Program: 1

Aim:

Review of python programming – Programs review the fundamentals of python

1. Write a python program that takes an input 'n' and calculate n+nn+nnn

   Program Code:

   ```
   n=int(input("Enter the number : "))
   print(n+n*n+n*n*n)
   ```

2. Write a python program to find the largest number from a given list?

   Program Code:

   ```
   l1=[5,7,2,1]
   print("list is ",l1)
   print("Largest number is ",max(l1))
   ```

3. Write a python program to copy a given list?

   Program Code:

   ```
   l1=[5,7,2,1]
   print("list is ",l1)
   l2=l1.copy()
   print("copied list is :",l2)
   ```

4. Write a python program to shuffle a given list?

   Program Code:

   ```
   l3=[1,2,3,4]
   print("list",l3)
   random.shuffle(l3)
   print("Shuffled list",l3)
   ```

5. Write a python program to sort a given dictionary by value?

   Program Code:

   ```
   dict1 = {1: 1, 2: 9, 3: 4}
   print("Dictionary is ",dict1)
   sorted_values = sorted(dict1.values())
   ```

```
sorted_dict = {}
for i in sorted_values:
    for k in dict1.keys():
        if dict1[k] == i:
            sorted_dict[k] = dict1[k]
            break
print("Sorted dictionary is ",sorted_dict)
```

6. Write a python program to add values to a dictionary?

Program Code:

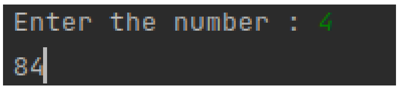
```
dic={1:"annu",2:"binu"}
print("Dictionary is ",dic)
dic[3]="annu"
dic[5]="binu"
print("updated dictionary",dic)
```

7. Write a python program to merge two dictionary?

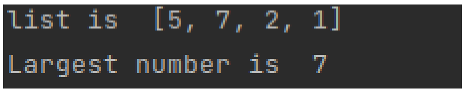
Program Code:

```
d1={'a':10,'b':20,'c':30}
d2={'z':50,'x':45,'y':78}
print("directory 1",d1)
print("directory 2",d2)
d2.update(d1)
print("Merged directory",d2)
```

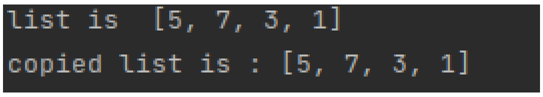
Output

1. 

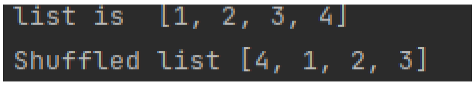
```
Enter the number : 4
84
```

2. 

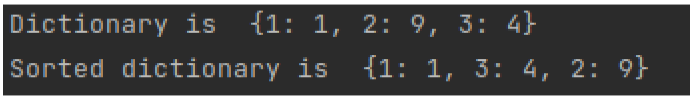
```
list is  [5, 7, 2, 1]
Largest number is  7
```

3. 

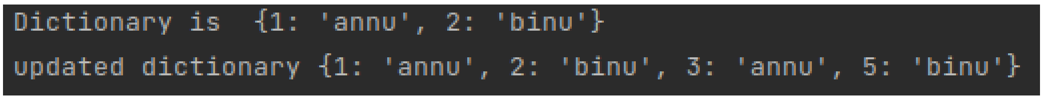
```
list is  [5, 7, 3, 1]
copied list is : [5, 7, 3, 1]
```

4. 

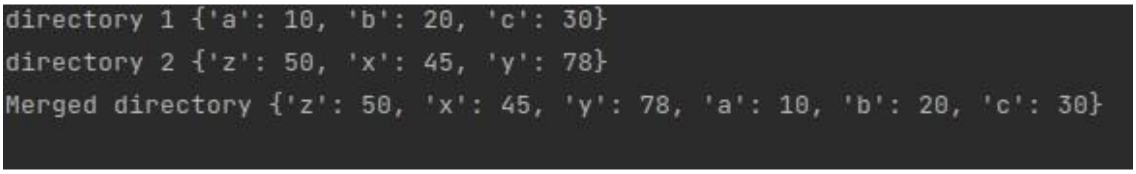
```
list is  [1, 2, 3, 4]
Shuffled list [4, 1, 2, 3]
```

5. 

```
Dictionary is  {1: 1, 2: 9, 3: 4}
Sorted dictionary is  {1: 1, 3: 4, 2: 9}
```

6. 

```
Dictionary is  {1: 'annu', 2: 'binu'}
updated dictionary {1: 'annu', 2: 'binu', 3: 'annu', 5: 'binu'}
```

7. 

```
directory 1 {'a': 10, 'b': 20, 'c': 30}
directory 2 {'z': 50, 'x': 45, 'y': 78}
Merged directory {'z': 50, 'x': 45, 'y': 78, 'a': 10, 'b': 20, 'c': 30}
```

Program: 2

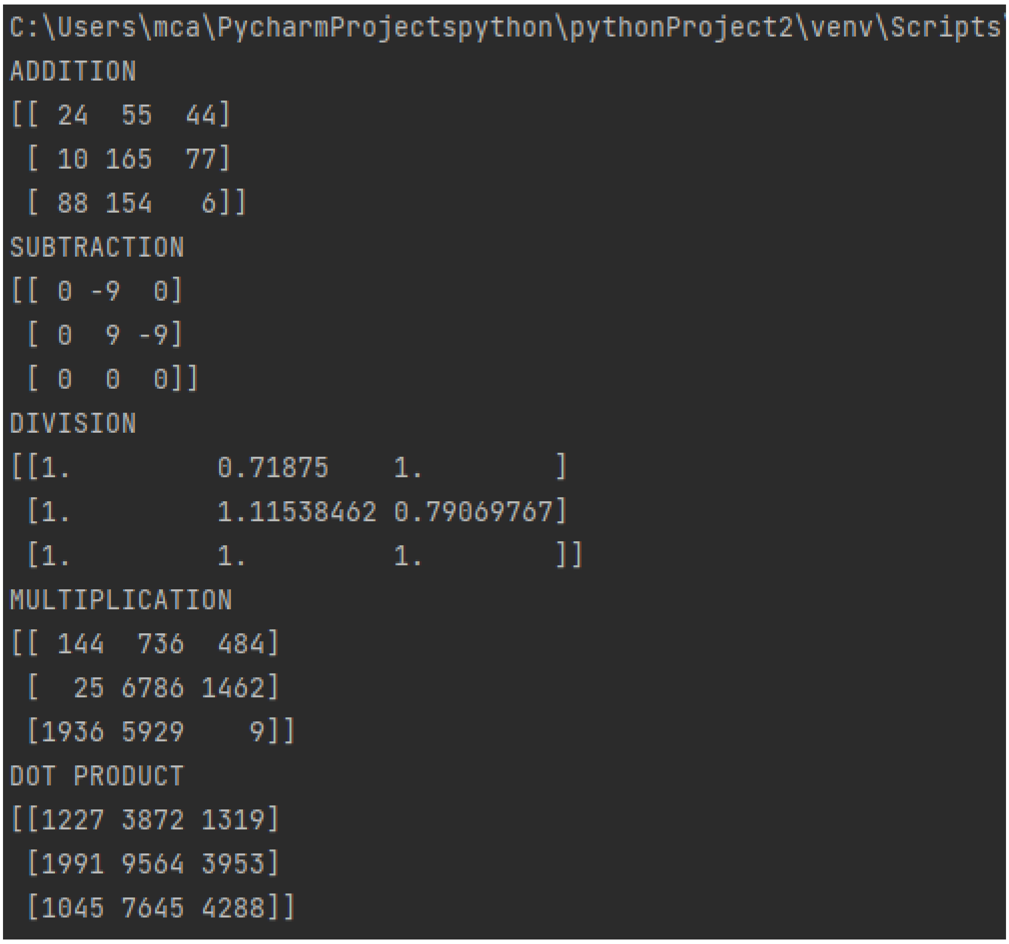
Aim:

Perform all matrix operation using python (using numpy)

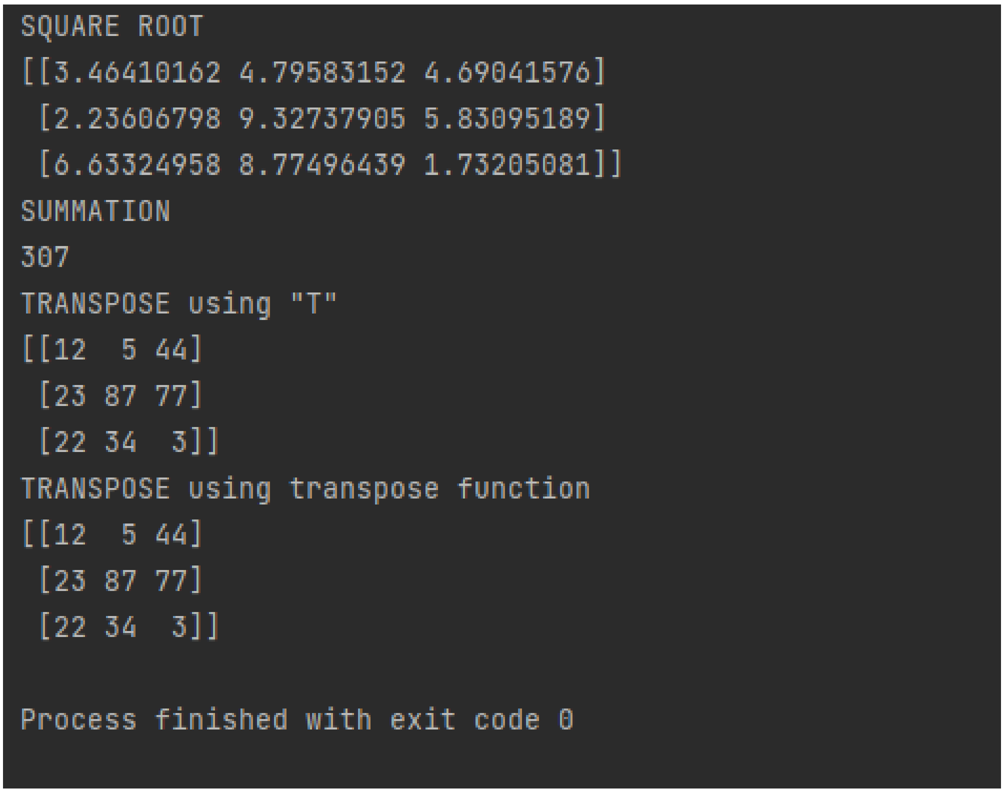
Program Code:

```
import numpy as np
mat1=np.array([[12,23,22],[5,87,34],[44,77,3]])
mat2=np.array([[12,32,22],[5,78,43],[44,77,3]])
print('ADDITION')
print(np.add(mat1,mat2))
print('SUBTRACTION')
print(np.subtract(mat1,mat2))
print('DIVISION')
print(np.divide(mat1,mat2))
print('MULTIPLICATION')
print(np.multiply(mat1,mat2))
print('DOT PRODUCT')
print(np.dot(mat1,mat2))
print('SQUARE ROOT')
print(np.sqrt(mat1))
print('SUMMATION')
print(np.sum(mat1))
print('TRANSPOSE using "T" ')
print(mat1.T)
print('TRANSPOSE using transpose function ')
print(np.transpose(mat1))
```

Output



```
C:\Users\mca\PycharmProjectspython\pythonProject2\venv\Scripts
ADDITION
[[ 24  55  44]
 [ 10 165  77]
 [ 88 154   6]]
SUBTRACTION
[[ 0 -9  0]
 [ 0  9 -9]
 [ 0  0  0]]
DIVISION
[[1.         0.71875    1.        ]
 [1.         1.11538462 0.79069767]
 [1.         1.         1.        ]]
MULTIPLICATION
[[ 144  736  484]
 [  25 6786 1462]
 [1936 5929    9]]
DOT PRODUCT
[[1227 3872 1319]
 [1991 9564 3953]
 [1045 7645 4288]]
```



```
SQUARE ROOT
[[3.46410162 4.79583152 4.69041576]
 [2.23606798 9.32737905 5.83095189]
 [6.63324958 8.77496439 1.73205081]]
SUMMATION
307
TRANSPOSE using "T"
[[12  5 44]
 [23 87 77]
 [22 34  3]]
TRANSPOSE using transpose function
[[12  5 44]
 [23 87 77]
 [22 34  3]]

Process finished with exit code 0
```

Program: 3

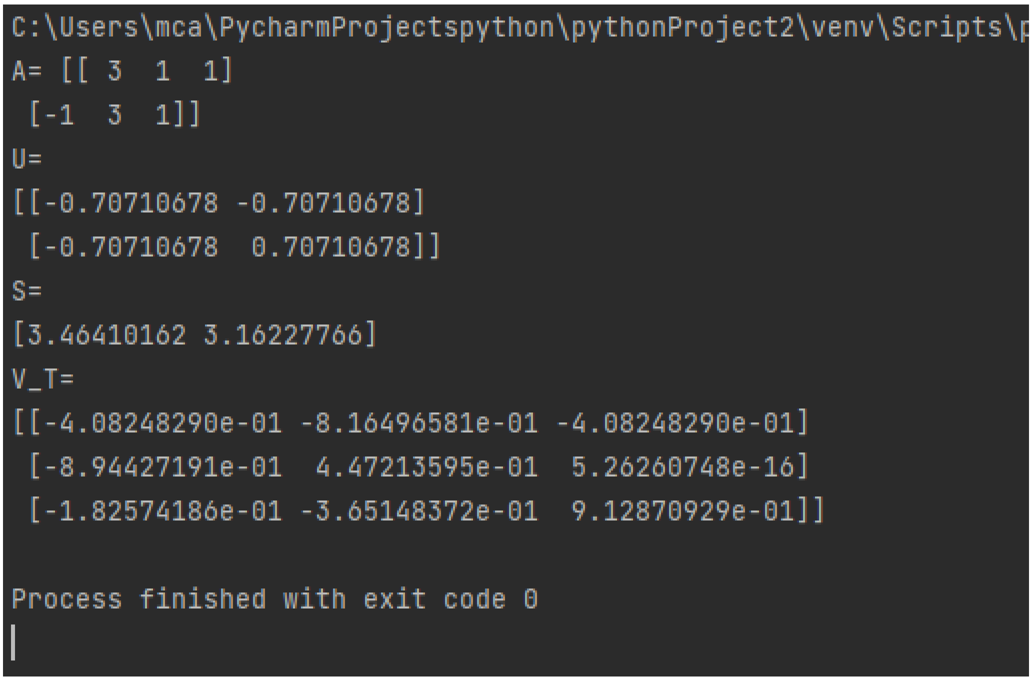
Aim:

Program to Perform SVD (Singular Value Decomposition) in Python

Program Code:

```
# Singular-value decomposition
from numpy import array
from scipy.linalg import svd
# define a matrix
A = array([[3, 1, 1], [-1, 3, 1]])
print("A=",A)
# SVD
U, S, V_T = svd(A)
# left singular vectors
print("U=")
print(U)
# singular values
print("S=")
print(S)
#right singular vectors
print("V_T=")
print(V_T)
```

Output



```
C:\Users\mca\PycharmProjectspython\pythonProject2\venv\Scripts\p
A= [[ 3  1  1]
 [-1  3  1]]
U=
[[-0.70710678 -0.70710678]
 [-0.70710678  0.70710678]]
S=
[3.46410162 3.16227766]
V_T=
[[-4.08248290e-01 -8.16496581e-01 -4.08248290e-01]
 [-8.94427191e-01  4.47213595e-01  5.26260748e-16]
 [-1.82574186e-01 -3.65148372e-01  9.12870929e-01]]

Process finished with exit code 0
```

.

Program: 4

Aim:

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

Program Code:

1. Class stratified Histogram(using matplotlib)

```
import numpy as np
import matplotlib.pyplot as plt
bins = 10
data = np.random.randn(1000, 3)
colors = ['blue','green', 'red']
plt.hist(data, bins, histtype='bar', color=colors, stacked=True, fill=True)
plt.show()
```

2. Multiple Scatter matrix(using plotly)

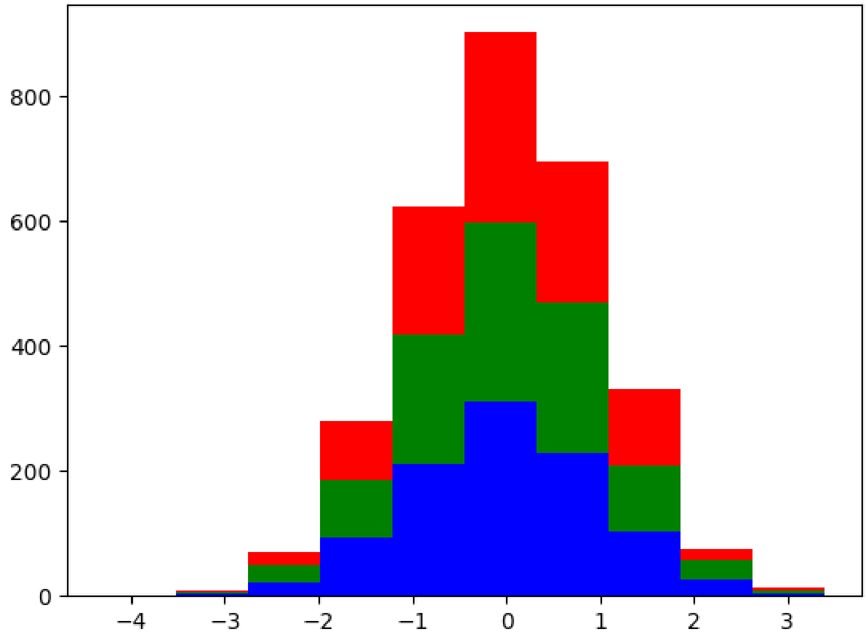
```
import plotly.express as px df = px.data.iris()
fig = px.scatter_matrix(df,
dimensions=["sepal_width", "sepal_length", "petal_width", "petal_length"],
color="species", symbol="species", title="Scatter matrix of iris data set",
labels={col:col.replace('_', ' ') for col in df.columns}) # remove underscore
fig.update_traces(diagonal_visible=False) fig.show()
```

3. Histogram(using seaborn)

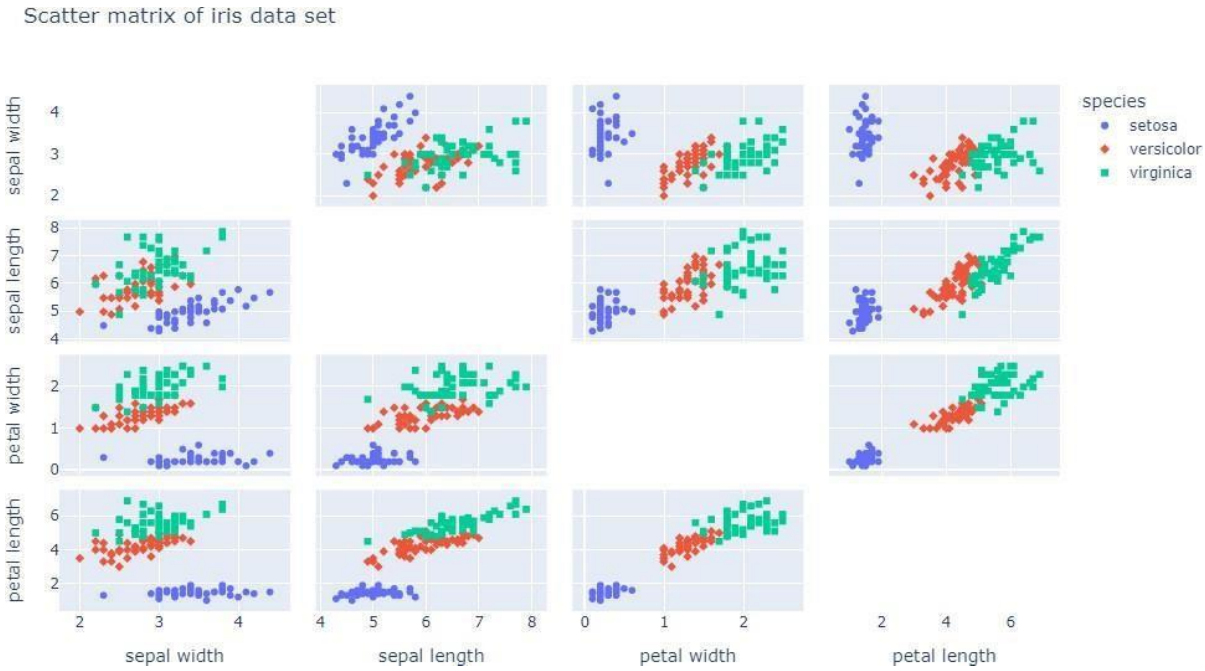
```
import matplotlib.pyplot as plt import pandas as pd
import numpy as np import seaborn as sns
# Load the data
df = pd.read_csv('iris.csv')
# Extract feature we're interested in data = df['SepalWidthCm']
# Generate histogram/distribution plot sns.displot(data)
plt.show()
```

Output

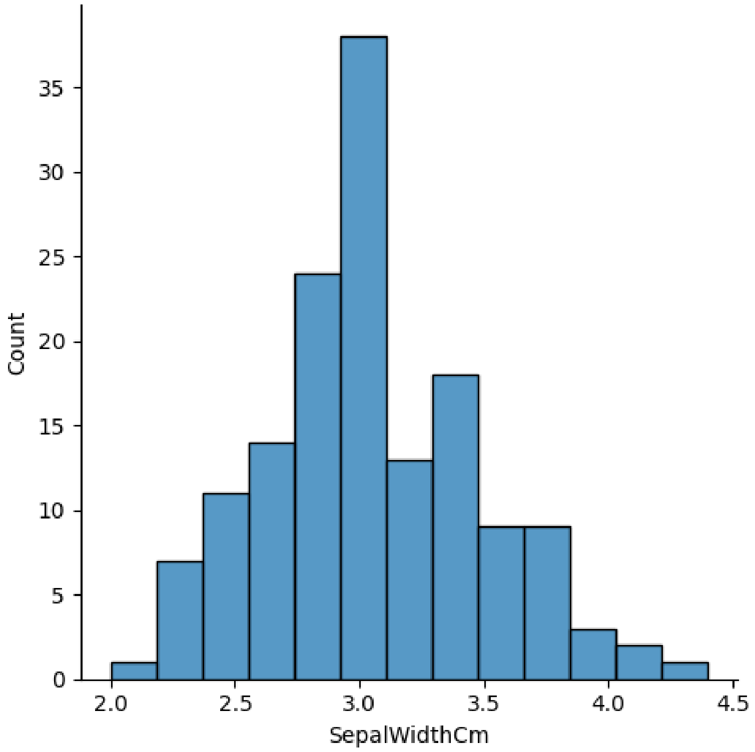
1. Class stratified Histogram



2. Multiple Scatter matrix



3. Histogram



Program: 5

Aim:

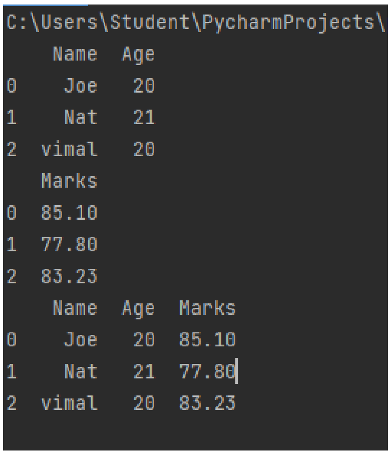
Programs to handle data using pandas.

Program Code:

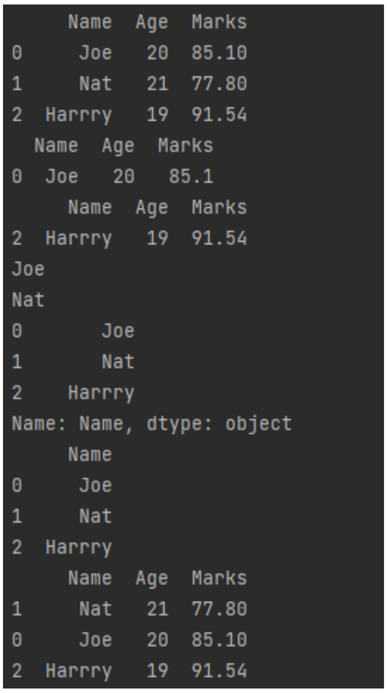
```
#python program to demonstrate
#Working of array using pandas
import pandas as pd

#declare first array
student_dict={'Name':['Joe','Nat','vimal'],'Age':[20,21,20]}
student_df=pd.DataFrame(student_dict)
print(student_df)

#declare second array
marks_dict={'Marks':[85.10,77.80,83.23]}
mark_df=pd.DataFrame(marks_dict)
print(mark_df)

#join two array

joined_df=student_df.join(mark_df)
print(joined_df)

student_dict={'Name':['Joe','Nat','Harrry'],'Age':[20,21,19],'Marks':[85.10,77.80,91.54]}
student_df=pd.DataFrame(student_dict)
print(student_df)

#select top 2 rows
print(student_df.head(1))
#select last 2 rows
print(student_df.tail(1))

#select value at row index 0 and column'Name'
print(student_df.at[0,'Name'])

#select value at first row and first column
print(student_df.iat[1,0])

#select values of 'Name' column
print(student_df.get('Name'))
```

```
#select values from row index 0 to 2 and 'Name' column
print(student_df.loc[0:2,['Name']])

#sort column by marks
student_df=student_df.sort_values(by=['Marks'])
print(student_df)

#select values fro, row index 0 to 2 (exclusive) and column position 0 to 2 exclusive
print(student_df.iloc[0:2,0:2])

#convert dataframe to dict
dict=student_df.to_dict()
print(dict)

#filter a data based on some condition with mark>80
filter=student_df['Marks']>80
student_df['Marks'].where(filter,other=0,inplace=True)
print(student_df)

#filter in names first name start with  'N' then remaining

student_nu=student_df.filter(like='N',axis='columns')
print(student_nu)
```

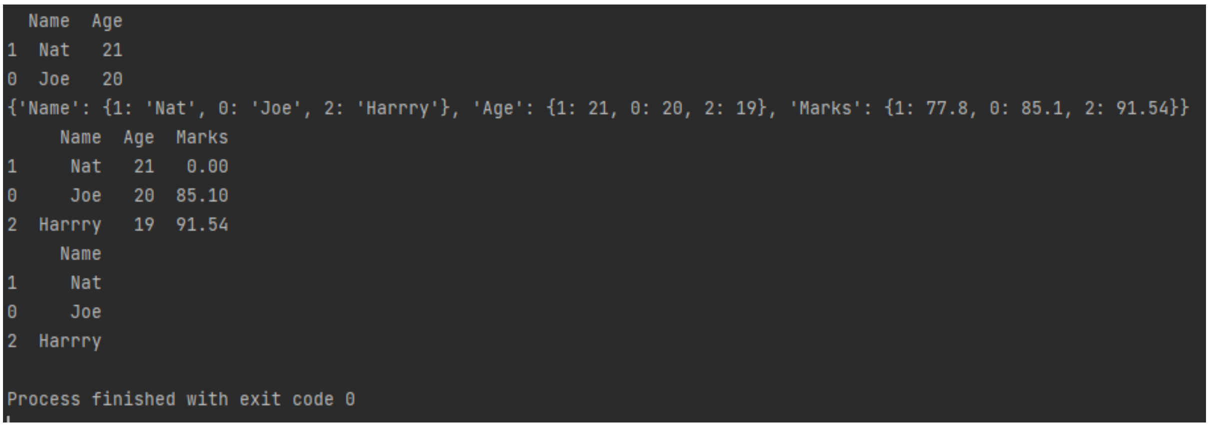
Output



```
C:\Users\Student\PycharmProjects\
    Name  Age
0    Joe   20
1    Nat   21
2  vimal   20
   Marks
0  85.10
1  77.80
2  83.23
    Name  Age  Marks
0    Joe   20  85.10
1    Nat   21  77.80
2  vimal   20  83.23
```



```
     Name  Age  Marks
0     Joe   20  85.10
1     Nat   21  77.80
2  Harrry   19  91.54
  Name  Age  Marks
0  Joe   20   85.1
     Name  Age  Marks
2  Harrry   19  91.54
Joe
Nat
0       Joe
1       Nat
2    Harrry
Name: Name, dtype: object
     Name
0     Joe
1     Nat
2  Harrry
     Name  Age  Marks
1     Nat   21  77.80
0     Joe   20  85.10
2  Harrry   19  91.54
```



```
  Name  Age
1  Nat   21
0  Joe   20
{'Name': {1: 'Nat', 0: 'Joe', 2: 'Harrry'}, 'Age': {1: 21, 0: 20, 2: 19}, 'Marks': {1: 77.8, 0: 85.1, 2: 91.54}}
     Name  Age  Marks
1     Nat   21   0.00
0     Joe   20  85.10
2  Harrry   19  91.54
     Name
1     Nat
0     Joe
2  Harrry

Process finished with exit code 0
```

Program: 6

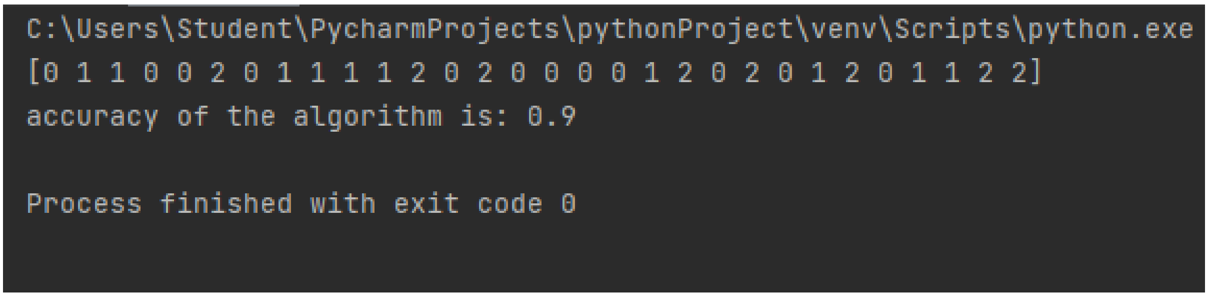
Aim:

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

Program Code:

```
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
irisData = load_iris()
m = irisData.data
n = irisData.target
m_train, m_test, n_train, n_test = train_test_split(m,n, test_size=0.2, random_state=46)
knn = KNeighborsClassifier(n_neighbors=2)
knn.fit(m_train, n_train)
print(knn.predict(m_test))
p = knn.predict(m_test)
q = accuracy_score(n_test, p)
print("accuracy of the algorithm is:", q)
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject\venv\Scripts\python.exe
[0 1 1 0 0 2 0 1 1 1 1 2 0 2 0 0 0 0 1 2 0 2 0 1 2 0 1 1 2 2]
accuracy of the algorithm is: 0.9

Process finished with exit code 0
```

Program: 7

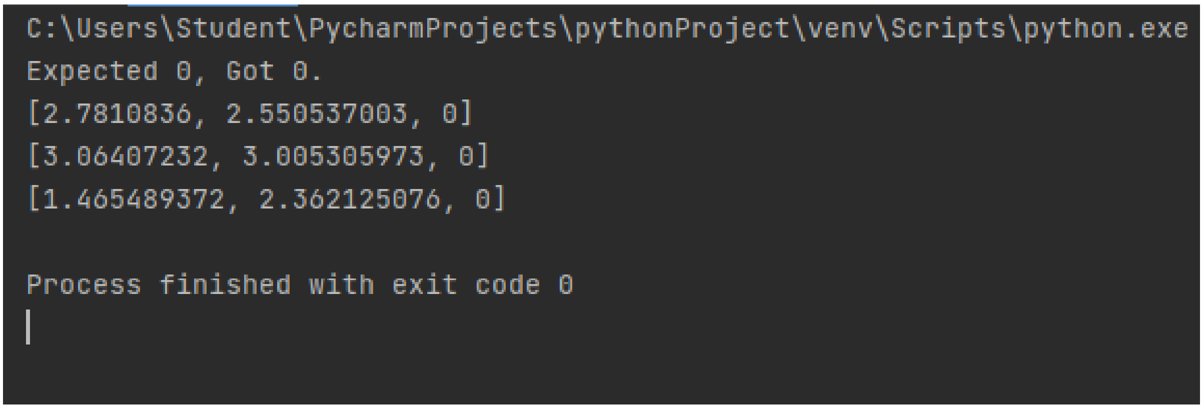
Aim:

Program to implement kNN classification using any random data, without using inbuilt package.

Program Code:

```
from math import sqrt
# calculate the Euclidean distance between two vectors    distance = 0.0
def euclidean_distance(row1, row2):
    distance = 0.0
    for i in range(len(row1) - 1):
        distance += (row1[i] - row2[i]) ** 2
    return sqrt(distance)
# Locate the closest neighbors
def get_neighbors(train, test_row, num_neighbors):
    distances = list()
    for train_row in train:
        dist = euclidean_distance(test_row, train_row)
        distances.append((train_row, dist))
    distances.sort(key=lambda tup: tup[1])
    neighbors = list()
    for i in range(num_neighbors):
        neighbors.append(distances[i][0])
    return neighbors
def predict_classification(train, test_row, num_neighbors):
    neighbors = get_neighbors(train, test_row, num_neighbors)
    output_values = [row[-1] for row in neighbors]
    prediction = max(set(output_values), key=output_values.count)
    return prediction

# Test distance function
dataset = [[2.7810836, 2.550537003, 0],
           [1.465489372, 2.362125076, 0],
           [3.396561688, 4.400293529, 0],
           [1.38807019, 1.850220317, 0],
           [3.06407232, 3.005305973, 0],
           [7.627531214, 2.759262235, 1],
           [5.332441248, 2.088626775, 1],
           [6.922596716, 1.77106367, 1],
           [8.675418651, -0.242068655, 1],
           [7.673756466, 3.508563011, 1]]
prediction = predict_classification(dataset, dataset[0], 5)
print('Expected %d, Got %d.' % (dataset[0][-1], prediction))
neighbors = get_neighbors(dataset, dataset[0], 3)
for neighbor in neighbors:
    print(neighbor)
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject\venv\Scripts\python.exe
Expected 0, Got 0.
[2.7810836, 2.550537003, 0]
[3.06407232, 3.005305973, 0]
[1.465489372, 2.362125076, 0]

Process finished with exit code 0
```

Program: 8

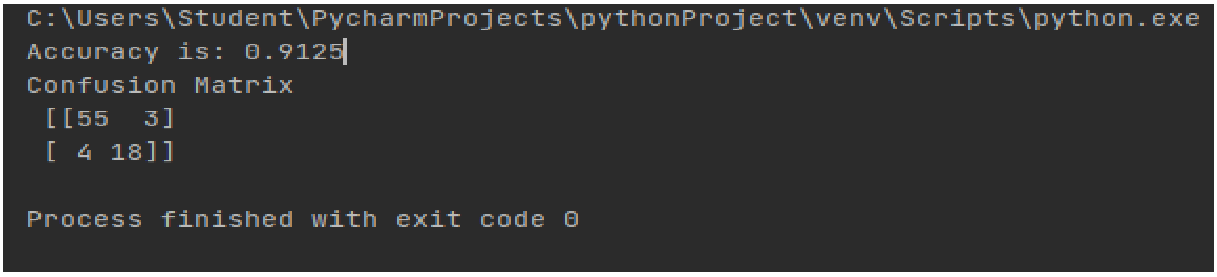
Aim:

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

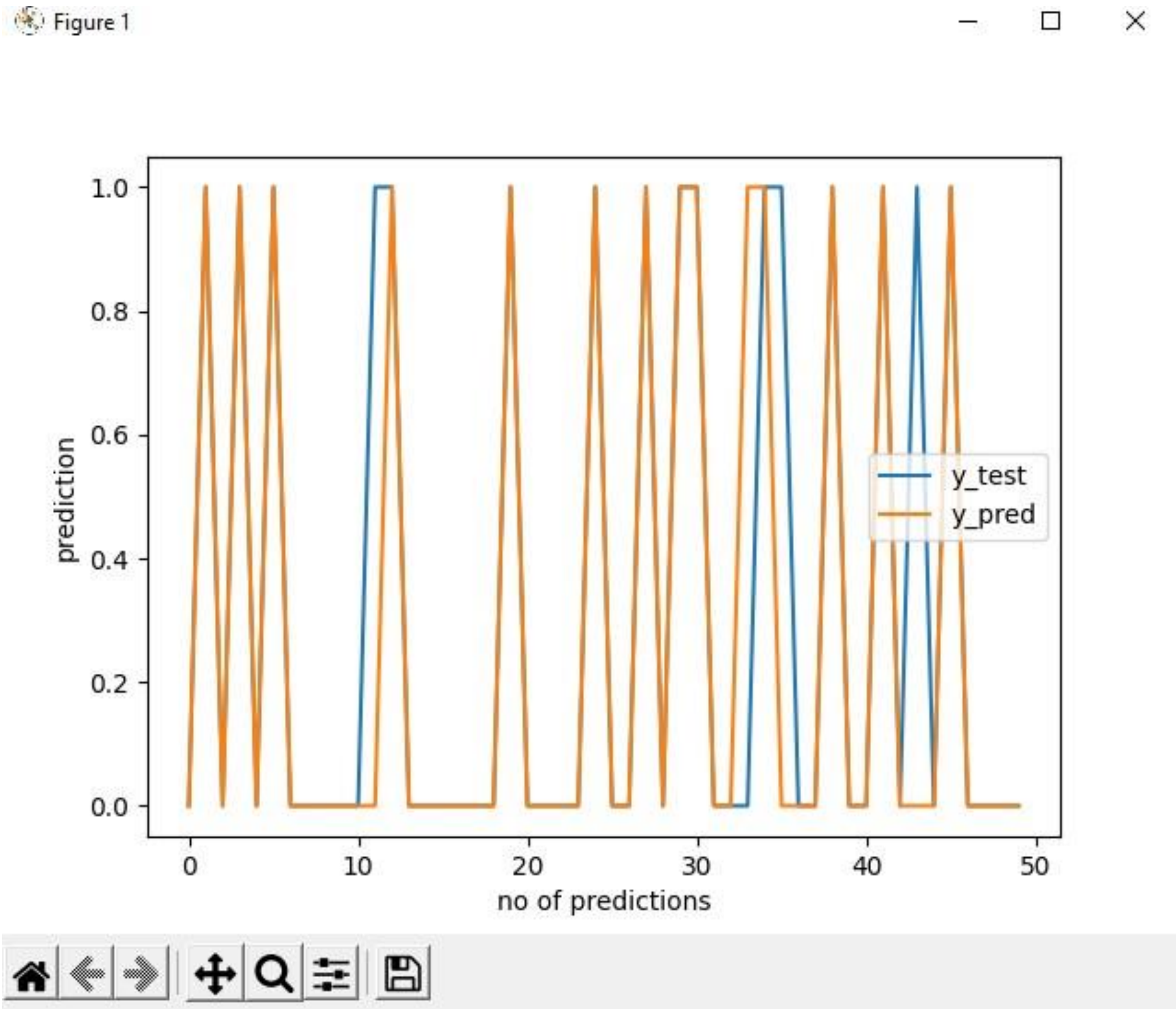
Program Code:

```
# Importing the libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
# Importing the dataset
dataset = pd.read_csv('Social_Network_Ads.csv')
X = dataset.iloc[:, [2, 3]].values
y = dataset.iloc[:, -1].values

# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.20, random_state = 0)

# Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
# Training the Naive Bayes model on the Training set
from sklearn.naive_bayes import GaussianNB
classifier = GaussianNB()
classifier.fit(X_train, y_train)

# Predicting the Test set results
y_pred = classifier.predict(X_test)

# Making the Confusion Matrix
from sklearn.metrics import confusion_matrix, accuracy_score
ac = accuracy_score(y_test,y_pred)
cm = confusion_matrix(y_test, y_pred)

print("Accuracy is:", ac)
print("Confusion Matrix\n",cm)
plt.plot([i for i in range(0, 50)], y_test[20:70])
plt.plot([i for i in range(0, 50)], y_pred[20:70])
plt.xlabel("no of predictions")
plt.ylabel("prediction")
plt.legend(["y_test", "y_pred"])
plt.show()
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject\venv\Scripts\python.exe
Accuracy is: 0.9125
Confusion Matrix
 [[55  3]
 [ 4 18]]

Process finished with exit code 0
```



Program: 9

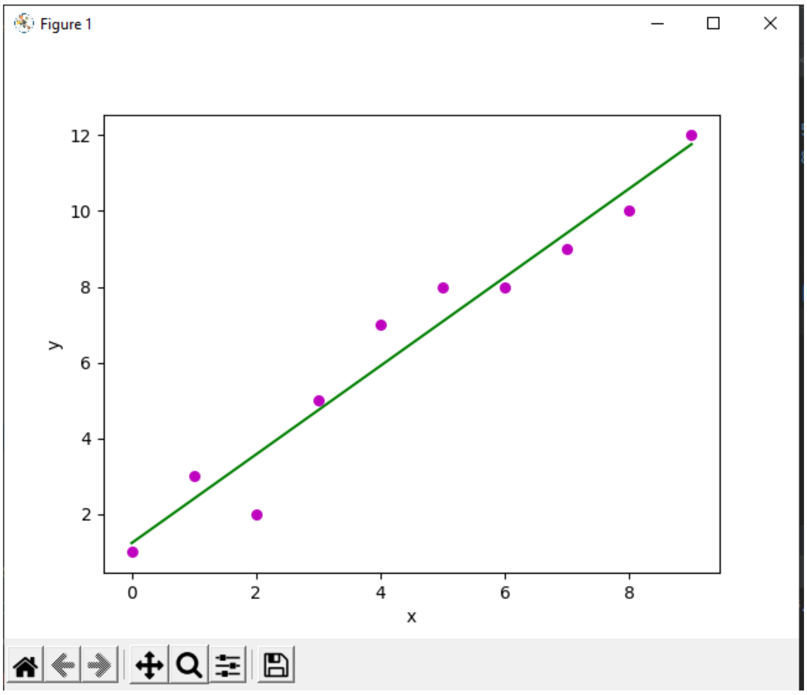
Aim:

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

Program Code:

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

def estimate_coef(x, y):
  # number of observations/points
  n = np.size(x)

  # mean of x and y vector
  m_x = np.mean(x)
  m_y = np.mean(y)

  # calculating cross-deviation and deviation about x
  SS_xy = np.sum(y*x) - n*m_y*m_x
  SS_xx = np.sum(x*x) - n*m_x*m_x

  # calculating regression coefficients
  b_1 = SS_xy / SS_xx
  b_0 = m_y - b_1*m_x

  return (b_0, b_1)

def plot_regression_line(x, y, b):
  # plotting the actual points as scatter plot
  plt.scatter(x, y, color = "m",
        marker = "o", s = 30)
  # predicted response vector
  y_pred = b[0] + b[1]*x

  # plotting the regression line
  plt.plot(x, y_pred, color = "g")

  # putting labels
  plt.xlabel('x')
  plt.ylabel('y')

  # function to show plot
  plt.show()

def main():
  # observations / data
  x = np.array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9])
  y = np.array([1, 3, 2, 5, 7, 8, 8, 9, 10, 12])

  # estimating coefficients
  b = estimate_coef(x, y)
  print("Estimated coefficients:\nb_0 = {} \
    \nb_1 = {}".format(b[0], b[1]))

  # plotting regression line
  plot_regression_line(x, y, b)

if__name__== "_main_":
  main()
```

Output



Program: 10

Aim:

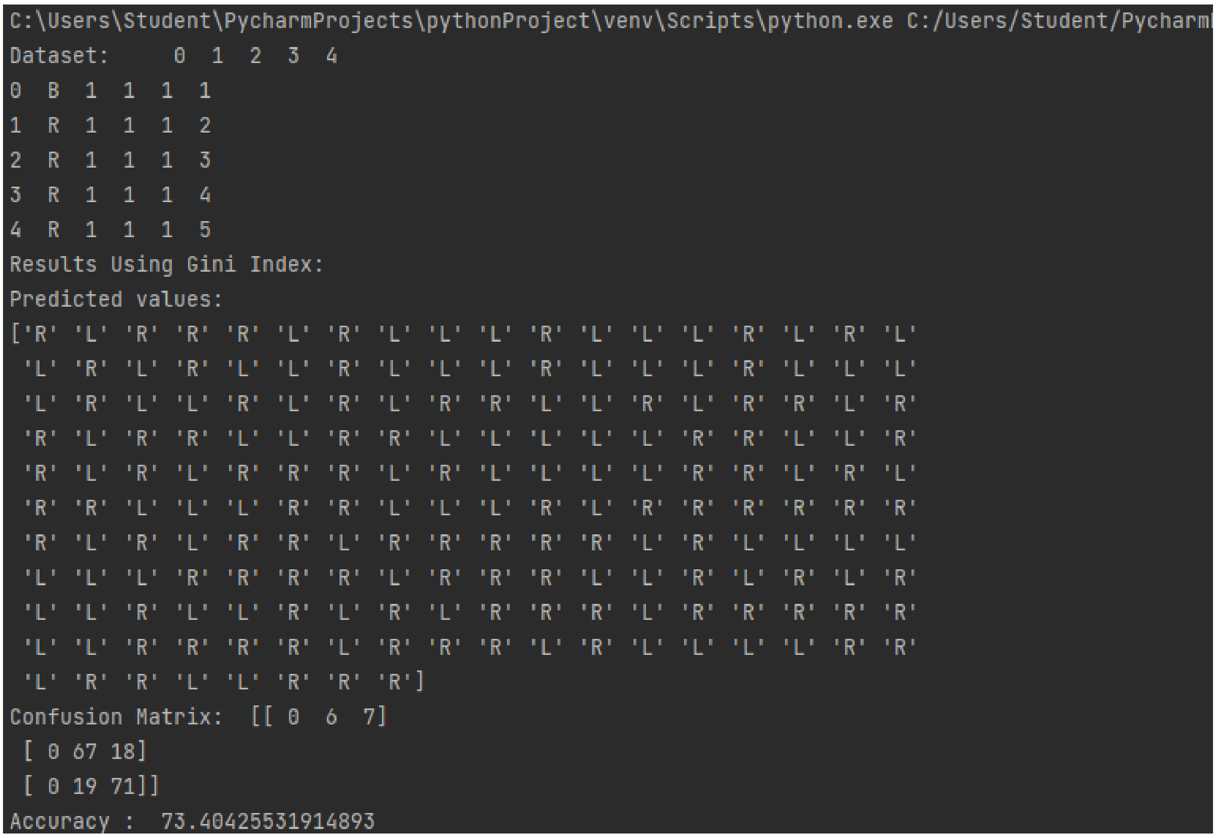
Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm.

Program Code:

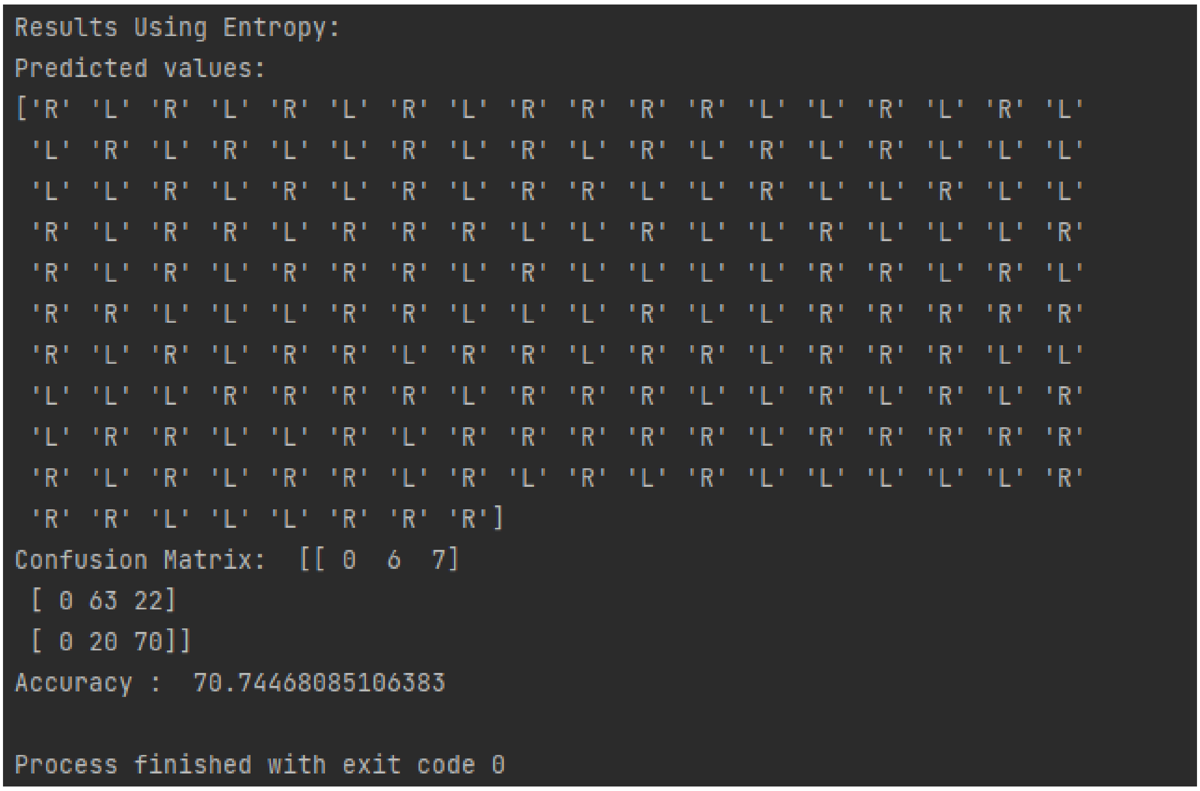
```
import pandas as pd
from sklearn.metrics import confusion_matrix
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score

# Function importing Dataset
def importdata():
    balance_data = pd.read_csv(
        'https://archive.ics.uci.edu/ml/machine-learning-' +
        'databases/balance-scale/balance-scale.data',
        sep=',', header=None)

    # Printing the dataset obseravtions
    print("Dataset: ", balance_data.head())
    return balance_data

# Function to split the dataset
def splitdataset(balance_data):
    # Separating the target variable
    X = balance_data.values[:, 1:5]
    Y = balance_data.values[:, 0]

    # Splitting the dataset into train and test
    X_train, X_test, y_train, y_test = train_test_split(
        X, Y, test_size=0.3, random_state=100)

    return X, Y, X_train, X_test, y_train, y_test

# Function to perform training with giniIndex.
def train_using_gini(X_train, X_test, y_train):
    # Creating the classifier object
    clf_gini = DecisionTreeClassifier(criterion="gini",
                                      random_state=100, max_depth=3, min_samples_leaf=5)

    # Performing training
    clf_gini.fit(X_train, y_train)
    return clf_gini

# Function to perform training with entropy.
```

```
def train_using_entropy(X_train, X_test, y_train):
    # Decision tree with entropy
    clf_entropy = DecisionTreeClassifier(
        criterion="entropy", random_state=100,
        max_depth=3, min_samples_leaf=5)

    # Performing training
    clf_entropy.fit(X_train, y_train)
    return clf_entropy

# Function to make predictions
def prediction(X_test, clf_object):
    # Predicton on test with giniIndex
    y_pred = clf_object.predict(X_test)
    print("Predicted values:")
    print(y_pred)
    return y_pred

# Function to calculate accuracy
def cal_accuracy(y_test, y_pred):
     print("Confusion Matrix: ",
          confusion_matrix(y_test, y_pred))

    print("Accuracy : ",
          accuracy_score(y_test, y_pred) * 100)

# Driver code
def main():
    # Building Phase
    data = importdata()
    X, Y, X_train, X_test, y_train, y_test = splitdataset(data)
    clf_gini = train_using_gini(X_train, X_test, y_train)
    clf_entropy = train_using_entropy(X_train, X_test, y_train)

    # Operational  Phase
    print("Results Using Gini Index:")

    # Prediction using gini
    y_pred_gini = prediction(X_test, clf_gini)
    cal_accuracy(y_test, y_pred_gini)

    print("Results Using Entropy:")
    # Prediction using entropy
    y_pred_entropy = prediction(X_test, clf_entropy)
    cal_accuracy(y_test, y_pred_entropy)

# Calling main function
if__name__== "_main_":
    main()
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject\venv\Scripts\python.exe C:/Users/Student/Pycharm
Dataset:     0  1  2  3  4
0  B  1  1  1  1
1  R  1  1  1  2
2  R  1  1  1  3
3  R  1  1  1  4
4  R  1  1  1  5
Results Using Gini Index:
Predicted values:
['R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'R' 'L'
 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L'
 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'R' 'L' 'R'
 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'R' 'L'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L'
 'L' 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R'
 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R'
 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R'
 'L' 'R' 'R' 'L' 'L' 'R' 'R' 'R']
Confusion Matrix:  [[ 0  6  7]
 [ 0 67 18]
 [ 0 19 71]]
Accuracy :  73.40425531914893
```



```
Results Using Entropy:
Predicted values:
['R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L'
 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L'
 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L'
 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L' 'L' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'R' 'L'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L'
 'L' 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R'
 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'L' 'R'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'R']
Confusion Matrix:  [[ 0  6  7]
 [ 0 63 22]
 [ 0 20 70]]
Accuracy :  70.74468085106383

Process finished with exit code 0
```

Program: 11

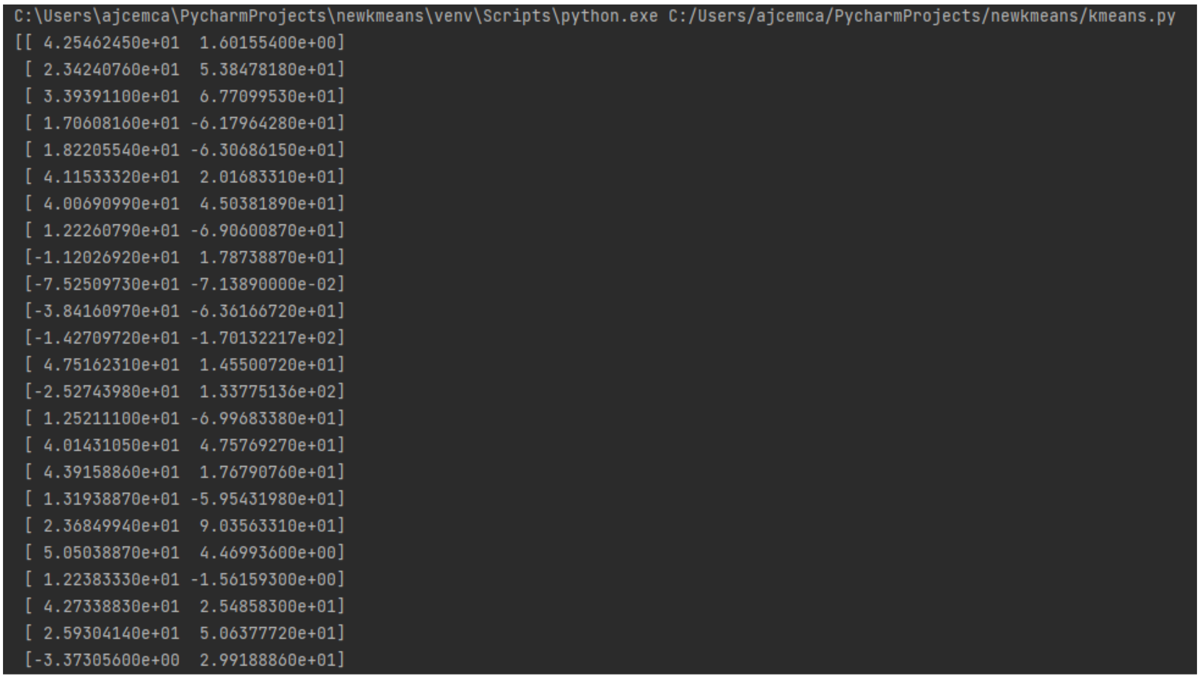
Aim:

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

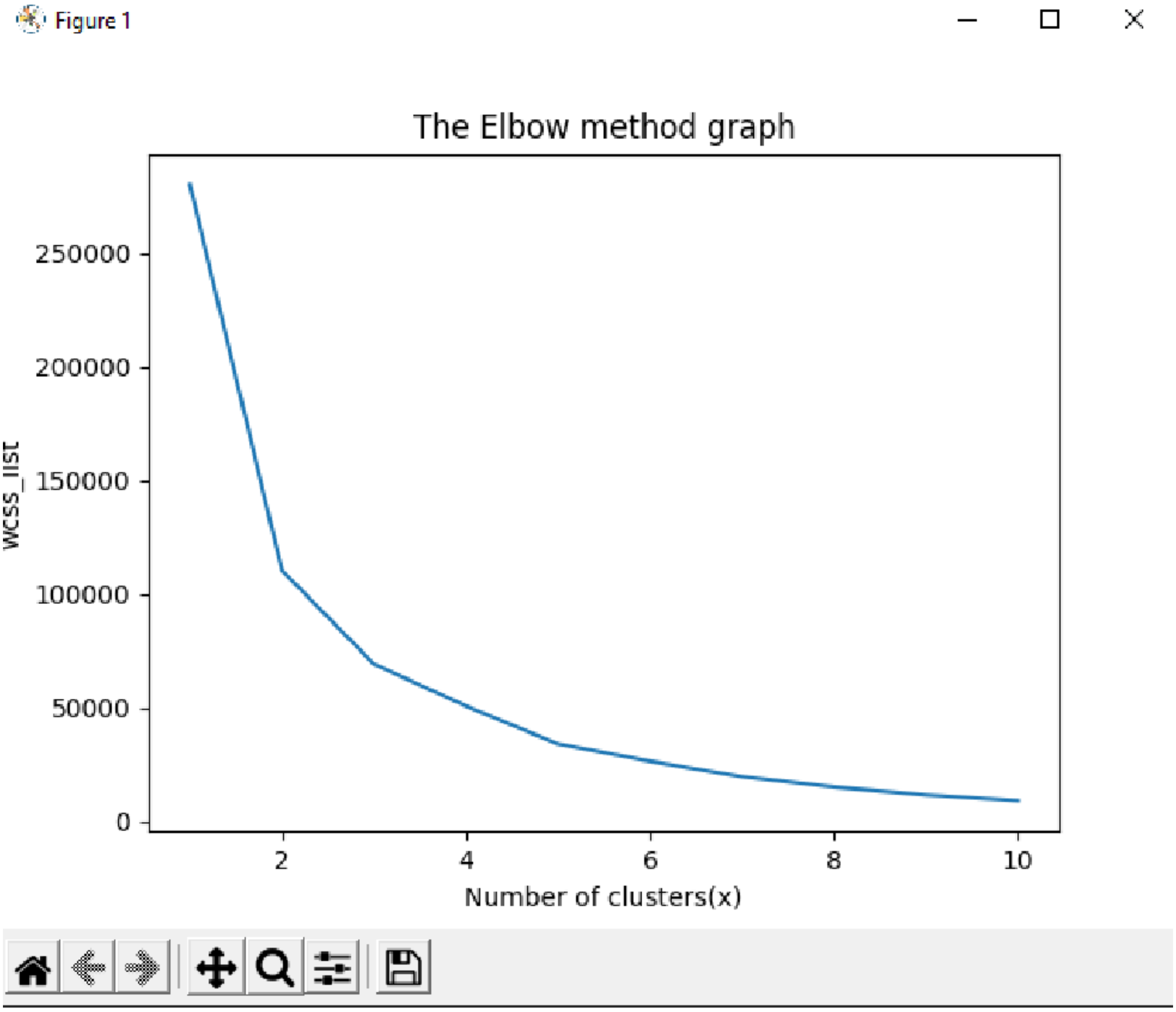
Program Code:

```
import matplotlib.pyplot as mtp
import pandas as pd
from sklearn.cluster import KMeans

dataset = pd.read_csv('world_country_and_usa_states_latitude_and_longitude_values.csv')
x = dataset.iloc[:, [1, 2]].values
print(x)

wcss_list = []

for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state=42)
    kmeans.fit(x)
    wcss_list.append(kmeans.inertia_)
mtp.plot(range(1, 11), wcss_list)
mtp.title('The Elbow method graph')
mtp.xlabel('Number of clusters(x)')
mtp.ylabel('wcss_list')
mtp.show()

kmeans = KMeans(n_clusters=3, init='k-means++', random_state=42)
y_predict = kmeans.fit_predict(x)

print(y_predict)

mtp.scatter(x[y_predict == 0, 0], x[y_predict == 0, 1], s=16, c='blue', label='cluster1')
mtp.scatter(x[y_predict == 1, 0], x[y_predict == 1, 1], s=16, c='green', label='cluster2')
mtp.scatter(x[y_predict == 2, 0], x[y_predict == 2, 1], s=16, c='red', label='cluster3')
mtp.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=50, c='yellow',
label='Centroids')
mtp.title('Clusters of countries')
mtp.xlabel('Latitude')
mtp.ylabel('Longitude')
mtp.legend()
mtp.show()
```

Output



```
C:\Users\ajcemca\PycharmProjects\newkmeans\venv\Scripts\python.exe C:/Users/ajcemca/PycharmProjects/newkmeans/kmeans.py
[[ 4.25462450e+01  1.60155400e+00]
 [ 2.34240760e+01  5.38478180e+01]
 [ 3.39391100e+01  6.77099530e+01]
 [ 1.70608160e+01 -6.17964280e+01]
 [ 1.82205540e+01 -6.30686150e+01]
 [ 4.11533320e+01  2.01683310e+01]
 [ 4.00690990e+01  4.50381890e+01]
 [ 1.22260790e+01 -6.90600870e+01]
 [-1.12026920e+01  1.78738870e+01]
 [-7.52509730e+01 -7.13890000e-02]
 [-3.84160970e+01 -6.36166720e+01]
 [-1.42709720e+01 -1.70132217e+02]
 [ 4.75162310e+01  1.45500720e+01]
 [-2.52743980e+01  1.33775136e+02]
 [ 1.25211100e+01 -6.99683380e+01]
 [ 4.01431050e+01  4.75769270e+01]
 [ 4.39158860e+01  1.76790760e+01]
 [ 1.31938870e+01 -5.95431980e+01]
 [ 2.36849940e+01  9.03563310e+01]
 [ 5.05038870e+01  4.46993600e+00]
 [ 1.22383330e+01 -1.56159300e+00]
 [ 4.27338830e+01  2.54858300e+01]
 [ 2.59304140e+01  5.06377720e+01]
 [-3.37305600e+00  2.99188860e+01]
```



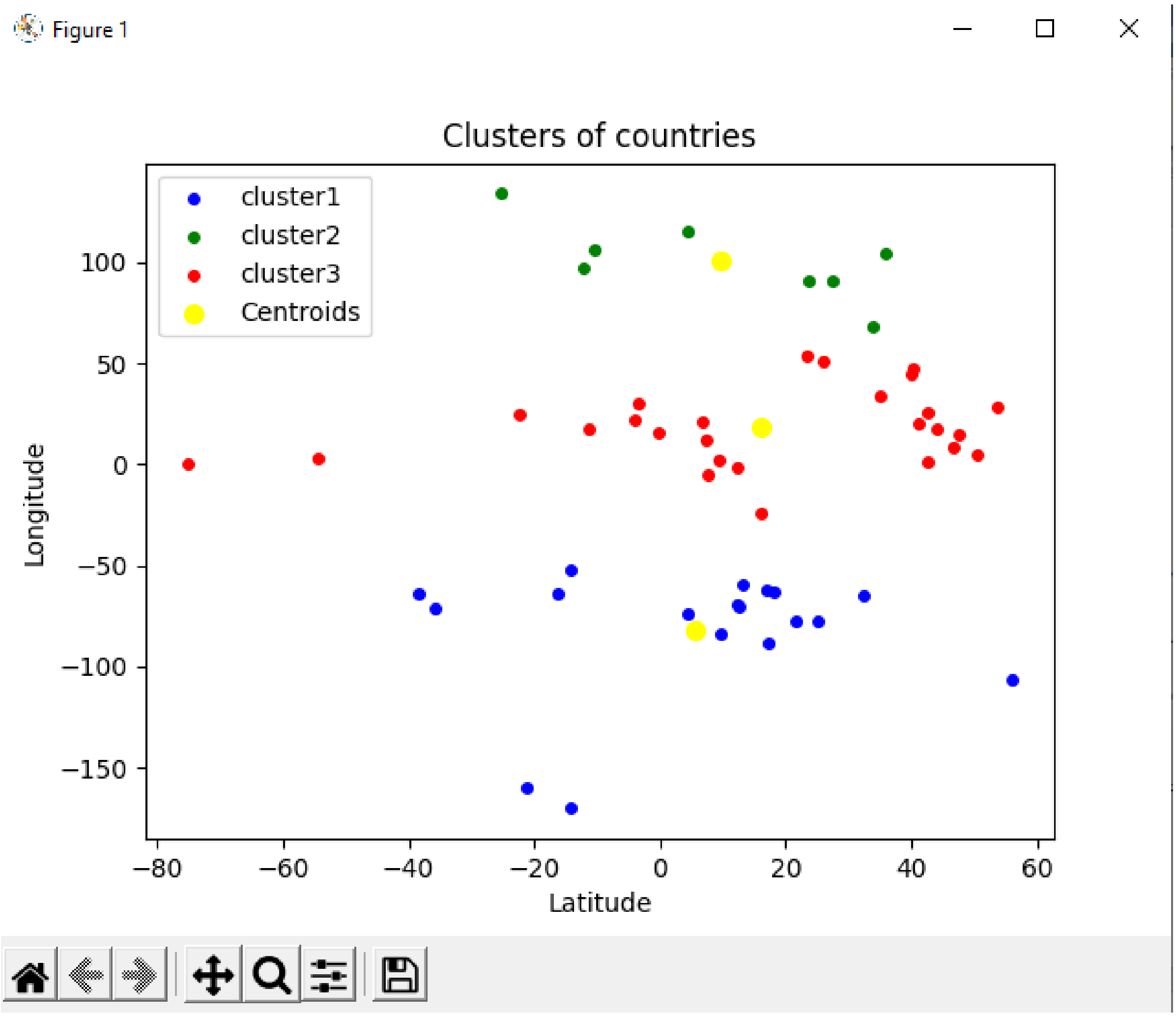


Figure 1
Clusters of countries
cluster1
cluster2
cluster3
Centroids
Longitude
100
50
0
−50
−100
−150
−80
−60
−40
−20
0
20
40
60
Latitude

Program: 12

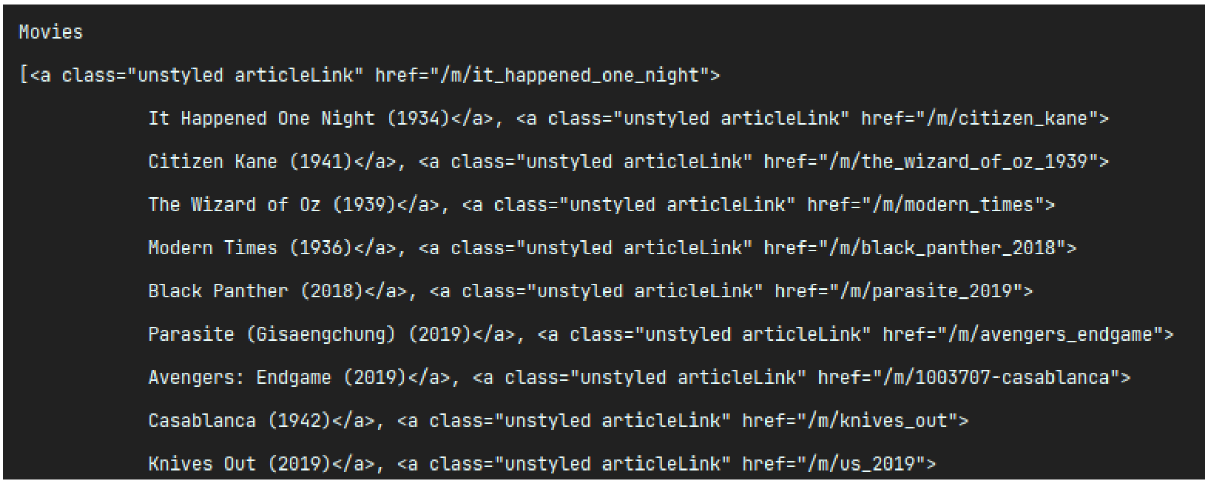
Aim:

Program to implement simple web crawler using python

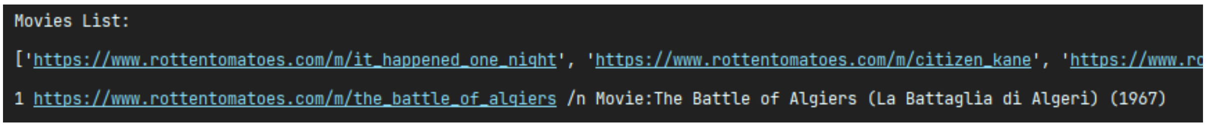
Program Code:

```
import requests
import lxml
from bs4 import BeautifulSoup

url = "https://www.rottentomatoes.com/top/bestofrt/"
headers = {
    'User-Agent': 'Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML,
like Gecko) Chrome/63.0.3239.132 Safari/537.36 OPR/50.0.2762.58 (Edition Yx 01)'}
f = requests.get(url, headers=headers)
movies_lst = []
soup = BeautifulSoup(f.content, 'html.parser')
movies = soup.find('table',
                   {'class': 'table'}).find_all('a')
print("Movies")
print(movies)
num = 0
for anchor in movies:
    urls = 'https://www.rottentomatoes.com' + anchor['href']
    movies_lst.append(urls)
print("Movies List: ")
print(movies_lst)
num +=  1
#movie_url = urls
movie_f = requests.get(urls, headers=headers)
movie_soup = BeautifulSoup(movie_f.content, 'lxml')
movie_content = movie_soup.find('div', {
    'class': 'movie_synopsis clamp clamp-6 js-clamp'
})
print(num, urls, '/n', 'Movie:' + anchor.string.strip())
print("Movie Information: ")
print('Movie info:' + movie_content.string.strip())
```

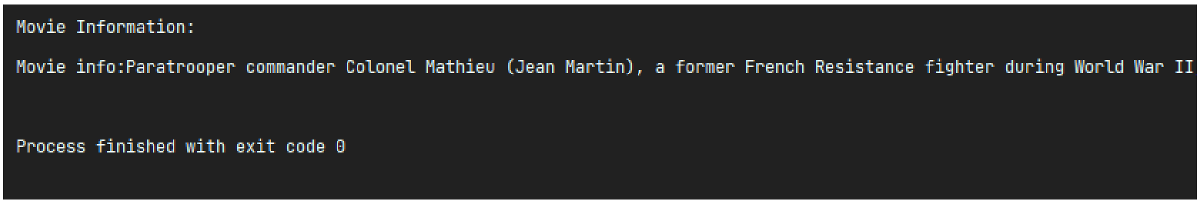
Output



```
Movies
[<a class="unstyled articleLink" href="/m/it_happened_one_night">
            It Happened One Night (1934)</a>, <a class="unstyled articleLink" href="/m/citizen_kane">
            Citizen Kane (1941)</a>, <a class="unstyled articleLink" href="/m/the_wizard_of_oz_1939">
            The Wizard of Oz (1939)</a>, <a class="unstyled articleLink" href="/m/modern_times">
            Modern Times (1936)</a>, <a class="unstyled articleLink" href="/m/black_panther_2018">
            Black Panther (2018)</a>, <a class="unstyled articleLink" href="/m/parasite_2019">
            Parasite (Gisaengchung) (2019)</a>, <a class="unstyled articleLink" href="/m/avengers_endgame">
            Avengers: Endgame (2019)</a>, <a class="unstyled articleLink" href="/m/1003707-casablanca">
            Casablanca (1942)</a>, <a class="unstyled articleLink" href="/m/knives_out">
            Knives Out (2019)</a>, <a class="unstyled articleLink" href="/m/us_2019">
```



```
Movies List:
['https://www.rottentomatoes.com/m/it_happened_one_night', 'https://www.rottentomatoes.com/m/citizen_kane', 'https://www.ro
1 https://www.rottentomatoes.com/m/the_battle_of_algiers /n Movie:The Battle of Algiers (La Battaglia di Algeri) (1967)
```



```
Movie Information:
Movie info:Paratrooper commander Colonel Mathieu (Jean Martin), a former French Resistance fighter during World War II


Process finished with exit code 0
```

Program: 13

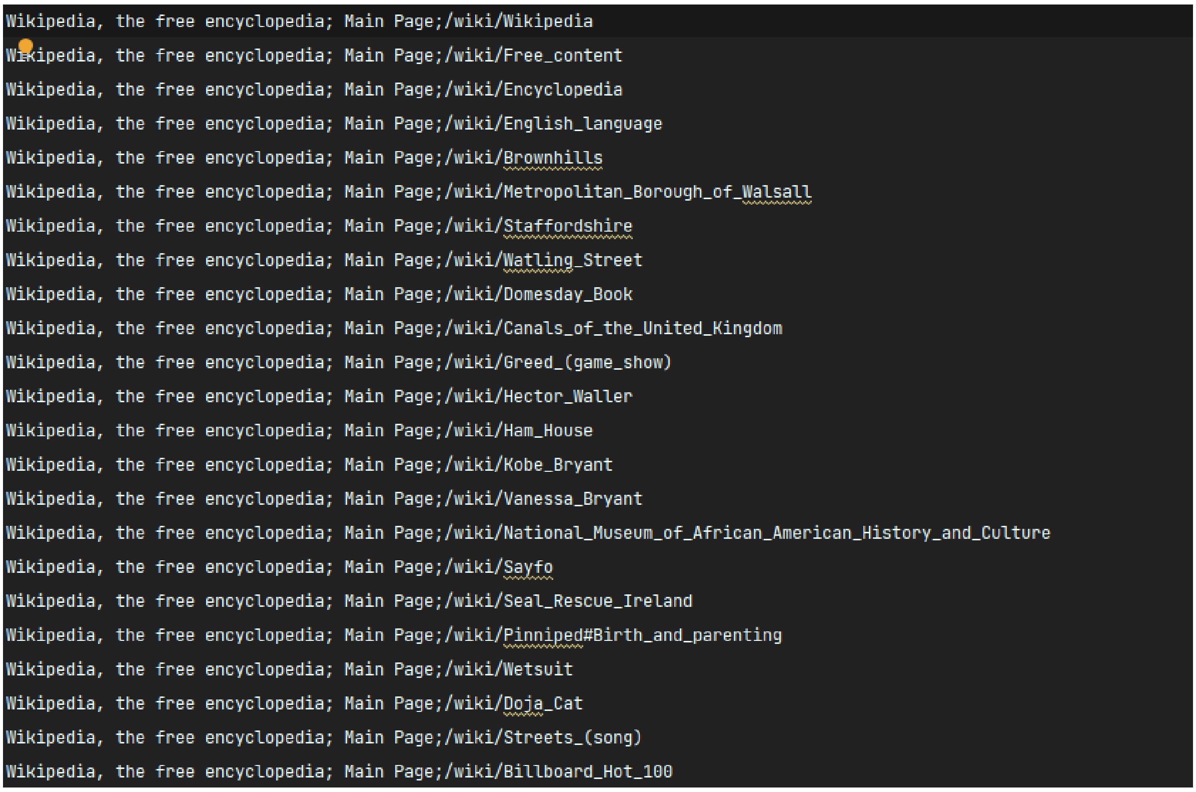
Aim:

Program to implement simple web crawler using python

Program Code:

```
from bs4 import BeautifulSoup
import requests

pages_crawled = []


def crawler(url):
    page = requests.get(url)
    soup = BeautifulSoup(page.text, 'html.parser')
    links = soup.find_all('a')

    for link in links:
        if 'href' in link.attrs:
            if link['href'].startswith('/wiki') and ':' not in link['href']:
                if link['href'] not in pages_crawled:
                    new_link = f"https://en.wikepedia.org{link['href']}"
                    pages_crawled.append(link['href'])
                    try:
                        with open('data.csv', 'a') as file:
                            file.write(f'{soup.title.text}; {soup.h1.text};{link["href"]}\n')
                        crawler(new_link)
                    except:

                        continue


crawler("https://en.wikipedia.org")
```

Output



```
Wikipedia, the free encyclopedia; Main Page;/wiki/Wikipedia
Wikipedia, the free encyclopedia; Main Page;/wiki/Free_content
Wikipedia, the free encyclopedia; Main Page;/wiki/Encyclopedia
Wikipedia, the free encyclopedia; Main Page;/wiki/English_language
Wikipedia, the free encyclopedia; Main Page;/wiki/Brownhills
Wikipedia, the free encyclopedia; Main Page;/wiki/Metropolitan_Borough_of_Walsall
Wikipedia, the free encyclopedia; Main Page;/wiki/Staffordshire
Wikipedia, the free encyclopedia; Main Page;/wiki/Watling_Street
Wikipedia, the free encyclopedia; Main Page;/wiki/Domesday_Book
Wikipedia, the free encyclopedia; Main Page;/wiki/Canals_of_the_United_Kingdom
Wikipedia, the free encyclopedia; Main Page;/wiki/Greed_(game_show)
Wikipedia, the free encyclopedia; Main Page;/wiki/Hector_Waller
Wikipedia, the free encyclopedia; Main Page;/wiki/Ham_House
Wikipedia, the free encyclopedia; Main Page;/wiki/Kobe_Bryant
Wikipedia, the free encyclopedia; Main Page;/wiki/Vanessa_Bryant
Wikipedia, the free encyclopedia; Main Page;/wiki/National_Museum_of_African_American_History_and_Culture
Wikipedia, the free encyclopedia; Main Page;/wiki/Sayfo
Wikipedia, the free encyclopedia; Main Page;/wiki/Seal_Rescue_Ireland
Wikipedia, the free encyclopedia; Main Page;/wiki/Pinniped#Birth_and_parenting
Wikipedia, the free encyclopedia; Main Page;/wiki/Wetsuit
Wikipedia, the free encyclopedia; Main Page;/wiki/Doja_Cat
Wikipedia, the free encyclopedia; Main Page;/wiki/Streets_(song)
Wikipedia, the free encyclopedia; Main Page;/wiki/Billboard_Hot_100
```

Program: 14

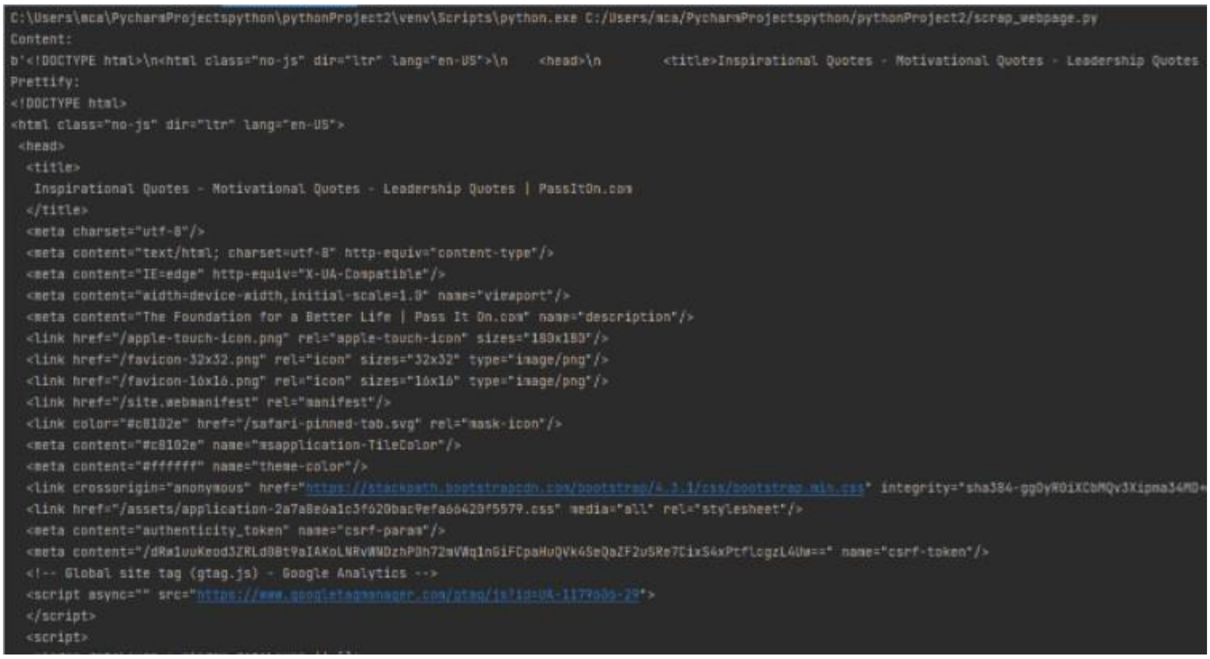
Aim:

Program to implement scrap of any website

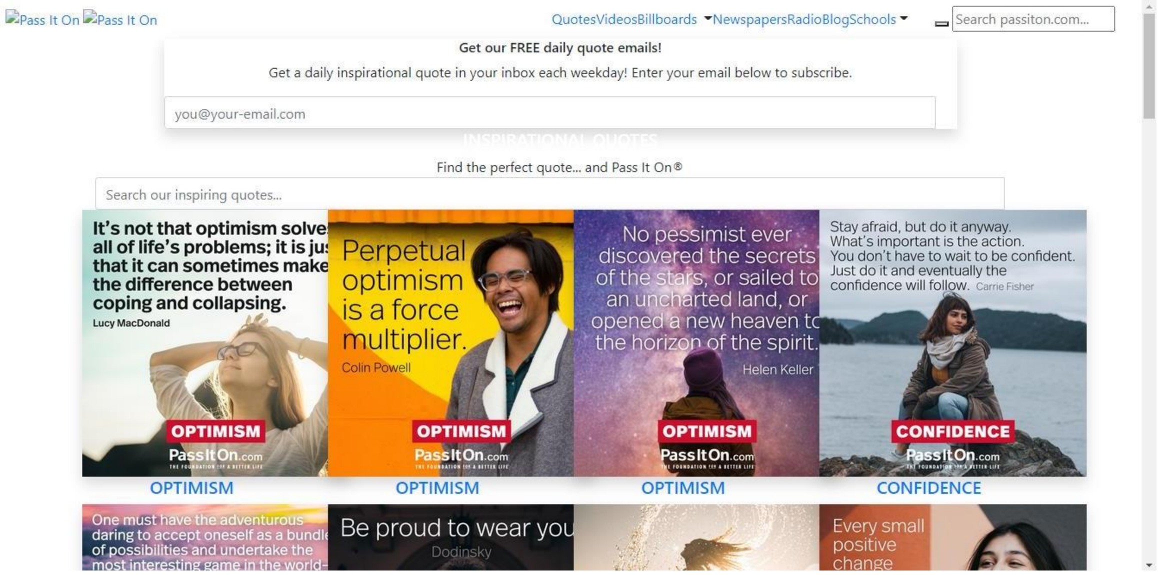
Program Code:

```
import requests
from bs4 import BeautifulSoup
import csv

url = "http://www.values.com/inspirational-quotes"
r = requests.get(url)
print("Content:")
print(r.content)

print("Prettify:")
soup = BeautifulSoup(r.content, 'lxml')
print(soup.prettify())

quotes = []

table = soup.find('div', attrs={'id': 'all_quotes'})

for row in table.find_all('div', attrs={'class': 'col-6 col-lg-3 text-center margin-30px-bottom 
sm-margin-30px-top'}):
    quote = {}
    quote['theme'] = row.h5.text
    quote['url'] = row.a['href']
    quote['img'] = row.img['src']
    quote['lines'] = row.img['alt'].split(" #")[0]
    quote['author'] = row.img['alt'].split(" #")[1]
    quotes.append(quote)

filename = 'inspirational_quotion.csv'
with open(filename, 'w', newline='') as f:
    w = csv.DictWriter(f, ['theme', 'url', 'img', 'lines', 'author'])
    w.writeheader()
    for quote in quotes:
        w.writerow(quote)
```

Output



```
C:\Users\mca\PycharmProjectspython\pythonProject2\venv\Scripts\python.exe C:/Users/mca/PycharmProjectspython/pythonProject2/scrap_webpage.py
Content:
b'<!DOCTYPE html>\n<html class="no-js" dir="ltr" lang="en-US">\n    <head>\n        <title>Inspirational Quotes - Motivational Quotes - Leadership Quotes
Prettify:
<!DOCTYPE html>
<html class="no-js" dir="ltr" lang="en-US">
 <head>
  <title>
   Inspirational Quotes - Motivational Quotes - Leadership Quotes | PassItOn.com
  </title>
  <meta charset="utf-8"/>
  <meta content="text/html; charset=utf-8" http-equiv="content-type"/>
  <meta content="IE=edge" http-equiv="X-UA-Compatible"/>
  <meta content="width=device-width,initial-scale=1.0" name="viewport"/>
  <meta content="The Foundation for a Better Life | Pass It On.com" name="description"/>
  <link href="/apple-touch-icon.png" rel="apple-touch-icon" sizes="180x180"/>
  <link href="/favicon-32x32.png" rel="icon" sizes="32x32" type="image/png"/>
  <link href="/favicon-16x16.png" rel="icon" sizes="16x16" type="image/png"/>
  <link href="/site.webmanifest" rel="manifest"/>
  <link color="#c8102e" href="/safari-pinned-tab.svg" rel="mask-icon"/>
  <meta content="#c8102e" name="msapplication-TileColor"/>
  <meta content="#ffffff" name="theme-color"/>
  <link crossorigin="anonymous" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css" integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+
  <link href="/assets/application-2a7a8e6a1c3f620bac9efa66420f5579.css" media="all" rel="stylesheet"/>
  <meta content="authenticity_token" name="csrf-param"/>
  <meta content="/dRa1uuKeod3ZRLd0Bt9aIAKoLNRvWNDzhP0h72mVWq1nGiFCpaHuQVk4SeQaZF2uSRe7CixS4xPtfLogzL4Uw==" name="csrf-token"/>
  <!-- Global site tag (gtag.js) - Google Analytics -->
  <script async="" src="https://www.googletagmanager.com/gtag/js?id=UA-1179006-29">
  </script>
  <script>
```



Pass It On Pass It On QuotesVideosBillboards NewspapersRadioBlogSchools Search passiton.com...

Get our FREE daily quote emails!

Get a daily inspirational quote in your inbox each weekday! Enter your email below to subscribe.

you@your-email.com

INSPIRATIONAL QUOTES

Find the perfect quote... and Pass It On®

Search our inspiring quotes...

It's not that optimism solve all of life's problems; it is jus that it can sometimes make the difference between coping and collapsing.
Lucy MacDonald
OPTIMISM
PassItOn.com
Perpetual optimism is a force multiplier.
Colin Powell
OPTIMISM
PassItOn.com
No pessimist ever discovered the secrets of the stars, or sailed to an uncharted land, or opened a new heaven to the horizon of the spirit.
Helen Keller
OPTIMISM
PassItOn.com
Stay afraid, but do it anyway. What's important is the action. You don't have to wait to be confident. Just do it and eventually the confidence will follow.
Carrie Fisher
CONFIDENCE
PassItOn.com
OPTIMISM
OPTIMISM
OPTIMISM
CONFIDENCE
One must have the adventurous daring to accept oneself as a bundle of possibilities and undertake the most interesting game in the world-
Be proud to wear you
Dodinsky
Every small positive change

Program: 15

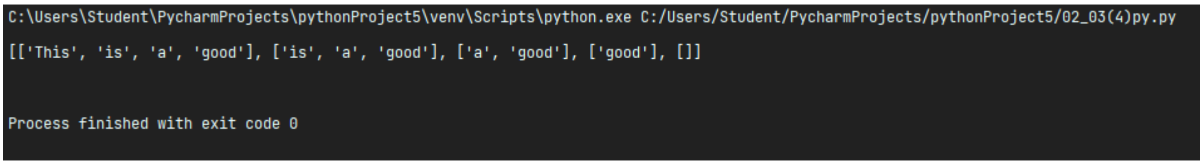
Aim:

Program for Natural Language Processing which performs n-grams.

Program Code:

```
def generate_ngrams(text, WordsToCombine):
    words = text.split()
    output = []
    for i in range(len(words) - WordsToCombine + 1):
        output.append(words[i:1 + WordsToCombine])
    return output


x = generate_ngrams(text="This is a good book to study", WordsToCombine=3)
print(x)
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject5\venv\Scripts\python.exe C:/Users/Student/PycharmProjects/pythonProject5/02_03(4)py.py
[['This', 'is', 'a', 'good'], ['is', 'a', 'good'], ['a', 'good'], ['good'], []]


Process finished with exit code 0
```

Program: 16

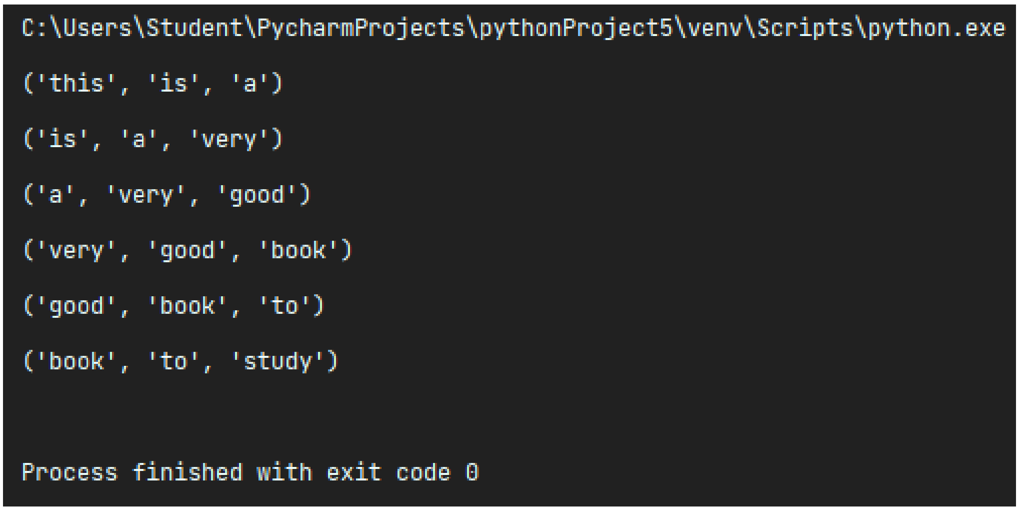
Aim:

Program for Natural Language Processing which performs n-grams (Using inbuilt functions)

Program Code:

```
import nltk
from nltk.util import ngrams

text = "this is a very good book to study"
Ngrams = ngrams(sequence=nltk.wordpunct_tokenize(text), n=3)
for grams in Ngrams:
    print(grams)
```

Output



```
C:\Users\Student\PycharmProjects\pythonProject5\venv\Scripts\python.exe
('this', 'is', 'a')
('is', 'a', 'very')
('a', 'very', 'good')
('very', 'good', 'book')
('good', 'book', 'to')
('book', 'to', 'study')


Process finished with exit code 0
```

Program: 17

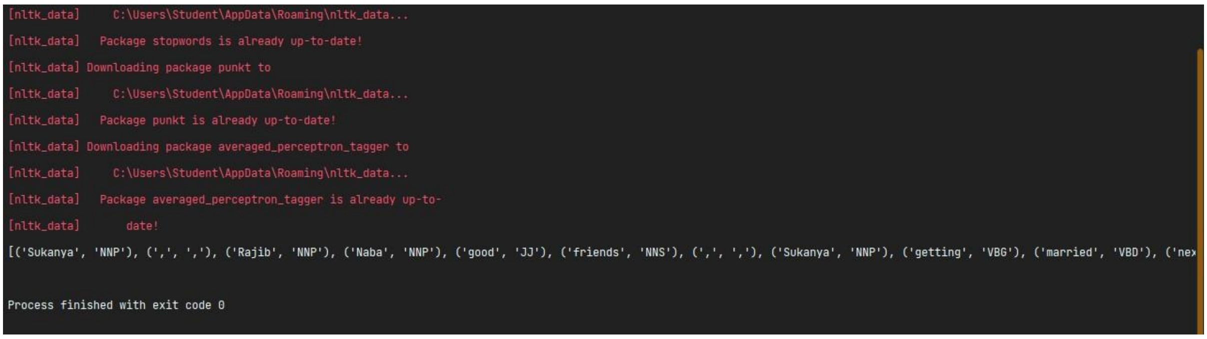
Aim:

Program for Natural Language Processing which performs speech tagging.

Program Code:

```
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize, sent_tokenize
nltk.download('stopwords')
nltk.download('punkt')
nltk.download('averaged_perceptron_tagger')

stop_words = set(stopwords.words('english'))
txt = "Sukanya, Rajib and Naba are my good friends,"\
        "Sukanya is getting married next year."\
        "Marriage is a big step in one's life."\
        "It is both exiting and frightening." \
        "But friendship is a sacred bond between people."\
        "It is a special kind of love between us"\
        "Many of you must have tried searching for a friend"\
        "but never found the right one."

tokenized = sent_tokenize(txt)
for i in tokenized:

    wordslist = nltk.word_tokenize(i)


    wordslist = [w for w in wordslist if not w in stop_words]

tagged = nltk.pos_tag(wordslist)

print(tagged)
```

Output



```
[nltk_data]     C:\Users\Student\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\Student\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     C:\Users\Student\AppData\Roaming\nltk_data...
[nltk_data]   Package averaged_perceptron_tagger is already up-to-
[nltk_data]       date!
[('Sukanya', 'NNP'), (',', ','), ('Rajib', 'NNP'), ('Naba', 'NNP'), ('good', 'JJ'), ('friends', 'NNS'), (',', ','), ('Sukanya', 'NNP'), ('getting', 'VBG'), ('married', 'VBD'), ('nex


Process finished with exit code 0
```