20MCA241 – Data Science Lab

Lab Report Submitted By

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AJC22MCA-2044

In Partial fulfilment for the Award of the Degree Of

MASTER OF COMPUTER APPLICATIONS
(MCA TWO YEAR)
[Accredited by NBA]

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

AMAL JYOTHI COLLEGE OF ENGINEERING

KANJIRAPPALLY

[Affiliated to APJ Abdul Kalam Technological University, Kerala. Approved by AICTE,
Accredited by NAAC. Koovappally, Kanjirappally, Kottayam, Kerala – 686518]

2022-2024

DEPARTMENT OF COMPUTER APPLICATIONS

AMAL JYOTHI COLLEGE OF ENGINEERING
KANJIRAPPALLY

CERTIFICATE

This is to certify that the lab report, “**20MCA241 DATA SCIENCE LAB”** is the bonafide work of **FATHIMA HAZBIN R (AJC22MCA-2044)** in partial fulfilment of the requirements for the award of the Degree of Master of Computer Applications under APJ Abdul Kalam Technological University during the year **2023-24.**

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Course Code	Course Name	Syllabus Year	L-T-P-C
20MCA241	Data Science Lab	2020	0-1-3-2

VISION

To promote an academic and research environment conducive for innovation centric technical education.

MISSION

MS1 - Provide foundations and advanced technical education in both theoretical and applied Computer Applications in-line with Industry demands.

MS2 - Create highly skilled computer professionals capable of designing and innovating real life solutions.

MS3 - Sustain an academic environment conducive to research and teaching focused to generate up-skilled professionals with ethical values.

MS4 - Promote entrepreneurial initiatives and innovations capable of bridging and contributing with sustainable, socially relevant technology solutions.

COURSE OUTCOME

CO	Outcome	Target
CO1	Use different python packages to perform numerical calculations, statistical computations and data visualization.	60.2
CO2	Use different packages and frameworks to implement regression and classification algorithms.	60.2
CO3	Use different packages and frameworks to implement text classification using SVM and clustering using K-means.	60.2
CO4	Implement convolutional neural network algorithm using Keras framework.	60.2
CO5	Implement programs for web data mining and natural language processing using NLTK.	60.2

COURSE END SURVEY

CO	Survey Question	Answer Format
CO1	To what extend you are able to use different python packages to perform numerical calculations, statistical computations and data visualization?	Excellent/Very Good/Good/Satisfactory/Poor
CO2	To what extend you are able to use different packages and frameworks to implement regression and classification algorithms?	Excellent/Very Good/Good/Satisfactory/Poor
CO3	To what extend you are able to use different packages and frameworks to implement text classification using SVM and clustering using K-means?	Excellent/Very Good/Good/Satisfactory/Poor
CO4	To what extend you are able to implement convolutional neural network algorithm using Keras framework?	Excellent/Very Good/Good/Satisfactory/Poor
CO5	To what extend you are able to implement programs for web data mining and natural language processing using NLTK?	Excellent/Very Good/Good/Satisfactory/Poor

CONTENT

Experiment No.: 01

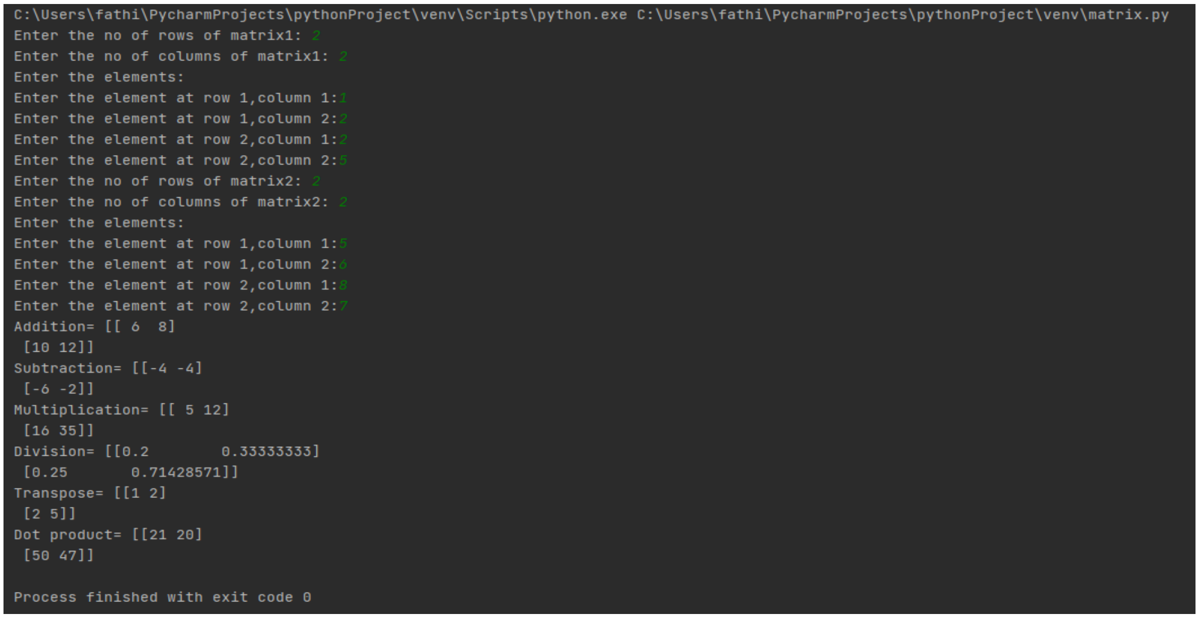
Aim: Program to perform matrix operations. Use Numpy as the python library and perform the operations using built in functions in Numpy.

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

Procedure:

```
import numpy as np
def input_matrix(ourmatrix):
    r = int(input(f"Enter the no of rows for {ourmatrix}:"))
    c = int(input(f"Enter the no of columns for {ourmatrix}:"))
    matrix=[]
    print("Enter the elements:")
    for i in range(r):
        r=[]
        for j in range(c):
            elements=int(input(f"enter the element at row{i+1},colomn{j+1}"))
            r.append(elements)
            matrix.append(r)
    return np.array(matrix)
matrix1=input_matrix("matrix1")
input_matrix(matrix1)
matrix2=input_matrix("matrix2")
input_matrix(matrix2)
```

Output Screenshot



```
C:\Users\fathi\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\fathi\PycharmProjects\pythonProject\venv\matrix.py
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 1:2
Enter the element at row 2,column 2:5
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 1:8
Enter the element at row 2,column 2:7
Addition= [[ 6  8]
 [10 12]]
Subtraction= [[-4 -4]
 [-6 -2]]
Multiplication= [[ 5 12]
 [16 35]]
Division= [[0.2        0.33333333]
 [0.25       0.71428571]]
Transpose= [[1 2]
 [2 5]]
Dot product= [[21 20]
 [50 47]]

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No.: 02

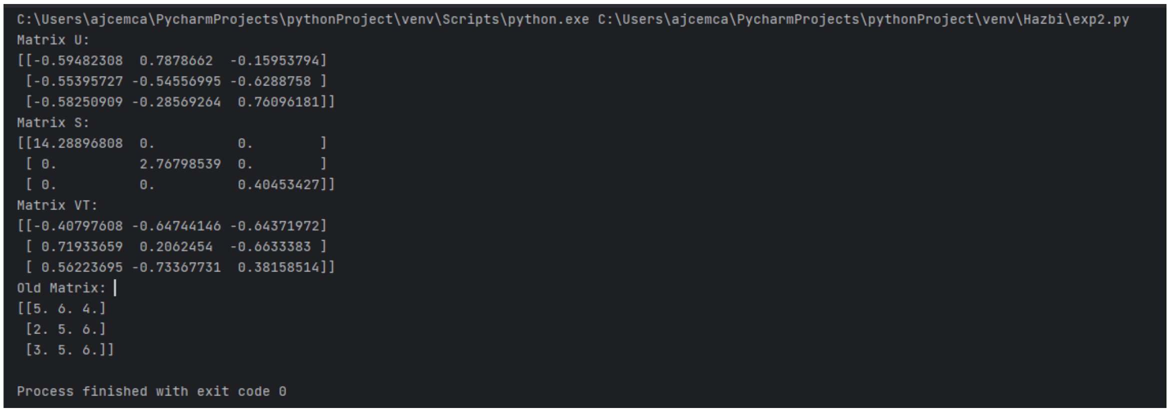
Aim: Program to perform single value decomposition(SVD) using python Numpy.

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\venv\Hazbi\exp2.py
Matrix U:
[[-0.59482308  0.7878662  -0.15953794]
 [-0.55395727 -0.54556995 -0.6288758 ]
 [-0.58250909 -0.28569264  0.76096181]]
Matrix S:
[[14.28896808  0.          0.        ]
 [ 0.          2.76798539  0.        ]
 [ 0.          0.          0.40453427]]
Matrix VT:
[[-0.40797608 -0.64744146 -0.64371972]
 [ 0.71933659  0.2062454  -0.6633383 ]
 [ 0.56223695 -0.73367731  0.38158514]]
Old Matrix: 
[[5. 6. 4.]
 [2. 5. 6.]
 [3. 5. 6.]]

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No.: 03

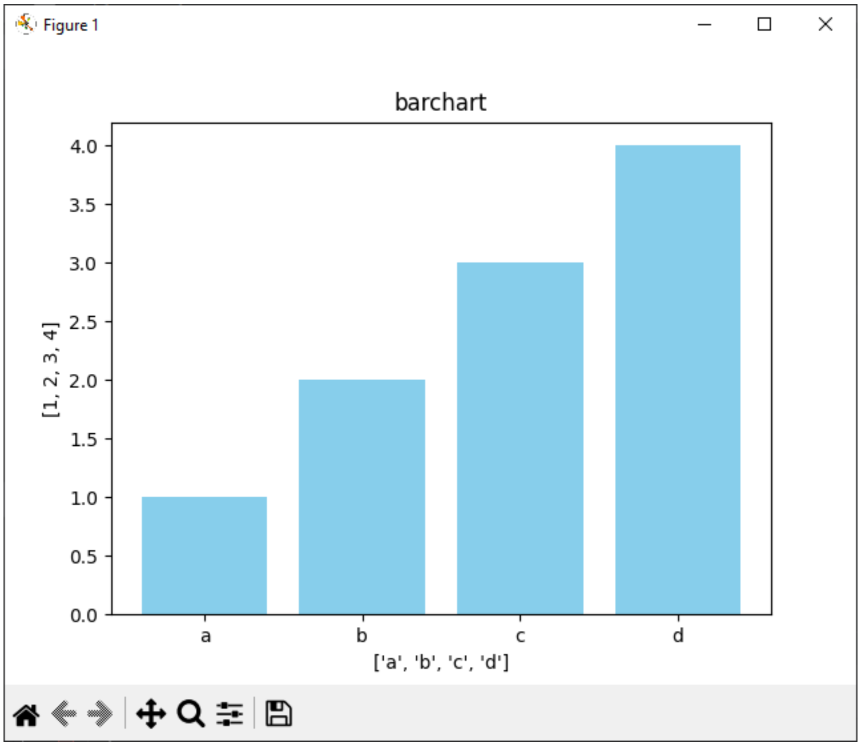
Aim: Program to perform data visualisation using the python library matplotlib.

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 and the result was successfully obtained. Thus CO1 was obtained.

Experiment No.: 04

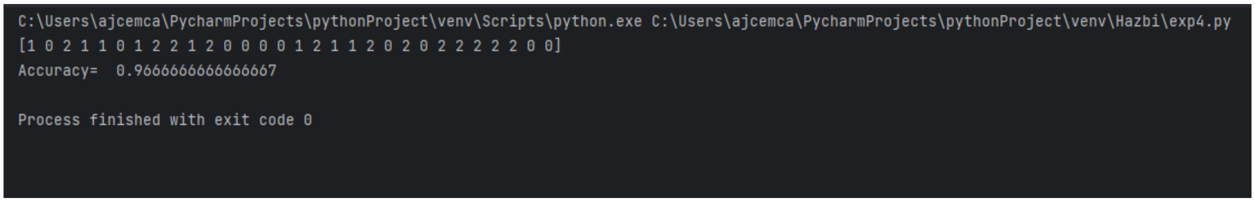
Aim: Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm(Iris Dataset).

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\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\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 and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 05

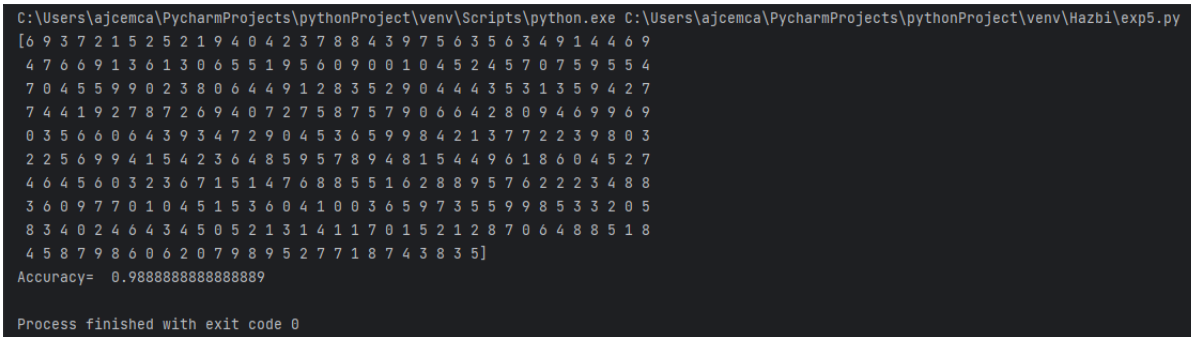
Aim: Program to implement k-NN classification using any standard dataset available in the public domain and find the accuracy of the algorithm(Load Digits).

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\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp5.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 5 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 9 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 8 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 8 9 5 2 7 7 1 8 7 4 3 8 3 5]
Accuracy=  0.9888888888888889

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 06

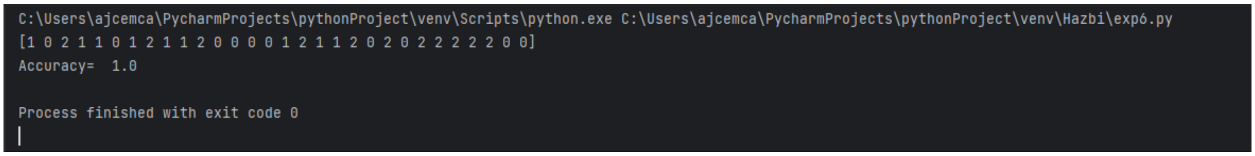
Aim: Program to implement Naïve Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm (Iris Dataset).

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

Procedure:

```
from sklearn.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\venv\Hazbi\exp6.py
[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

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 07

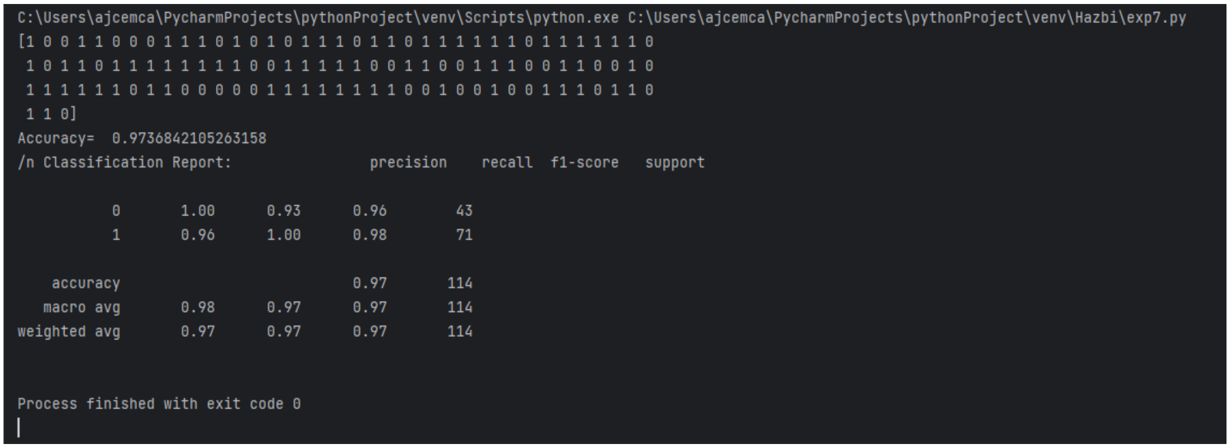
Aim: Program to implement Naïve Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm (Breast Cancer Dataset).

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\venv\Hazbi\exp7.py
[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 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
/n 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 and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 08

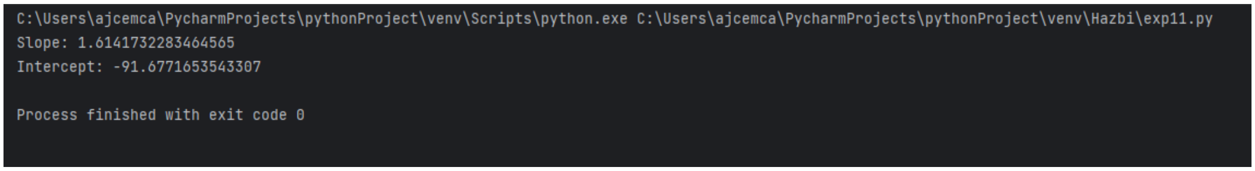
Aim: Given a one dimensional data represented with Numpy array. Write a program to calculate slope and intercept.

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\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp11.py
Slope: 1.6141732283464565
Intercept: -91.6771653543307

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 09

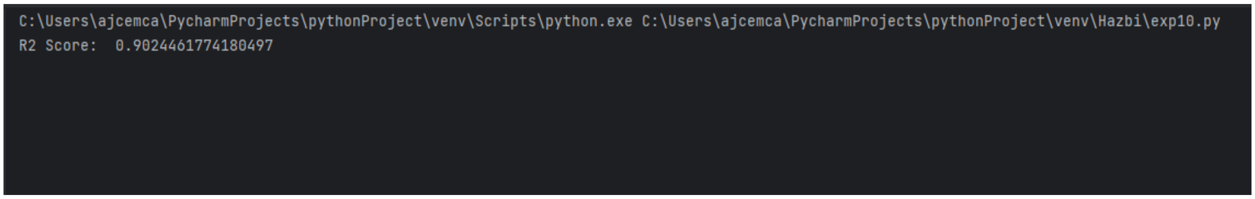
Aim: Program to implement Simple Linear Regression using any standard dataset available in public domain and find the R2 score.

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

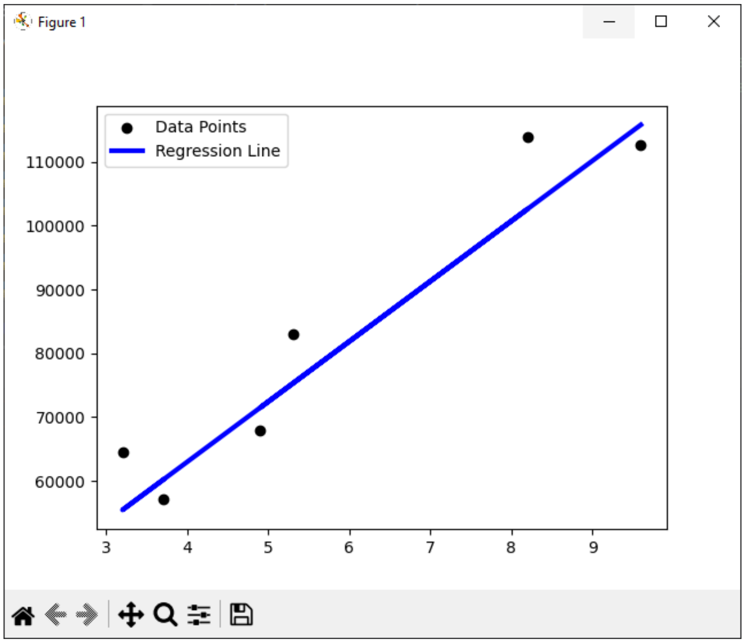
Procedure:

```
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.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp10.py
R2 Score:  0.9024461774180497
```



Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 10

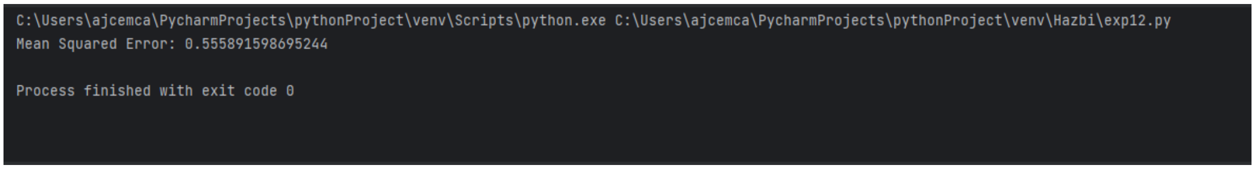
Aim: Program to implement Multiple Linear Regression using any standard dataset available in public domain and evaluate its performance.

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\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp12.py
Mean Squared Error: 0.555891598695244

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No.: 11

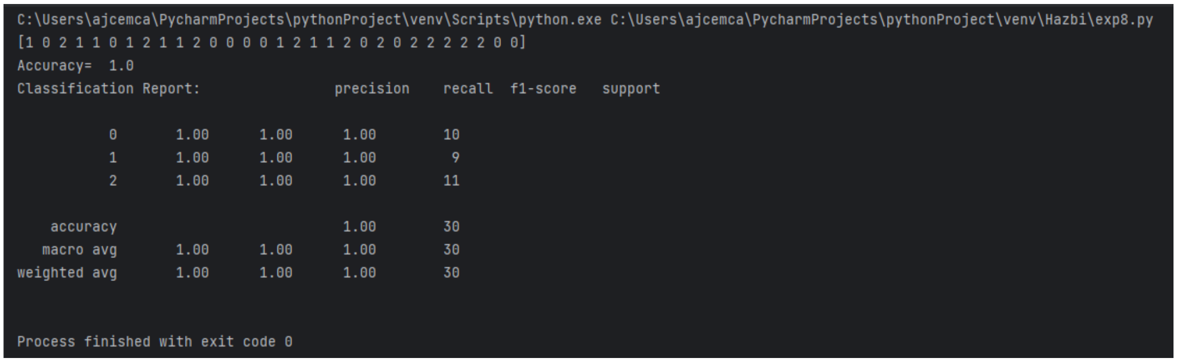
Aim: Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm(Iris Dataset).

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

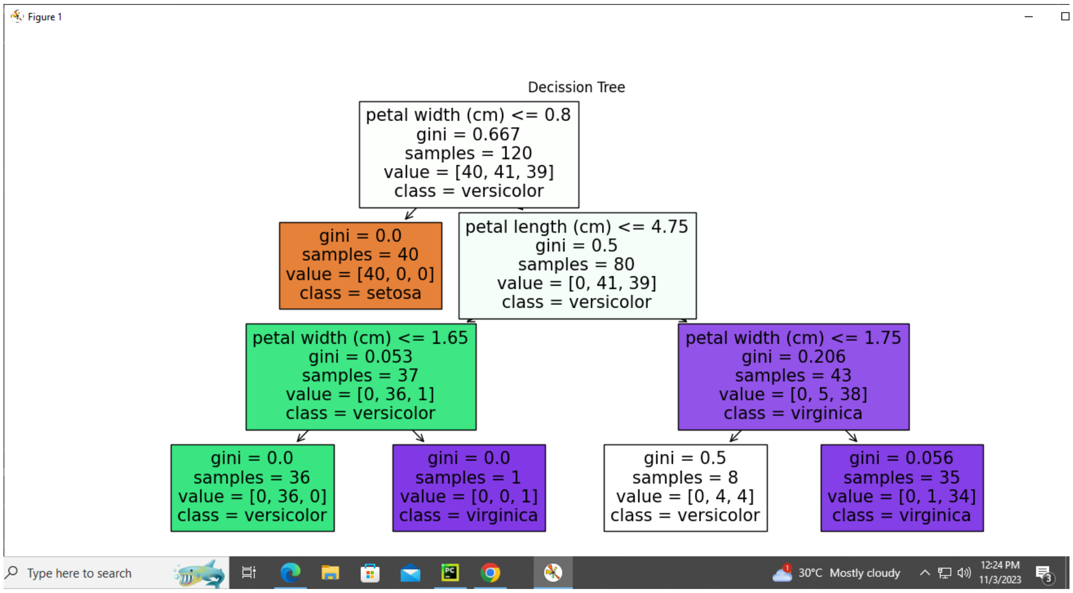


```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp8.py
[1 0 2 1 1 0 1 2 1 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0]
Accuracy=  1.0
Classification Report:               precision    recall  f1-score   support

           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 and the result was successfully obtained. Thus CO3 was obtained.

Experiment No.: 12

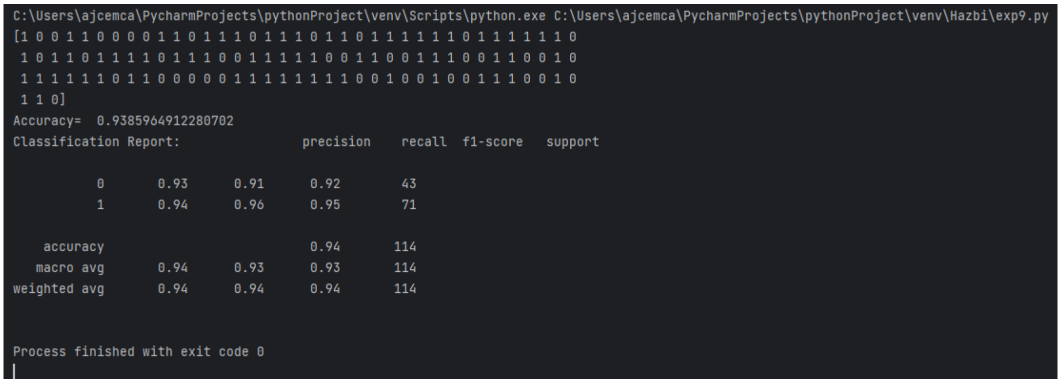
Aim: Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm(Breast Cancer Dataset).

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

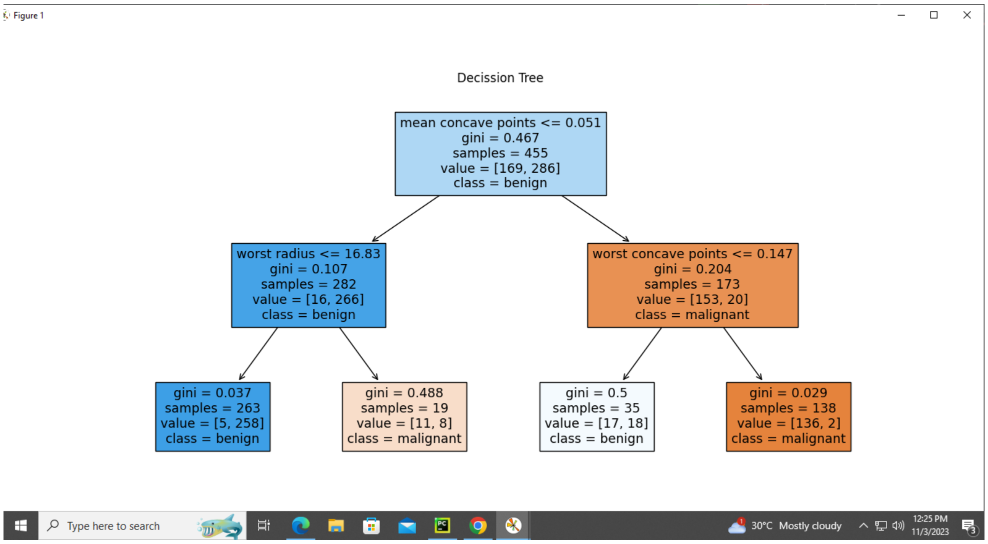


```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\exp9.py
[1 0 0 1 1 0 0 0 0 1 1 0 1 1 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 1 0
 1 0 1 1 0 1 1 1 1 0 1 1 1 0 0 1 1 1 1 1 0 0 1 1 0 0 1 1 1 0 0 1 1 0 0 1 0
 1 1 1 1 1 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 0 1 0
 1 1 0]
Accuracy=  0.9385964912280702
Classification Report:                precision    recall  f1-score   support

           0       0.93      0.91      0.92        43
           1       0.94      0.96      0.95        71

    accuracy                           0.94       114
   macro avg       0.94      0.93      0.93       114
weighted avg       0.94      0.94      0.94       114


Process finished with exit code 0
```



Result:

The program was executed and the result was successfully obtained. Thus CO3 was obtained.

Experiment No.: 13

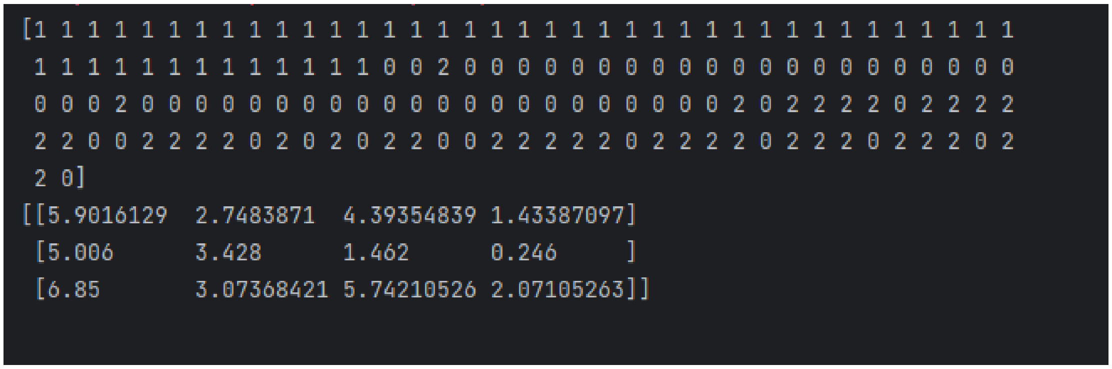
Aim: Program to implement k-means clustering technique using any standard dataset available in the public domain (Iris Dataset).

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

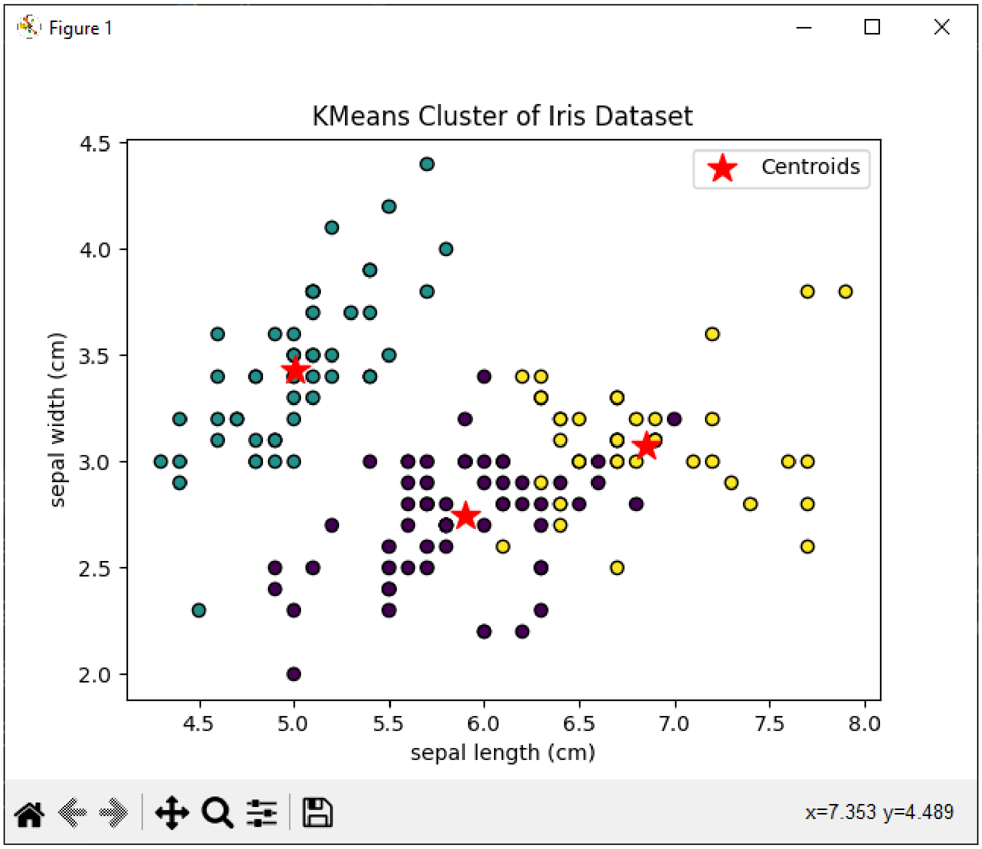
Procedure:

```
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 and the result was successfully obtained. Thus CO3 was obtained.

Experiment No.: 14

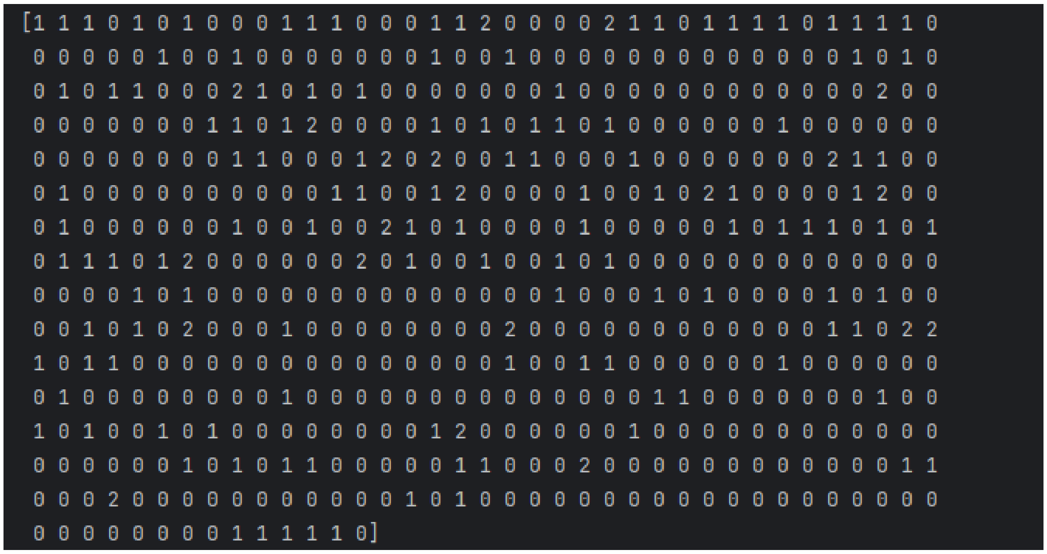
Aim: Program to implement k-means clustering technique using any standard dataset available in the public domain (Breast Cancer Dataset).

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

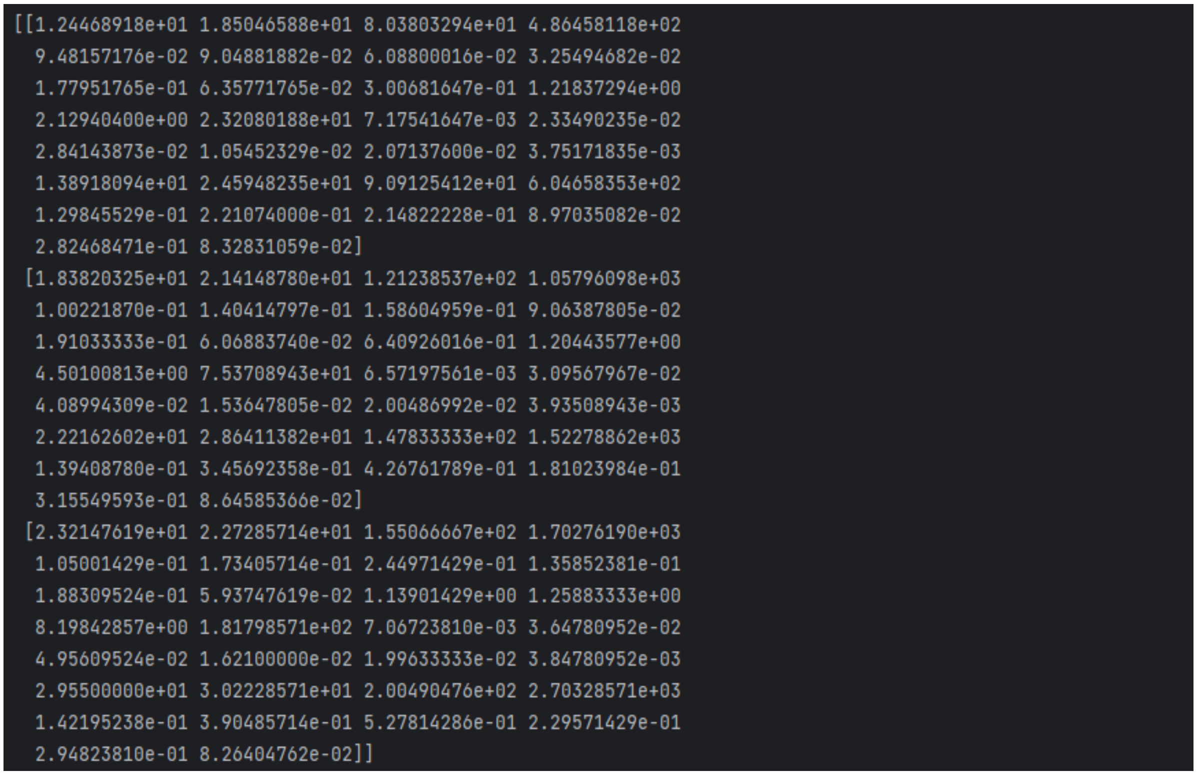
Procedure:

```
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()
```

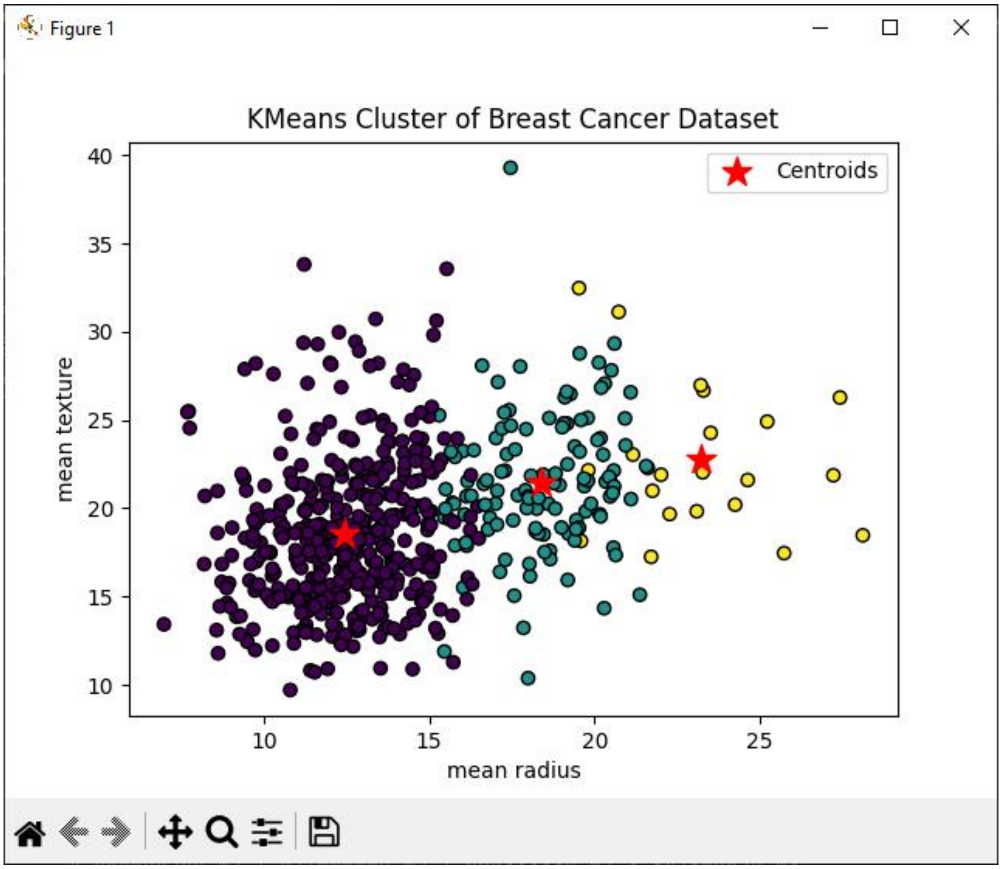
Output Screenshot



```
[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 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 1 0 0 1 0 0 2 1 0 1 0 0 0 0 1 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 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 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 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 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 1 0 1 0 1 1 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 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 and the result was successfully obtained. Thus CO3 was obtained.

Experiment No.: 15

Aim: Program to implement test classification using Support Vector Machine.

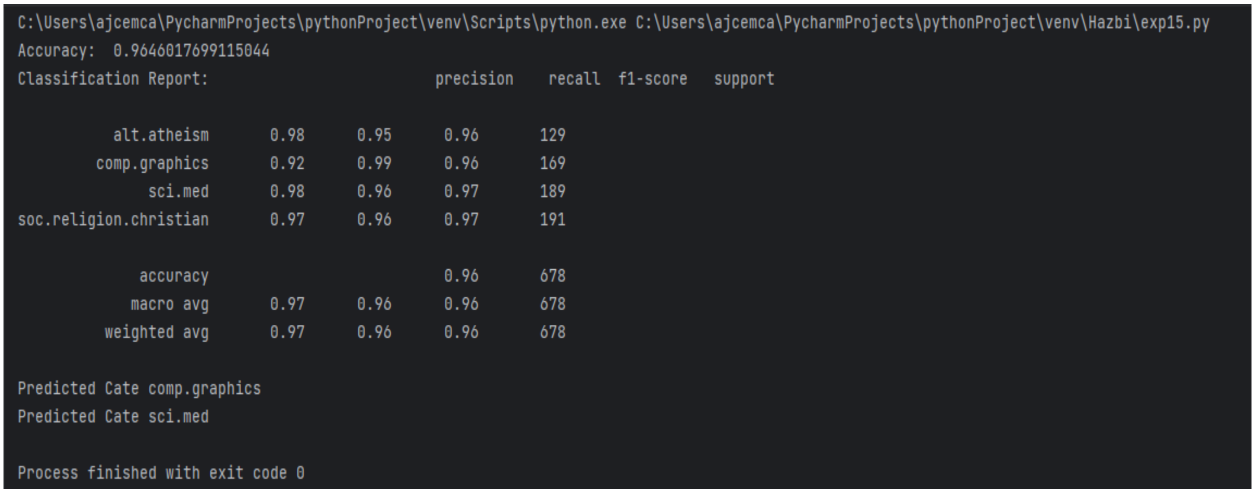
CO3: Use different packages and frameworks to implement text classification using SVM and clustering using k-means.

Procedure:

```
from sklearn.datasets import fetch_20newsgroups
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer
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_state=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=0.3,random_state=42)
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\venv\Hazbi\exp15.py
Accuracy:  0.9646017699115044
Classification Report:                         precision    recall  f1-score   support

           alt.atheism       0.98      0.95      0.96       129
         comp.graphics       0.92      0.99      0.96       169
               sci.med       0.98      0.96      0.97       189
soc.religion.christian       0.97      0.96      0.97       191

              accuracy                           0.96       678
             macro avg       0.97      0.96      0.96       678
          weighted avg       0.97      0.96      0.96       678

Predicted Cate comp.graphics
Predicted Cate sci.med

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO3 was obtained.

Experiment No.: 16

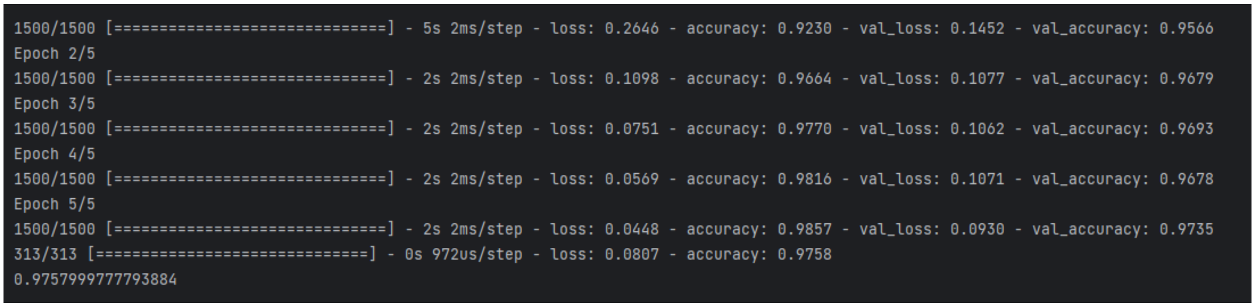
Aim: Program on artificial neural network to classify images from any standard dataset in the public domain using Keras framework.

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 [==============================] - 5s 2ms/step - loss: 0.2646 - accuracy: 0.9230 - val_loss: 0.1452 - val_accuracy: 0.9566
Epoch 2/5
1500/1500 [==============================] - 2s 2ms/step - loss: 0.1098 - accuracy: 0.9664 - val_loss: 0.1077 - val_accuracy: 0.9679
Epoch 3/5
1500/1500 [==============================] - 2s 2ms/step - loss: 0.0751 - accuracy: 0.9770 - val_loss: 0.1062 - val_accuracy: 0.9693
Epoch 4/5
1500/1500 [==============================] - 2s 2ms/step - loss: 0.0569 - accuracy: 0.9816 - val_loss: 0.1071 - val_accuracy: 0.9678
Epoch 5/5
1500/1500 [==============================] - 2s 2ms/step - loss: 0.0448 - accuracy: 0.9857 - val_loss: 0.0930 - val_accuracy: 0.9735
313/313 [==============================] - 0s 972us/step - loss: 0.0807 - accuracy: 0.9758
0.9757999777793884
```

Result:

The program was executed and the result was successfully obtained. Thus CO4 was obtained.

Experiment No.: 17

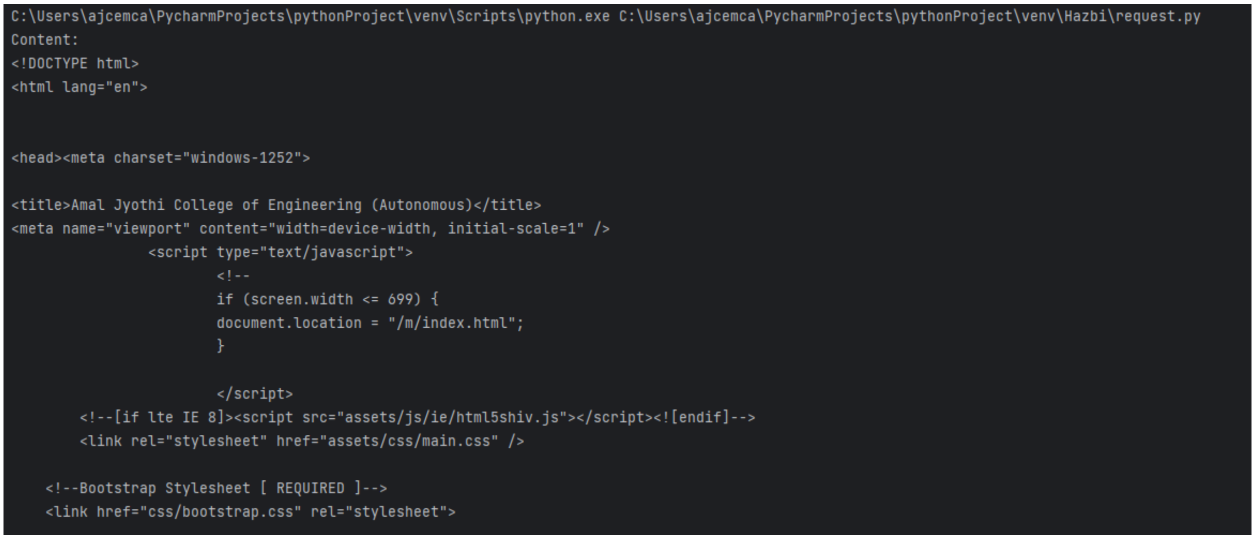
Aim: Program to implement a simple web crawler using requests library.

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



```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\request.py
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 and the result was successfully obtained. Thus CO5 was obtained.

Experiment No.: 18

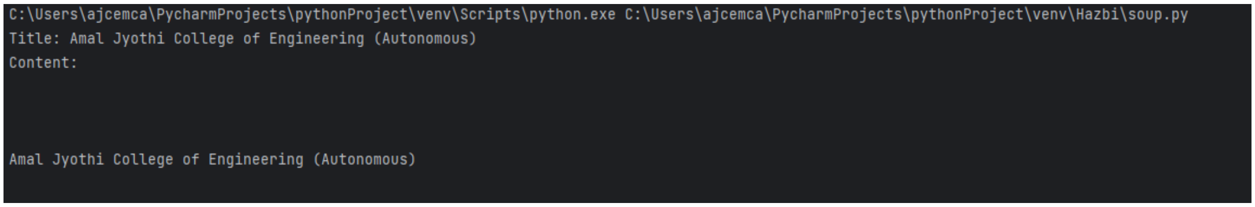
Aim: Program to implement a simple web crawler and parse the content using BeautifulSoup.

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



```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Hazbi\soup.py
Title: Amal Jyothi College of Engineering (Autonomous)
Content:



Amal Jyothi College of Engineering (Autonomous)
```

Result:

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment No.: 19

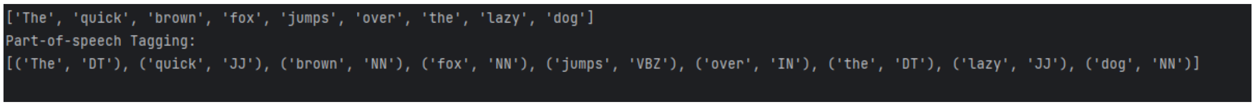
Aim: Program to implement a simple web crawler using requests library.

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

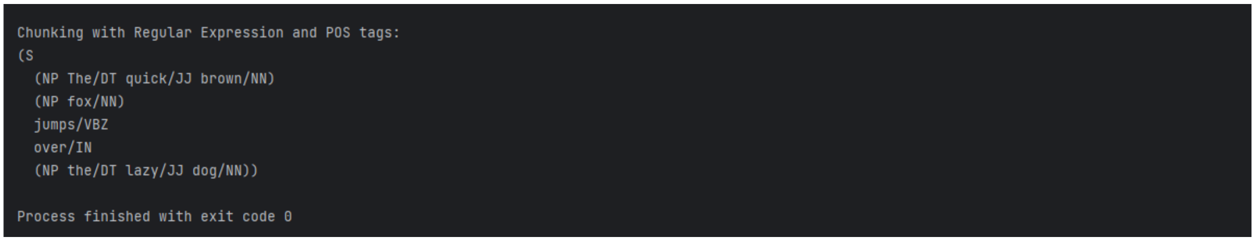
Procedure:

```
import nltk
nltk.download('brown')
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("\nN-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("\nChunking with Regular Expression 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')]
```



```
Chunking with Regular Expression and POS tags:
(S
  (NP The/DT quick/JJ brown/NN)
  (NP fox/NN)
  jumps/VBZ
  over/IN
  (NP the/DT lazy/JJ dog/NN))

Process finished with exit code 0
```

Result:

The program was executed and the result was successfully obtained. Thus CO5 was obtained.