 5 2 1 3 1 4 1 1 7 0 1 5 2 1 2 8 7 0 6 4 8 8 5 1 8
 4 5 8 7 9 8 6 0 6 2 0 7 9 1 9 5 2 7 7 1 8 7 4 3 8 3 5]
accuracy: 0.9833333333333333

Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 6

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

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
from sklearn.naive_bayes import GaussianNB
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
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)
clf=GaussianNB()
clf.fit(x_train,y_train)
print(clf.predict(x_test))
V=clf.predict(x_test)
result=accuracy_score(y_test,V)
print("Accuracy= ",result)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
[1 0 2 1 1 0 1 2 1 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0]
accuracy: 1.0
classification_report:              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30


Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 7

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

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
from sklearn.naive_bayes import GaussianNB
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score,classification_report
bc=load_breast_cancer()
x=bc.data
y=bc.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
gnb=GaussianNB()
gnb.fit(x_train,y_train)
print(gnb.predict(x_test))
G=gnb.predict(x_test)
result=accuracy_score(y_test,G)
print("Accuracy= ",result)
cr=classification_report(y_test,G)
print("/n Classification Report: ",cr)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
[1 0 0 1 1 0 0 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0
 1 0 1 1 0 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1 1 1 0 0 1 1 0 0 1 0
 1 1 1 1 1 1 0 1 1 0 0 0 0 0 1 1 1 1 1 1 1 1 0 0 1 0 0 1 0 0 1 1 1 0 1 1 0
 1 1 0]
accuracy: 0.9736842105263158
classification_report:               precision    recall  f1-score   support

           0       1.00      0.93      0.96        43
           1       0.96      1.00      0.98        71

    accuracy                           0.97       114
   macro avg       0.98      0.97      0.97       114
weighted avg       0.97      0.97      0.97       114


Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 8

Aim: Given a one dimensional data represented with Numpy array. Write a program to calculate slope and intercept.

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
import numpy as np
x_value = np.array([64,75,68,73,78,82,76,85,71,88]).reshape(-1,1)
y_value = np.array([17,27,15,24,39,44,30,48,19,47])
model=LinearRegression()
model.fit(x_value,y_value)
slope=model.coef_[0]
intercept=model.intercept_
print(f"Slope: {slope}")
print(f"Intercept: {intercept}")
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\
slope:1.6141732283464565
intercept:-91.6771653543307

Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 9

Aim: Program to implement Simple Linear Regression using any standard dataset available in public domain and find the R2 score.

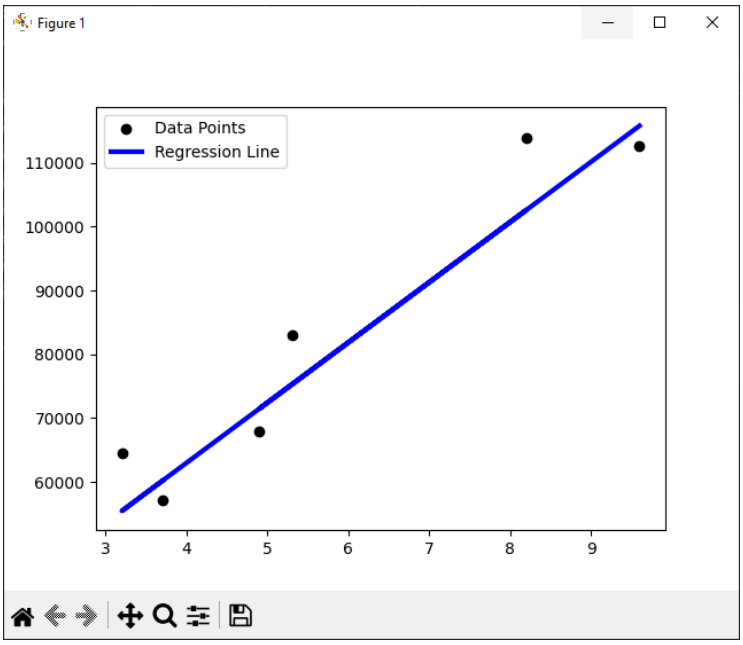
CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
data=pd.read_csv('Salary_Data.csv')
x=data['YearsExperience'].values.reshape(-1,1)
y=data['Salary'].values
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
LR=LinearRegression()
LR.fit(x_train,y_train)
D=LR.predict(x_test)
r2 = r2_score(y_test, D)
print("R2 Score: ", r2)
plt.scatter(x_test,y_test,color='black',label='Data Points')
plt.plot(x_test,D,color='blue', linewidth=3,label='Regression Line')
plt.xlabel='YearsExperience'
plt.ylabel='Salary'
plt.legend()
plt.show()
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python
[115790.21011287  71498.27809463 102596.86866063  75267.80422384
  55477.79204548  60189.69970699]
r2 score: 0.9024461774180497
```



Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 10

Aim: Program to implement Multiple Linear Regression using any standard dataset available in public domain.

CO2: Use different packages and frameworks to implement regression and classification algorithms.

Procedure:

```
import pandas as pd
from sklearn.datasets import fetch_california_housing
from sklearn.metrics import mean_squared_error
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
california_housing=fetch_california_housing()
df=pd.DataFrame(data=california_housing.data,columns=california_housing.feature_names)
df['Target']=california_housing.target
x=df.drop('Target',axis=1)
y=df['Target']
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
model = LinearRegression()
model.fit(x_train, y_train)
predictions = model.predict(x_test)
mse = mean_squared_error(y_test, predictions)
print(f"Mean Squared Error: {mse}")
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject
Mean Squared Error: 0.555891598695244

Process finished with exit code 0
```

Result: The program was executed successfully and the output was obtained. Thus, CO2 has been attained.

Experiment No.: 11

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

CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means.

Procedure:

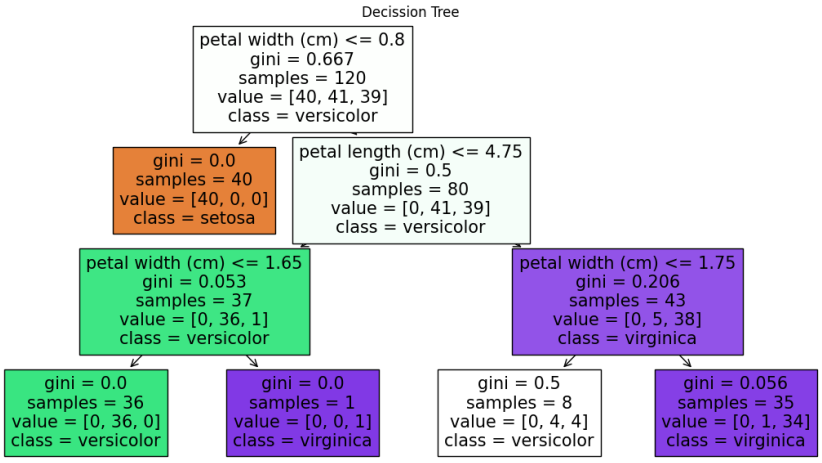
```
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier,plot_tree
from sklearn.metrics import accuracy_score,classification_report
from matplotlib import pyplot as plt
iris=load_iris()
x=iris.data
y=iris.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
dt=DecisionTreeClassifier(max_depth=3)
dt.fit(x_train,y_train)
print(dt.predict(x_test))
D=dt.predict(x_test)
result=accuracy_score(y_test,D)
print("Accuracy= ",result)
cr=classification_report(y_test,D)
print("Classification Report: ",cr)
plt.figure(figsize=(15,20))
plot_tree(dt,filled=True,feature_names=iris.feature_names,class_names=iris.target_names)
plt.title("Decission Tree")
plt.show()
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
[1 0 2 1 2 0 1 2 1 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0]
accuracy: 0.9666666666666667
classification_report:              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      0.89      0.94         9
           2       0.92      1.00      0.96        11

    accuracy                           0.97        30
   macro avg       0.97      0.96      0.97        30
weighted avg       0.97      0.97      0.97        30
```



Result: The program was executed successfully and the output was obtained. Thus, CO3 has been attained.

Experiment No.: 12

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

CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means

Procedure:

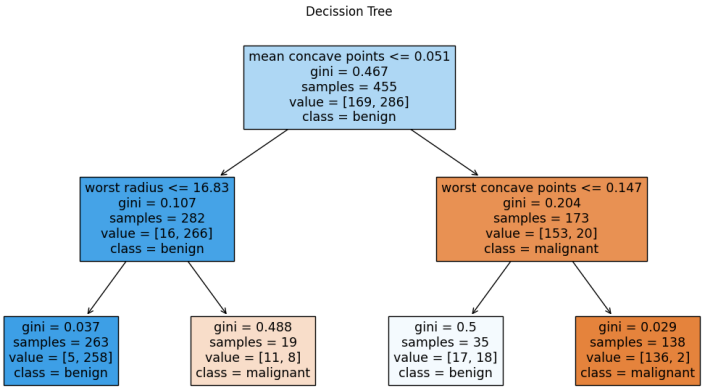
```
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier,plot_tree
from sklearn.metrics import accuracy_score,classification_report
from matplotlib import pyplot as plt
bc=load_breast_cancer()
x=bc.data
y=bc.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
dt=DecisionTreeClassifier(max_depth=2)
dt.fit(x_train,y_train)
print(dt.predict(x_test))
D=dt.predict(x_test)
result=accuracy_score(y_test,D)
print("Accuracy= ",result)
cr=classification_report(y_test,D)
print("Classification Report: ",cr)
plt.figure(figsize=(15,10))
plot_tree(dt,filled=True,feature_names=bc.feature_names,class_names=bc.target_names)
plt.title("Decission Tree")
plt.show()
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
[1 0 0 1 1 0 0 1 0 1 1 0 1 1 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0
 1 0 1 1 0 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1 1 1 0 0 1 1 0 0 1 0
 1 1 1 1 1 1 1 1 1 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 1 0 0 1 0 0 1 1 1 0 0 1 0
 1 1 0]
accuracy: 0.9298245614035088
classification_report:               precision    recall  f1-score   support

           0       0.95      0.86      0.90        43
           1       0.92      0.97      0.95        71

    accuracy                           0.93       114
   macro avg       0.93      0.92      0.92       114
weighted avg       0.93      0.93      0.93       114
```



Result: The program was executed successfully and the output was obtained. Thus, CO3 has been attained.

Experiment No.: 13

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

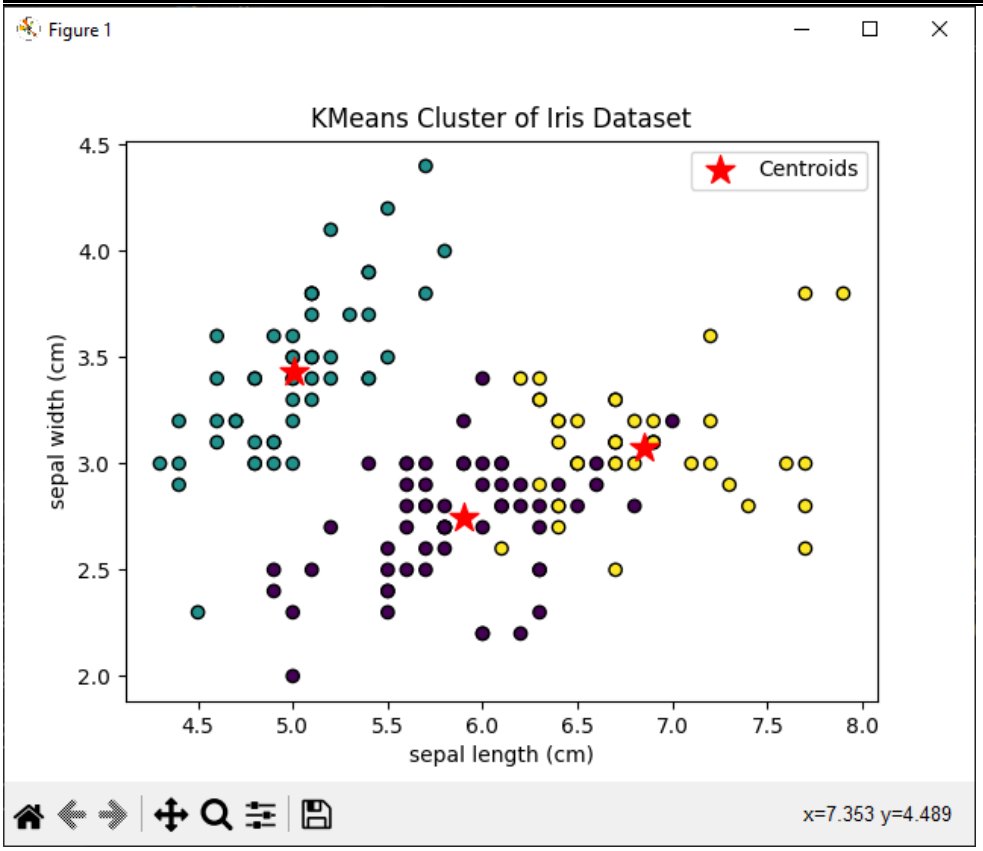
CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means

Procedure:

```
from sklearn.datasets import load_iris
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
iris = load_iris()
x = iris.data
y = iris.target
kmeans = KMeans(n_clusters=3, random_state=42)
kmeans.fit(x)
cluster_labels = kmeans.labels_
print(cluster_labels)
centroids = kmeans.cluster_centers_
print(centroids)
plt.scatter(x[:, 0], x[:, 1], c=cluster_labels, cmap='viridis', marker='o', edgecolors='black')
plt.scatter(centroids[:, 0], centroids[:, 1], marker="*", s=200, c='red', label='Centroids')
plt.xlabel(iris.feature_names[0])
plt.ylabel(iris.feature_names[1])
plt.title('KMeans Cluster of Iris Dataset')
plt.legend()
plt.show()
```

Output Screenshot

```
[1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 2 2 2 0 2 2 2 2
 2 2 0 0 2 2 2 2 0 2 0 2 0 2 2 0 0 2 2 2 2 2 0 2 2 2 2 0 2 2 2 0 2 2 2 0 2
 2 0]
[[5.9016129  2.7483871  4.39354839 1.43387097]
 [5.006      3.428      1.462      0.246     ]
 [6.85       3.07368421 5.74210526 2.07105263]]
```



Result: The program was executed successfully and the output was obtained. Thus, CO3 has been attained.

Experiment No.: 14

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

CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means

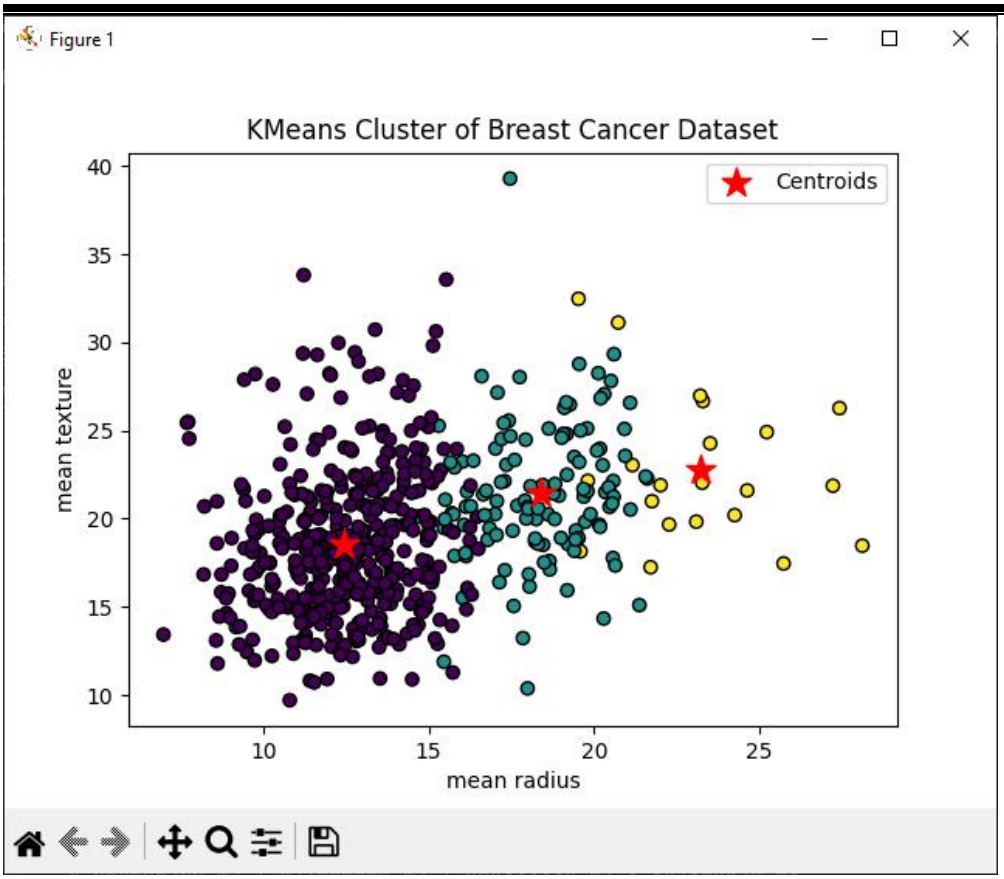
Procedure:

```
from sklearn.datasets import load_breast_cancer
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
bc = load_breast_cancer()
x = bc.data
y = bc.target
kmeans = KMeans(n_clusters=3, random_state=42)
kmeans.fit(x)
cluster_labels = kmeans.labels_
print(cluster_labels)
centroids = kmeans.cluster_centers_
print(centroids)
plt.scatter(x[:, 0], x[:, 1], c=cluster_labels, cmap='viridis', marker='o', edgecolors='black')
plt.scatter(centroids[:, 0], centroids[:, 1], marker="*", s=200, c='red', label='Centroids')
plt.xlabel(bc.feature_names[0])
plt.ylabel(bc.feature_names[1])
plt.title('KMeans Cluster of Breast Cancer Dataset')
plt.legend()
plt.show()
```

Output Screenshot

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

```
[[1.24468918e+01 1.85046588e+01 8.03803294e+01 4.86458118e+02
  9.48157176e-02 9.04881882e-02 6.08800016e-02 3.25494682e-02
  1.77951765e-01 6.35771765e-02 3.00681647e-01 1.21837294e+00
  2.12940400e+00 2.32080188e+01 7.17541647e-03 2.33490235e-02
  2.84143873e-02 1.05452329e-02 2.07137600e-02 3.75171835e-03
  1.38918094e+01 2.45948235e+01 9.09125412e+01 6.04658353e+02
  1.29845529e-01 2.21074000e-01 2.14822228e-01 8.97035082e-02
  2.82468471e-01 8.32831059e-02]
 [1.83820325e+01 2.14148780e+01 1.21238537e+02 1.05796098e+03
  1.00221870e-01 1.40414797e-01 1.58604959e-01 9.06387805e-02
  1.91033333e-01 6.06883740e-02 6.40926016e-01 1.20443577e+00
  4.50100813e+00 7.53708943e+01 6.57197561e-03 3.09567967e-02
  4.08994309e-02 1.53647805e-02 2.00486992e-02 3.93508943e-03
  2.22162602e+01 2.86411382e+01 1.47833333e+02 1.52278862e+03
  1.39408780e-01 3.45692358e-01 4.26761789e-01 1.81023984e-01
  3.15549593e-01 8.64585366e-02]
 [2.32147619e+01 2.27285714e+01 1.55066667e+02 1.70276190e+03
  1.05001429e-01 1.73405714e-01 2.44971429e-01 1.35852381e-01
  1.88309524e-01 5.93747619e-02 1.13901429e+00 1.25883333e+00
  8.19842857e+00 1.81798571e+02 7.06723810e-03 3.64780952e-02
  4.95609524e-02 1.62100000e-02 1.99633333e-02 3.84780952e-03
  2.95500000e+01 3.02228571e+01 2.00490476e+02 2.70328571e+03
  1.42195238e-01 3.90485714e-01 5.27814286e-01 2.29571429e-01
  2.94823810e-01 8.26404762e-02]]
```



Result: The program was executed successfully and the output was obtained. Thus, CO3 has been attained.

Experiment No.: 15

Aim: Program to implement text classification using support vector machine.

CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means

Procedure:

```
from sklearn.datasets import fetch_20newsgroups
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score ,classification_report
categories=['alt.atheism','soc.religion.christian','comp.graphics','sci.med']
twenty_train=fetch_20newsgroups(subset='train',categories=categories,shuffle=True,random_sta
te=42)
vectorizer=TfidfVectorizer()
X_train_tfidf=vectorizer.fit_transform(twenty_train.data)
y_train = twenty_train.target
x_train,x_test,y_train,y_test=train_test_split(X_train_tfidf,y_train,test_size=0.2,random_state=4
2)
svm_classifier=SVC(kernel='linear',random_state=42)
svm_classifier.fit(x_train,y_train)
predictions=svm_classifier.predict(x_test)
accuracy=accuracy_score(y_test,predictions)
classification=classification_report(y_test,predictions,target_names=twenty_train.target_names)
print("Accuracy",accuracy)
print("classification_report:",classification)
new_data=["I have a question about computer graphics","This is a medical related topic"]
x_new_tfidf=vectorizer.transform(new_data)
new_predictions=svm_classifier.predict(x_new_tfidf)
for i,text in enumerate(new_data):
 predicted_category=twenty_train.target_names[new_predictions[i]]
 print("Predicted Cate",predicted_category)
```

Output Screenshot

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject
Accuracy 0.9601769911504425
classification_report:                        precision    recall  f1-score   support

           alt.atheism       0.96      0.95      0.96        86
         comp.graphics       0.91      1.00      0.96       107
               sci.med       0.98      0.95      0.97       132
soc.religion.christian       0.98      0.94      0.96       127

              accuracy                           0.96       452
             macro avg       0.96      0.96      0.96       452
          weighted avg       0.96      0.96      0.96       452

Predicted Cate comp.graphics
Predicted Cate sci.med
```

Result: The program was executed successfully and the output was obtained. Thus, CO3 has been attained.

Experiment No.: 16

Aim: Program on artificial neural network to classify images from any standard dataset in the public domain using Keras framework.

CO4: Implement convolutional neural network algorithm using Keras framework.

Procedure:

```
import tensorflow as tf
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Flatten
from tensorflow.keras.utils import to_categorical
# Load the MNIST dataset
(X_train, y_train), (X_test, y_test) =mnist.load_data()
# Normalize pixel values to be between 0 and 1
X_train = X_train / 255.0
X_test = X_test / 255.0
# Flatten the images (convert 28x28 images to 1D vectors)
X_train = X_train.reshape(-1, 28 * 28)
print(X_train)
X_test = X_test.reshape(-1, 28 * 28)
print(X_train)
# One-hot encode the target labels
y_train = to_categorical(y_train)
y_test = to_categorical(y_test)
print(y_test)
# Create a simple feedforward neural network model
model=Sequential([
Dense(128, activation='relu', input_shape=(28 * 28,)),
Dense(68, activation='relu'),
Dense(10, activation='softmax')
])
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
model.fit(X_train,y_train, epochs=5 , batch_size=32, validation_split=0.2)
loss, accuracy= model.evaluate(X_test,y_test)
print(accuracy)
```

Output Screenshot

```
1500/1500 [==============================] - 3s 2ms/step - loss: 0.2654 - accuracy: 0.9220 - val_loss: 0.1610 - val_accuracy: 0.9513
Epoch 2/5
1500/1500 [==============================] - 2s 2ms/step - loss: 0.1121 - accuracy: 0.9662 - val_loss: 0.1144 - val_accuracy: 0.9669
Epoch 3/5
1500/1500 [==============================] - 2s 1ms/step - loss: 0.0782 - accuracy: 0.9761 - val_loss: 0.1126 - val_accuracy: 0.9658
Epoch 4/5
1500/1500 [==============================] - 2s 1ms/step - loss: 0.0588 - accuracy: 0.9810 - val_loss: 0.1107 - val_accuracy: 0.9696
Epoch 5/5
1500/1500 [==============================] - 2s 1ms/step - loss: 0.0441 - accuracy: 0.9861 - val_loss: 0.1032 - val_accuracy: 0.9725
313/313 [==============================] - 0s 956us/step - loss: 0.0967 - accuracy: 0.9715
0.9714999794960022
```

Result: The program was executed successfully and the output was obtained. Thus, CO4 has been attained.

Experiment No.: 17

Aim: Program to implement a simple web crawler using requests library.

CO5: Implement programs for web data mining and natural language processing using NLTK.

Procedure:

```
import requests
def simple_scraper(url):
  response=requests.get(url)
  if response.status_code==200:
     print("Content:")
     print(response.text)
  else:
     print("Failed to fetch the page. Status code:", response.status_code)
url_to_scrap="https://ajce.in"
simple_scraper(url_to_scrap)
```

Output Screenshot

```
Content:
<!DOCTYPE html>
<html lang="en">


<head><meta charset="windows-1252">

<title>Amal Jyothi College of Engineering (Autonomous)</title>
<meta name="viewport" content="width=device-width, initial-scale=1" />
               <script type="text/javascript">
                       <!--
                       if (screen.width <= 699) {
                       document.location = "/m/index.html";
                       }

                       </script>
       <!--[if lte IE 8]><script src="assets/js/ie/html5shiv.js"></script><![endif]-->
       <link rel="stylesheet" href="assets/css/main.css" />

    <!--Bootstrap Stylesheet [ REQUIRED ]-->
    <link href="css/bootstrap.css" rel="stylesheet">
```

Result: The program was executed successfully and the output was obtained. Thus, CO5 has been attained.

Experiment No.: 18

Aim: Program to implement a simple web crawler and parse the content using BeautifulSoup.

CO5: Implement programs for web data mining and natural language processing using NLTK.

Procedure:

```
import requests
from bs4 import BeautifulSoup
def simple_scraper(url):
  response=requests.get(url)
  if response.status_code==200:
     soup=BeautifulSoup(response.content, 'html.parser')
     print("Title:",soup.title.string)
     print("Content:")
     print(soup.get_text())
  else:
     print("Failed to fetch the page. Status code:", response.status_code)
url_to_scrap="https://ajce.in"
simple_scraper(url_to_scrap)
```

Output Screenshot

```
Amal Jyothi College of Engineering



KERALA'S LARGEST INFRASTRUCTURE FOR ENGINEERING EDUCATION WITH 7 NBA ACCREDITED PROGRAMS


HOME
B TECH
M TECH
M C A
IQAC

VIDEO

360°
FACULTY
HOSTELS
```

Result: The program was executed successfully and the output was obtained. Thus, CO5 has been attained.

Experiment No.: 19

Aim: Implement problems on natural language processing - Part of Speech tagging, N-gram & smoothening and Chunking using NLTK.

CO5: Implement programs for web data mining and natural language processing using NLTK.

Procedure:

```
import nltk
nltk.download('brown')
nltk.download('punkt')
nltk.download('averaged_perceptron_tagger')
from nltk.tokenize import word_tokenize
from nltk.util import ngrams
from nltk.corpus import brown
from nltk.chunk import RegexpParser
sentence = "The quick brown fox jumps over the lazy dog"
tokens = word_tokenize(sentence)
print(tokens)
pos_tags = nltk.pos_tag(tokens)
print("Part-of-Speech Tagging: ")
print(pos_tags)
text = brown.words(categories='news')[:1000]
bigrams = list(ngrams(text, 2))
freq_dist = nltk.FreqDist(bigrams)
print("\n N-gram Analysis (Bigrams with Smoothing): ")
for bigram in bigrams:
print(f"{bigram}: {freq_dist[bigram]}")
tagged_sentence = nltk.pos_tag(word_tokenize("The quick brown fox jumps over the lazy dog"))
grammar = r"NP: {<DT>?<JJ>*<NN>}"
cp = RegexpParser(grammar)
result = cp.parse(tagged_sentence)
print("\n Chunking with Regular Expressions and POS tags: ")
print(result)
```

Output Screenshot

```
['The', 'quick', 'brown', 'fox', 'jumps', 'over', 'the', 'lazy', 'dog']
Part-of-Speech Tagging:
[('The', 'DT'), ('quick', 'JJ'), ('brown', 'NN'), ('fox', 'NN'), ('jumps', 'VBZ'), ('over', 'IN'), ('the', 'DT'), ('lazy', 'JJ'), ('dog', 'NN')]

 N-gram Analysis (Bigrams with Smoothing):
('The', 'Fulton'): 1
('Fulton', 'County'): 6
('County', 'Grand'): 1
('Grand', 'Jury'): 1
('Jury', 'said'): 1
('said', 'Friday'): 1
('Friday', 'an'): 1
('an', 'investigation'): 1
('investigation', 'of'): 1
('of', "Atlanta's"): 1
("Atlanta's", 'recent'): 1
('recent', 'primary'): 1
('primary', 'election'): 1
('election', 'produced'): 1
('produced', '``'): 1
('``', 'no'): 1
('no', 'evidence'): 1
('evidence', "''"): 1
("''", 'that'): 1
```

Result: The program was executed successfully and the output was obtained. Thus, CO5 has been attained.