20MCA241 DATA SCIENCE LAB

Lab Report Submitted By

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Reg. No.: AJC20MCA-2042

In Partial fulfillment for the Award of the Degree Of

MASTER OF COMPUTER APPLICATIONS (2 Year)
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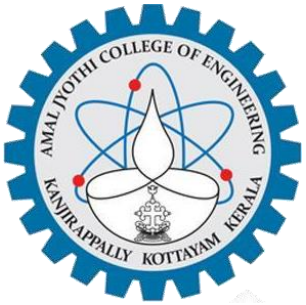
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY



AMAL JYOTHI COLLEGE OF ENGINEERING

KANJIRAPPALLY

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

2020-2022

DEPARTMENT OF COMPUTER APPLICATIONS

AMAL JYOTHI COLLEGE OF ENGINEERING

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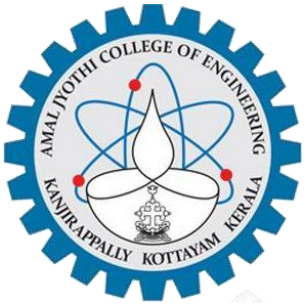

CERTIFICATE

This is to certify that the Lab report, "**20MCA241 DATA SCIENCE LAB"** is the bonafide work of **JEENA MATHEW (Reg.No:AJC20MCA-2042)** in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications under APJ Abdul Kalam Technological University during the year 2021-22.

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CONTENT

11	**Program to implement K-Means Clustering technique using any standard dataset available in the public domain.**	**05/01/2022**	**28**	
12	**Program to implement K-Means Clustering technique using any standard dataset available in the public domain.**	**05/01/2022**	**33**	
13	**Programs on Convolutional Neural Network(CNN) to classify images from any standard dataset in the public domain.**	**02/02/2022**	**37**	
14	**Program to implement a simple Web Crawler using python.**	**16/02/2022**	**41**	
15	**Program to implement a simple Web Crawler using python.**	**16/02/2022**	**49**	
16	**Program to implement scraping of any webpage of any popular website.**	**16/02/2022**	**51**	
17	**Program for Natural Language Processing which performs n-grams.**	**16/02/2022**	**54**	
18	**Program for Natural Language Processing which performs n-grams(Using built-in functions).**	**16/02/2022**	**55**	
19	**Program for Natural Language Processing which performs speech tagging.**	**16/02/2022**	**56**	
20	**Write a python program for natural program language processing with chunking.**	**23/02/2022**	**58**	
21	**Write a python program for natural program language processing with chunking.**	**23/02/2022**	**59**	

PROGRAM NO: 1 DATE:24/11/2021

AIM: PERFORM ALL MATRIX OPERATIONS USING PYTHON [USING NUMPY]

PROGRAM

```
import numpy as np
x = np.array([[4, 3], [12, 6]])
y = np.array([[14, 5], [8, 10]])
print ("Addition of two matrices: ")
print (np.add(x,y))
print ("Subtraction of two matrices : ")
print (np.subtract(x,y))
print ("Matrix Division : ")
print (np.divide(x,y))
print ("Multiplication of two matrices: ")
print (np.multiply(x,y))
print ("The product of two matrices : ")
print (np.dot(x,y))
print ("square root is : ")
print (np.sqrt(x))
print ("The summation of elements : ")
print (np.sum(y))
print ("The column wise summation  : ")
print (np.sum(y,axis=0))

print ("The row wise summation: ")
print (np.sum(y,axis=1))
print ("Matrix transposition : ")
print (x.T)
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe
Addition of two matrices:
[[18  8]
 [20 16]]
Subtraction of two matrices :
[[-10  -2]
 [  4  -4]]
Matrix Division :
[[0.28571429 0.6       ]
 [1.5        0.6       ]]
Multiplication of two matrices:
[[56 15]
 [96 60]]
The product of two matrices :
[[ 80  50]
 [216 120]]
square root is :
[[2.         1.73205081]
 [3.46410162 2.44948974]]
The summation of elements :
37
The column wise summation  :
[22 15]
```

```
The column wise summation  :
[22 15]
The row wise summation:
[19 18]
Matrix transposition :
[[ 4 12]
 [ 3  6]]

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 2 DATE: 01/12/2021

AIM: PERFORM SVD (SINGULAR VALUE DECOMPOSITION)

PROGRAM

```
from numpy import array

from scipy.linalg import svd

A= array([[6,5,2,4,5], [8,1,3,7,8], [4,2,7,10,9], [4,8,7,3,2], [9,10,7,1,5]])

print(A)

X, Y, Z =svd(A)

print("\nDecomposition: ", X)

print("\nInverse Matrix: ",Y)

print("\nTranspose of Matrix: ",Z)
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:/Users/ajcemca/P
[[ 6  5  2  4  5]
 [ 8  1  3  7  8]
 [ 4  2  7 10  9]
 [ 4  8  7  3  2]
 [ 9 10  7  1  5]]

Decomposition:  [[-0.35795072 -0.02542133 -0.35295795 -0.81761681 -0.27955048]
 [-0.44565919  0.43286247 -0.5080382   0.21004848  0.55838589]
 [-0.51111683  0.54319395  0.53762478  0.10442387 -0.37915059]
 [-0.37713702 -0.41338921  0.52445691 -0.25045479  0.59084209]
 [-0.51940969 -0.58824615 -0.23069986  0.46233152 -0.34235535]]

Inverse Matrix:  [27.79740326 11.37180805  5.80585429  1.97387889  1.17567493]

Transpose of Matrix:  [[-0.50151017 -0.41258672 -0.42833223 -0.40699508 -0.47869223]
 [-0.12879435 -0.68568089 -0.17247434  0.57439219  0.39189278]
 [-0.69068651  0.11903128  0.61827978  0.30156104 -0.18861269]
 [ 0.17809954 -0.53169979  0.61250768 -0.52937497  0.17370194]
 [ 0.47236877 -0.25048114  0.1713142   0.36503657 -0.74264842]]

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 3 DATE: 01/12/2021

AIM: PROGRAM TO IMPLEMENT K-NN CLASSIFICATION USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND FIND THE ACCURACY OF THE ALGORITHM (USING IN BUILT FUNCTION)

PROGRAM

```
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()


A = irisData.data

B = irisData.target

A_train, A_test, B_train, B_test = train_test_split(

    A, B, test_size=.3, random_state=10)

knn = KNeighborsClassifier(n_neighbors=2)


knn.fit(A_train, B_train)


print(knn.predict(A_test))


#Finding Accuracy of the Algorithm


W = knn.predict(A_test)

Q = accuracy_score(B_test, W)

print("Accuracy : " , Q)
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:/Users/ajc
[1 1 0 1 0 1 0 0 2 0 0 2 1 2 1 2 1 0 2 2 0 1 0 0 0 0 1 2 0 2 1 2 0 0 0 1 0
 1 1 2 0 2 2 2 1 2 0 2 1 2 0 0 2 0 2 2 2 0 0 1 2 1 0 2 2 2 0 2 1 1 2 1 0 0
 2 1 0 2 0 0 1 0 2 0 2 1 2 0 2 0 2 0 0 2 2 1 0 1 0 2 2 2 0 0 0 2 2 1 1 1 2
 1 1 1 2 1 1 2 1 2 1 0 1 0 1 0 2 2 1 0 1 1 1 1 2 0 0 1 0 1 2 0 2 1 1 2 2 1
 1]

Process finished with exit code 0
```

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:
[1]
Accuracy: 1.0

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 4 DATE: 01/12/2021

AIM: PROGRAM TO IMPLEMENT K-NN CLASSIFICATION USING ANY RANDOM DATASET WITHOUT USING IN BUILT PACKAGES

PROGRAM

```
from math import sqrt

#calculate the euclidean distance between two vectors

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 most similar 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

#make a classification prediction with 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], 3)
print('Expected %d, Got %d.' % (dataset[0][-1], prediction))
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\ven
Expected 0, Got 0.

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 5 DATE: 08/12/2021

AIM: PROGRAM TO IMPLEMENT NAIVE BAYES ALGORITHM USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND FIND THE ACCURACY OF THE ALGORITHM.

PROGRAM

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


# importing dataset
dataset = pd.read_csv("nba.csv")
a = dataset.iloc[:, [2, 3]].values
b = dataset.iloc[:, -1].values


# splitting into test and train dataset
from sklearn.model_selection import train_test_split
a_train, a_test, b_train, b_test = train_test_split(a, b, test_size=0.20, random_state=0)


# Feature scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
a_train = sc.fit_transform(a_train)
a_test = sc.transform(a_test)
print(a_train)
print(a_test)
# training the naive bayes model on the training set
from sklearn.naive_bayes import GaussianNB
```

```
classifier = GaussianNB()

classifier.fit(a_train, b_train)

# predicting the test set results

b_pred = classifier.predict(a_test)

print(b_pred)

# making confusion matrix

from sklearn.metrics import confusion_matrix, accuracy_score

ac = accuracy_score(b_test, b_pred)

co = confusion_matrix(b_test, b_pred)

print(ac)

print(co)
```

OUTPUT

```
 [ 2.11737157e+00  3.78719297e-01]
 [-1.38221530e+00  5.52551726e-01]
 [-1.09058306e+00 -3.45582490e-01]
 [ 1.73156642e-01 -6.64275277e-01]
 [ 3.67578135e-01  2.08236764e-03]
 [-6.04529329e-01  2.31984809e+00]
 [-3.12897090e-01  2.04886868e-01]
 [-1.57663679e+00 -2.00722133e-01]
 [ 6.59210374e-01 -1.38857706e+00]
 [-1.09058306e+00  5.52551726e-01]
 [-1.96547978e+00  3.49747226e-01]
 [ 3.67578135e-01  2.62831011e-01]
 [ 1.73156642e-01 -2.87638347e-01]
 [ 1.43689635e+00 -1.04091221e+00]
 [ 8.53631867e-01  1.07404901e+00]]
[0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 1 0 0 1 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0
 0 0 1 0 0 0 0 1 0 0 1 0 1 1 0 0 1 1 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0
 0 0 0 0 1 1]
0.9125
[[55  3]
 [ 4 18]]

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 6 DATE: 08/12/2021

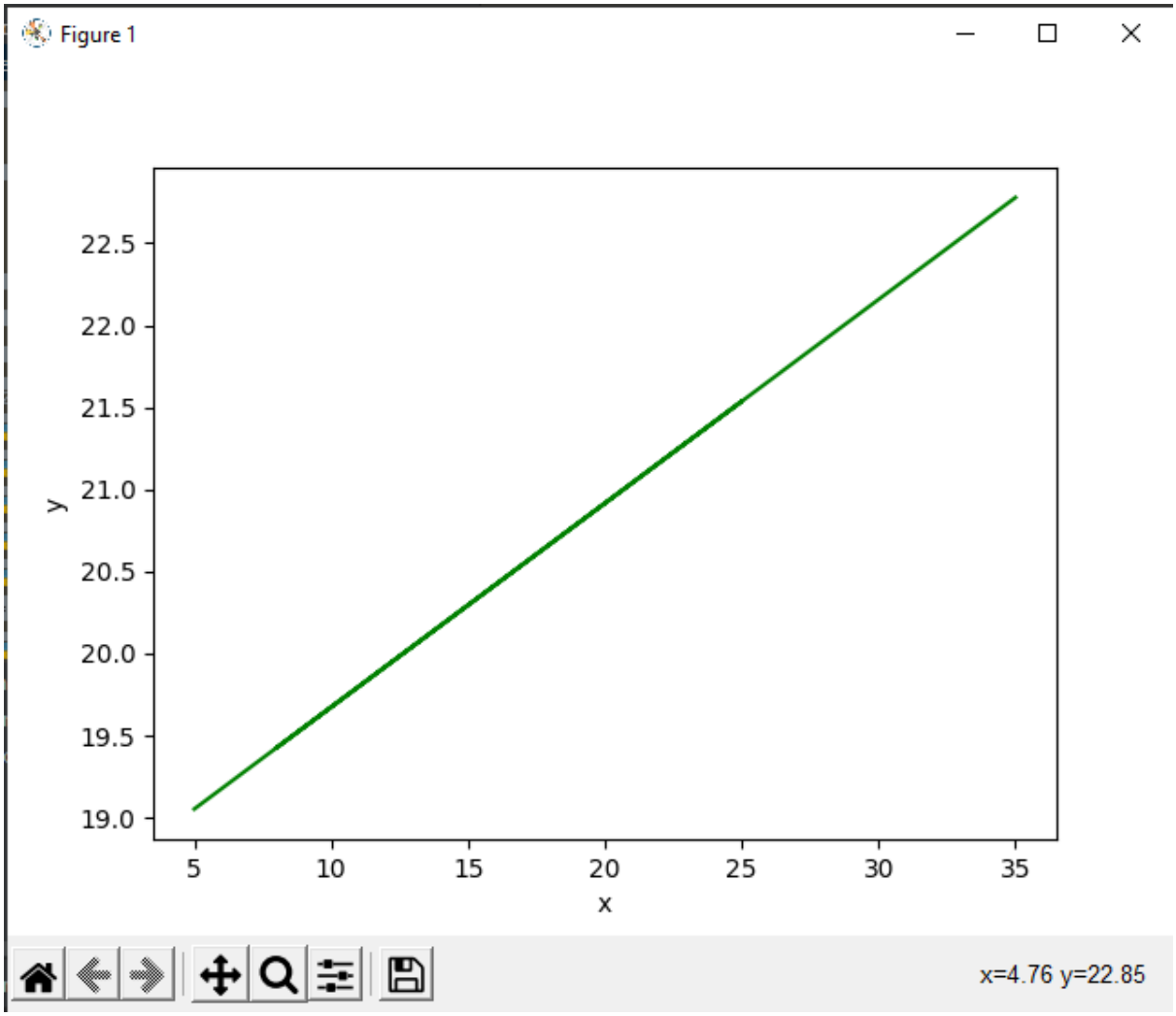
AIM: PROGRAM TO IMPLEMENT LINEAR REGRESSION TECHNIQUES USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND EVALUATE.

PROGRAM

```
import matplotlib.pyplot as plt

import numpy as np

import matplotlib.pyplot as plt

from sklearn.linear_model import LinearRegression

print("\nLinear Regression \n" )

x=np.array([5,15,20,25,8,35]).reshape((-1,1))

y=np.array([5,20,30,14,33,22])

print(x)

print(y)

model=LinearRegression()

model.fit(x,y)

r_sq=model.score(x,y)

print('Coefficient of determination : ', r_sq)

print('Intercept : ' , model.intercept_)

print('slope : ', model.coef_)

y_pred=model.predict(x)


print('predicted response : ', y_pred, sep='\n' )

plt.scatter(x,y, color="m",marker="0", sep=30)

plt.plot(x, y_pred, color="g" )

plt.xlabel('x')

plt.ylabel('y')

plt.show()
```

OUTPUT

```
Linear Regression

[[ 5]
 [15]
 [20]
 [25]
 [ 8]
 [35]]
[ 5 20 30 14 33 22]
Coefficient of determination :  0.017997935807665955
Intercept :  18.431182795698927
slope :  [0.12419355]

Process finished with exit code 0
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 7 DATE: 08/12/2021

AIM: PROGRAM TO IMPLEMENT LINEAR REGRESSION TECHNIQUES USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND EVALUATE (WITHOUT USING IN BUILT FUNCTION).

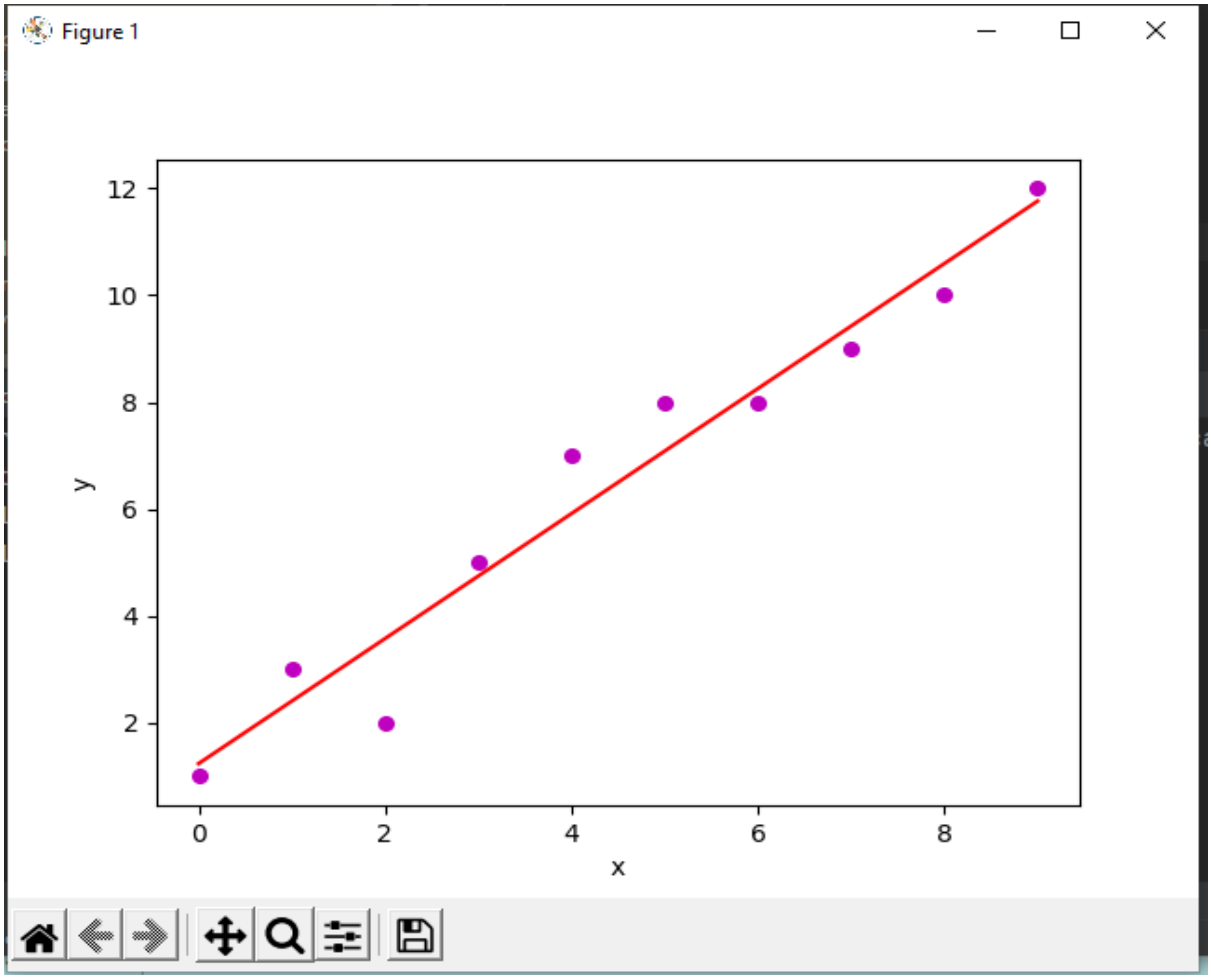
PROGRAM

```
import numpy as np
import matplotlib.pyplot as plt
def estimate_coef(x, y):
 n =np.size(x)
m_x = np.mean(x)
    m_y = np.mean(y)
    SS_xy = np.sum(y * x) - n * m_y * m_x
    SS_xx = np.sum(x * x) - n * m_x * m_x
    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="r")
    # putting labels
    plt.xlabel('x')
    plt.ylabel('y')
```

```
    # function to show plot
    plt.show()
def main():
    # observations
    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 are:\nb_0 = {}  \
        \nb_1 = {}".format(b[0], b[1]))


    # plotting regression line
    plot_regression_line(x, y, b)
if __name__ == "__main__":
    main()
```

OUTPUT

```
Estimated coefficients are:
b_0 = 1.2363636363636363
b_1 = 1.1696969696969697
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

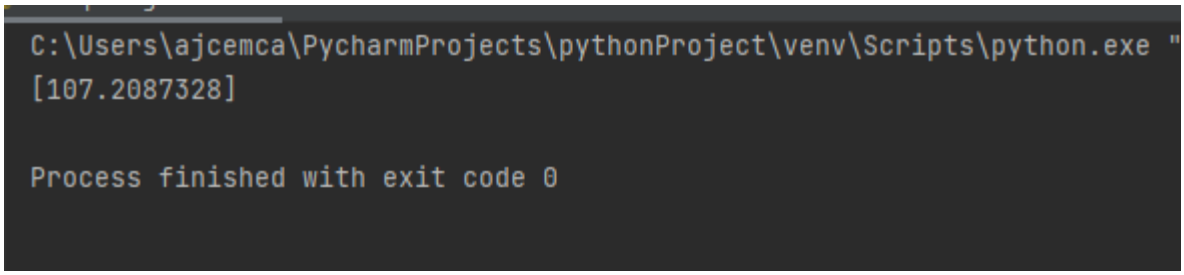
PROGRAM NO: 8 DATE: 15/12/2021

AIM: PROGRAM TO IMPLEMENT MULTIPLE LINEAR REGRESSION TECHNIQUES USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND EVALUATE.

PROGRAM

```
import pandas as pd

df = pd.read_csv("cars.csv")

X = df[['Weight', 'Volume']]

y = df['CO2']

from sklearn import linear_model

regr = linear_model.LinearRegression()

regr.fit(X, y)

predictedCO2 = regr.predict([[2300, 1300]])

print(predictedCO2)
```

OUTPUT



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 9 DATE: 15/12/2021

AIM: PROGRAM TO IMPLEMENT MULTIPLE LINEAR REGRESSION TECHNIQUES USING BOSTON DATASET AVAILABLE IN THE PUBLIC DOMAIN AND EVALUATE ACCURACY AND PLOTTING POINT.

PROGRAM

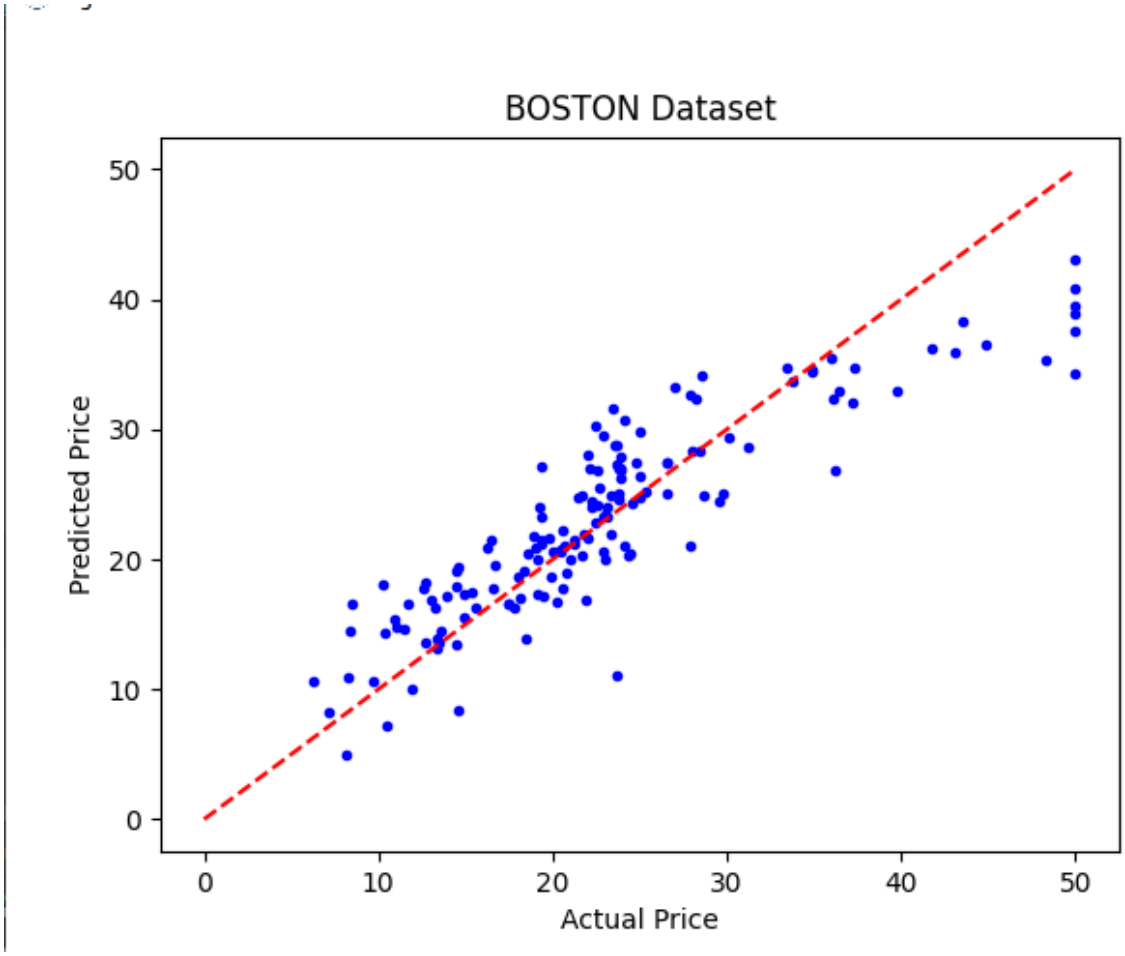
#Accuracy and plotting

```
import matplotlib.pyplot as plt

import numpy as np

from sklearn import datasets, linear_model, metrics

from sklearn.metrics import  mean_squared_error, r2_score


#load the boston dataset

boston = datasets.load_boston(return_X_y=False)


#defining feature matrix(x) and response vector(y)

x = boston.data

y = boston.target


#splitting x and y into training and testing sets

from sklearn.model_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(x,y, test_size=0.3,

                                   random_state=1)


reg = linear_model.LinearRegression()

reg.fit(x_train, y_train)

predicted = reg.predict(x_test)
```

```
#regression coefficient

print('coefficient: ', reg.coef_)


expected = y_test

# Plot a graph for expected and predicted values

plt.title( 'BOSTON Dataset')

plt.scatter(expected,predicted,c='b',marker='.',s=36)

plt.plot([0, 50], [0, 50], '--r')

plt.xlabel('Actual Price')

plt.ylabel('Predicted Price')

plt.show()
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe "C:/Users/a
coefficient:  [-9.85424717e-02  6.07841138e-02  5.91715401e-02  2.43955988e+00
 -2.14699650e+01  2.79581385e+00  3.57459778e-03 -1.51627218e+00
  3.07541745e-01 -1.12800166e-02 -1.00546640e+00  6.45018446e-03
 -5.68834539e-01]
variance score :0.7836295385076291

Process finished with exit code 0
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 10 DATE:22/12/2021

AIM: PROGRAM TO IMPLEMENT DECISION TREES USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN AND FIND THE ACCURACY OF THE ALGORITHM.

PROGRAM

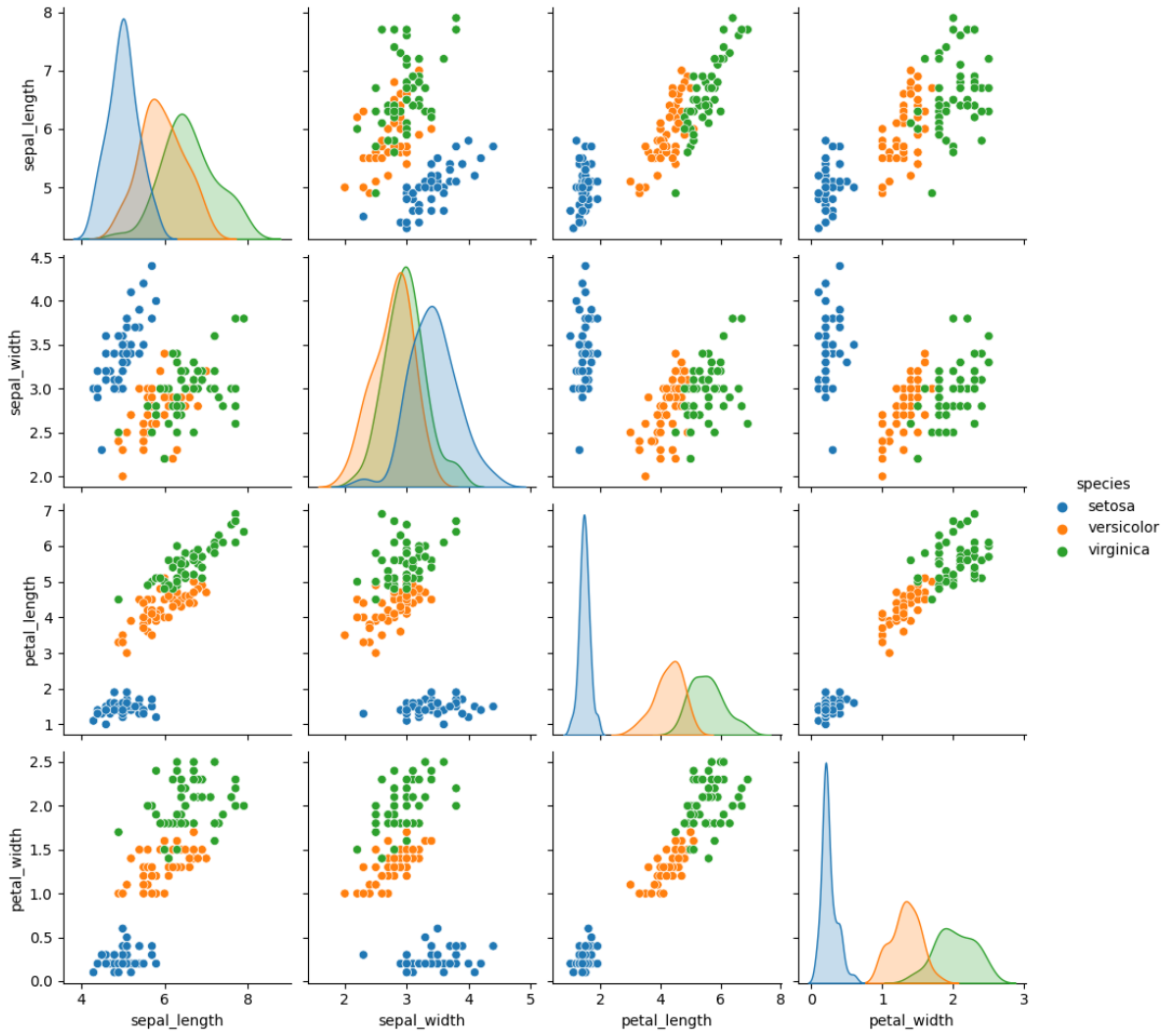
```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

from sklearn.preprocessing import LabelEncoder

from sklearn.model_selection import  train_test_split

from sklearn.tree import DecisionTreeClassifier

from sklearn.metrics import classification_report, confusion_matrix

from sklearn.tree import plot_tree

df = sns.load_dataset('iris')

print(df.head())

print(df.info())

df.isnull().any()

print(df.shape)


sns.pairplot(data=df, hue='species')

plt.savefig("pne.png")


sns.heatmap(df.corr())

plt.savefig("one.png")

target = df['species']

df1 = df.copy()

df1 = df1.drop('species', axis=1)
```

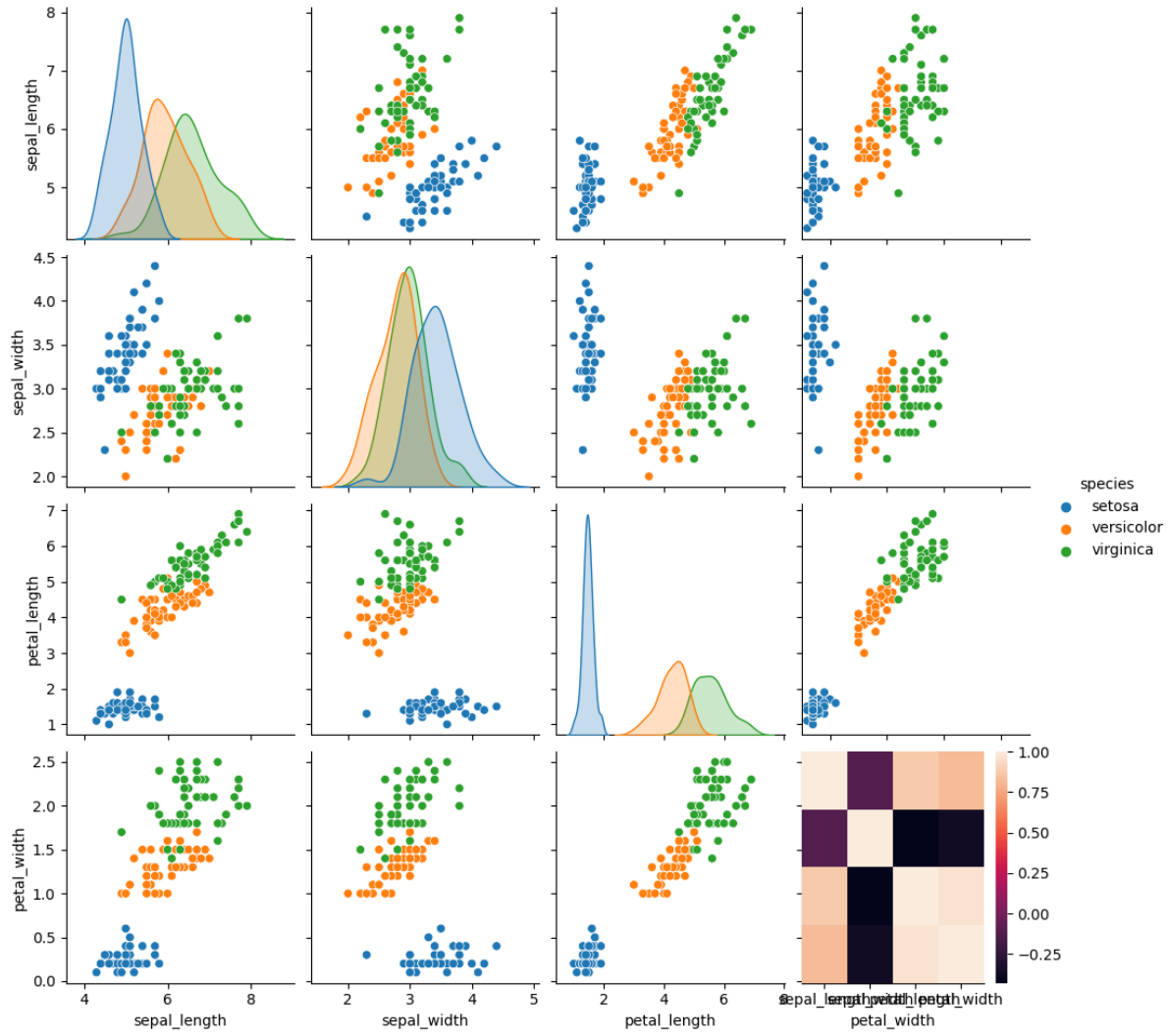
```
print(df1.shape)
print(df1.head())

x = df1
print(target)

le = LabelEncoder()
target = le.fit_transform(target)
print(target)
y = target
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=42)

print("Training split input- ", x_train.shape)
print("Testing split input- ", x_test.shape)

dtree = DecisionTreeClassifier()
dtree.fit(x_train,y_train)

print('Decision Tree Classifier Created')

y_pred = dtree.predict(x_test)
print("classification report- \n", classification_report(y_test,y_pred))

cm = confusion_matrix(y_test,y_pred)
plt.figure(figsize=(5,5))

sns.heatmap(data=cm, linewidths=.5, annot=True, square=True, cmap='Blues')
```

```
plt.ylabel('Actual label')

plt.xlabel('Predicted label')

all_sample_title = 'Accuracy Score:{0}'.format(dtree.score(x_test, y_test))

plt.title(all_sample_title, size = 15)

plt.savefig("two.png")

plt.figure(figsize=(20,20))

dec_tree = plot_tree(decision_tree=dtree, feature_names=df1.columns,

                     class_names=["setosa", "vercicolor", "verginica"] , filled=True, precision=4, rounded=True )

plt.savefig("three.png")
```

OUTPUT

```
C:\Users\hp\PycharmProjects\pythonProject\venv\Scripts\python.exe
   sepal_length  sepal_width  petal_length  petal_width species
0           5.1          3.5           1.4          0.2  setosa
1           4.9          3.0           1.4          0.2  setosa
2           4.7          3.2           1.3          0.2  setosa
3           4.6          3.1           1.5          0.2  setosa
4           5.0          3.6           1.4          0.2  setosa
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   sepal_length  150 non-null    float64
 1   sepal_width   150 non-null    float64
 2   petal_length  150 non-null    float64
 3   petal_width   150 non-null    float64
 4   species       150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
None
(150, 5)

Process finished with exit code 0
```


sepal_length
sepal_width
petal_length
petal_width
species
setosa
versicolor
virginica

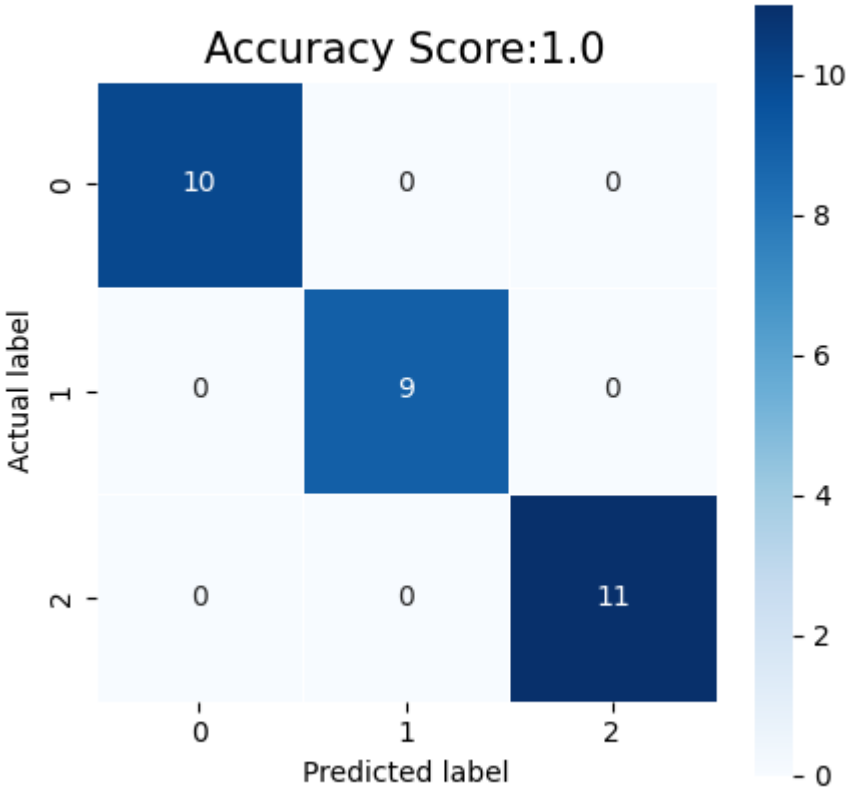


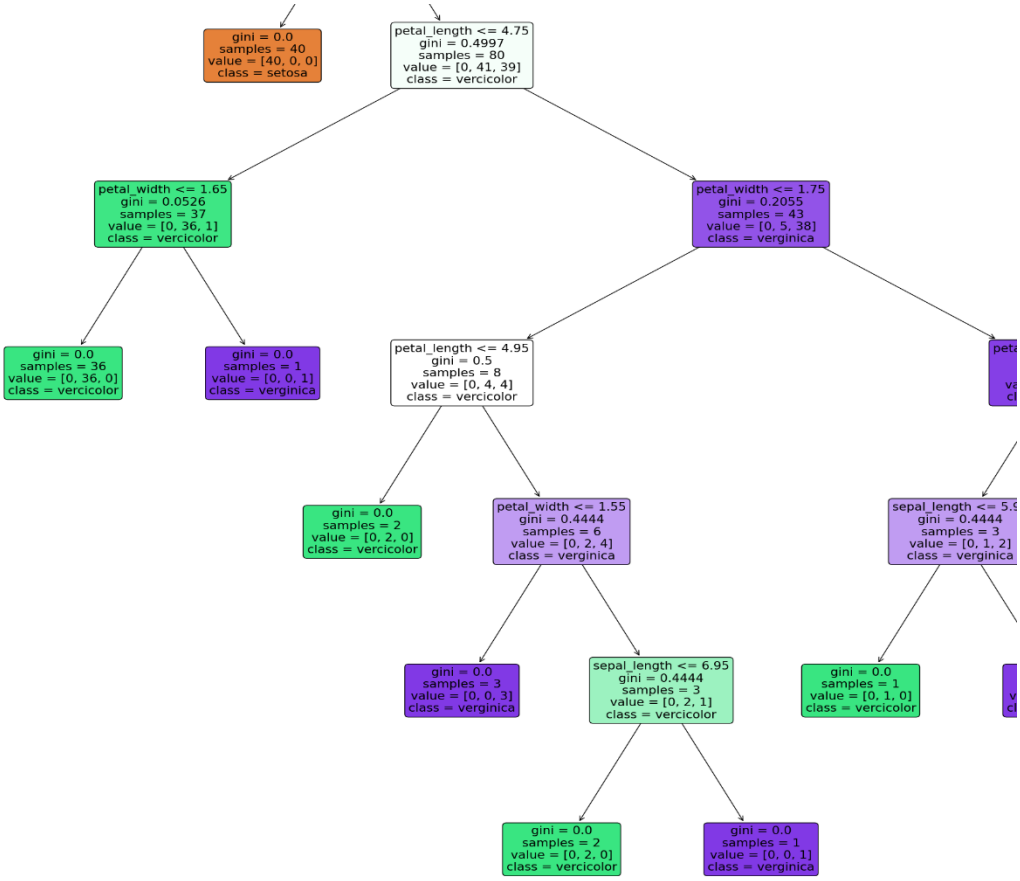

```
(150, 4)
   sepal_length  sepal_width  petal_length  petal_width
0           5.1          3.5           1.4          0.2
1           4.9          3.0           1.4          0.2
2           4.7          3.2           1.3          0.2
3           4.6          3.1           1.5          0.2
4           5.0          3.6           1.4          0.2
```

```
0         setosa
1         setosa
2         setosa
3         setosa
4         setosa
         ...
145    virginica
146    virginica
147    virginica
148    virginica
149    virginica
Name: species, Length: 150, dtype: object
```

```
[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 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 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 2 2 2 2 2 2 2 2 2 2 2
 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
 2 2]
```

```
Training split input-  (120, 4)
Testing split input-  (30, 4)
```


Accuracy Score:1.0
Actual label
Predicted label
0
1
2
10
0
0
0
9
0
0
0
11
10
8
6
4
2
0



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 11 DATE:05/01/2022

AIM: PROGRAM TO IMPLEMENT K-MEANS CLUSTERING TECHNIQUE USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN.

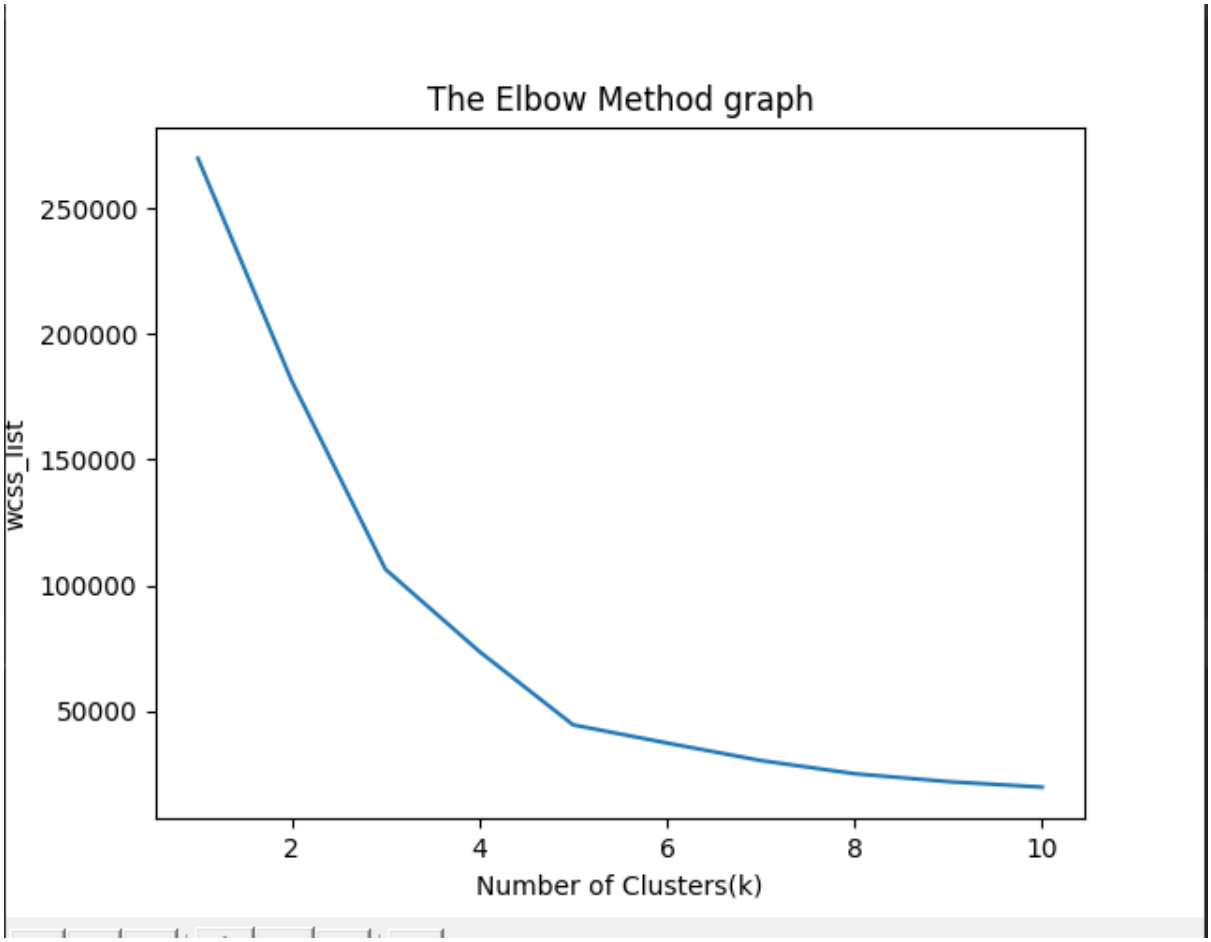
PROGRAM

```
import numpy as nm
import matplotlib.pyplot as mtp
import pandas as pd

dataset = pd.read_csv('Mall_Customers.csv')
X = dataset.iloc[:, [3,4]].values
print(X)

from sklearn.cluster import KMeans

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(k)')
mtp.ylabel('wcss_list')
mtp.show()

kmeans = KMeans(n_clusters=5, init="k-means++", random_state=42)
```

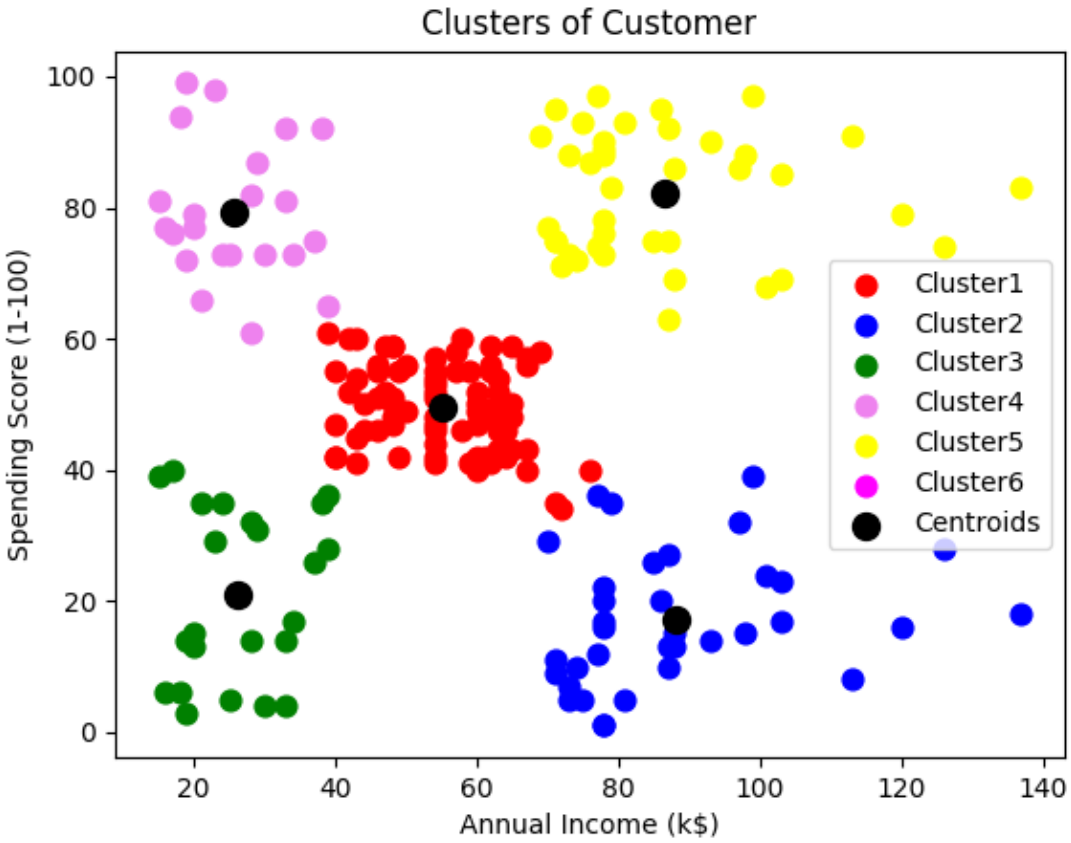
```
y_predict = kmeans.fit_predict(X)

print(y_predict)


mtp.scatter(X[y_predict == 0, 0], X[y_predict == 0, 1], s=60, c='red', label='Cluster1')

mtp.scatter(X[y_predict == 1, 0], X[y_predict == 1, 1], s=60, c='blue', label='Cluster2')

mtp.scatter(X[y_predict == 2, 0], X[y_predict == 2, 1], s=60, c='green', label='Cluster3')

mtp.scatter(X[y_predict == 3, 0], X[y_predict == 3, 1], s=60, c='violet', label='Cluster4')

mtp.scatter(X[y_predict == 4, 0], X[y_predict == 4, 1], s=60, c='yellow', label='Cluster5')

mtp.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=100, c='black', label='Centroids')

mtp.xlabel('Annual Income (k$)')

mtp.ylabel('Spending Score (1-100)')

mtp.legend()


mtp.show()
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe "C:/
[[ 15  39]
 [ 15  81]
 [ 16   6]
 [ 16  77]
 [ 17  40]
 [ 17  76]
 [ 18   6]
 [ 18  94]
 [ 19   3]
 [ 19  72]
 [ 19  14]
 [ 19  99]
 [ 20  15]
 [ 20  77]
 [ 20  13]
 [ 20  79]
 [ 21  35]
 [ 21  66]
 [ 23  29]
 [ 23  98]
 [ 24  35]
 [ 24  73]
 [ 93  14]
 [ 93  90]
 [ 97  32]
 [ 97  86]
 [ 98  15]
 [ 98  88]
 [ 99  39]
 [ 99  97]
 [101  24]
 [101  68]
 [103  17]
 [103  85]
 [103  23]
 [103  69]
 [113   8]
 [113  91]
 [120  16]
 [120  79]
 [126  28]
 [126  74]
 [137  18]
 [137  83]]
```




```
[2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2
 3 2 3 2 3 2 0 2 3 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 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 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 4 1 4 0 4 1 4 1 4 0 4 1 4 1 4 1 4 1 4 0 4 1 4 1 4
 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1
 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4]

Process finished with exit code 0
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 12 DATE:5/01/2022

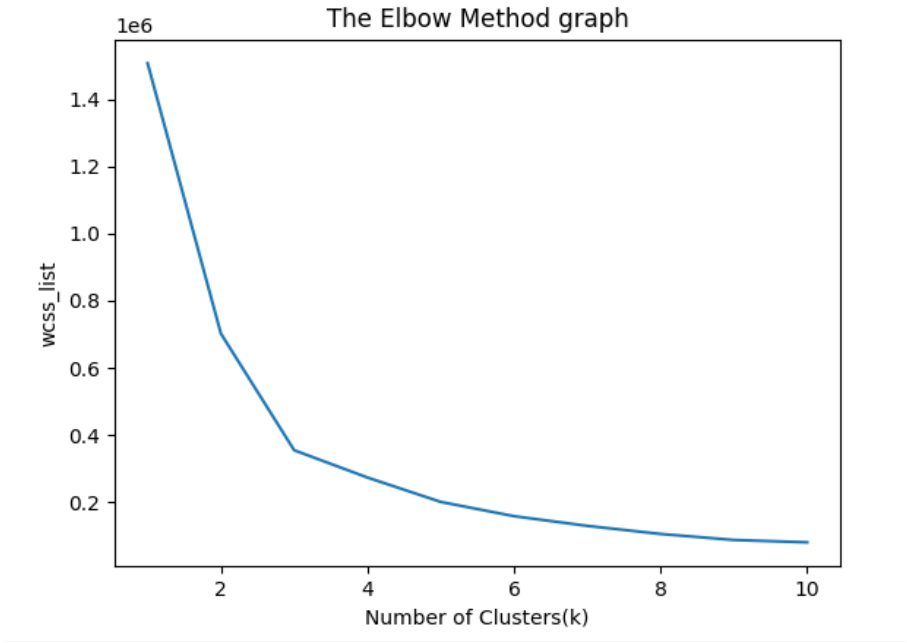
AIM: PROGRAM TO IMPLEMENT K-MEANS CLUSTERING TECHNIQUE USING ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN.

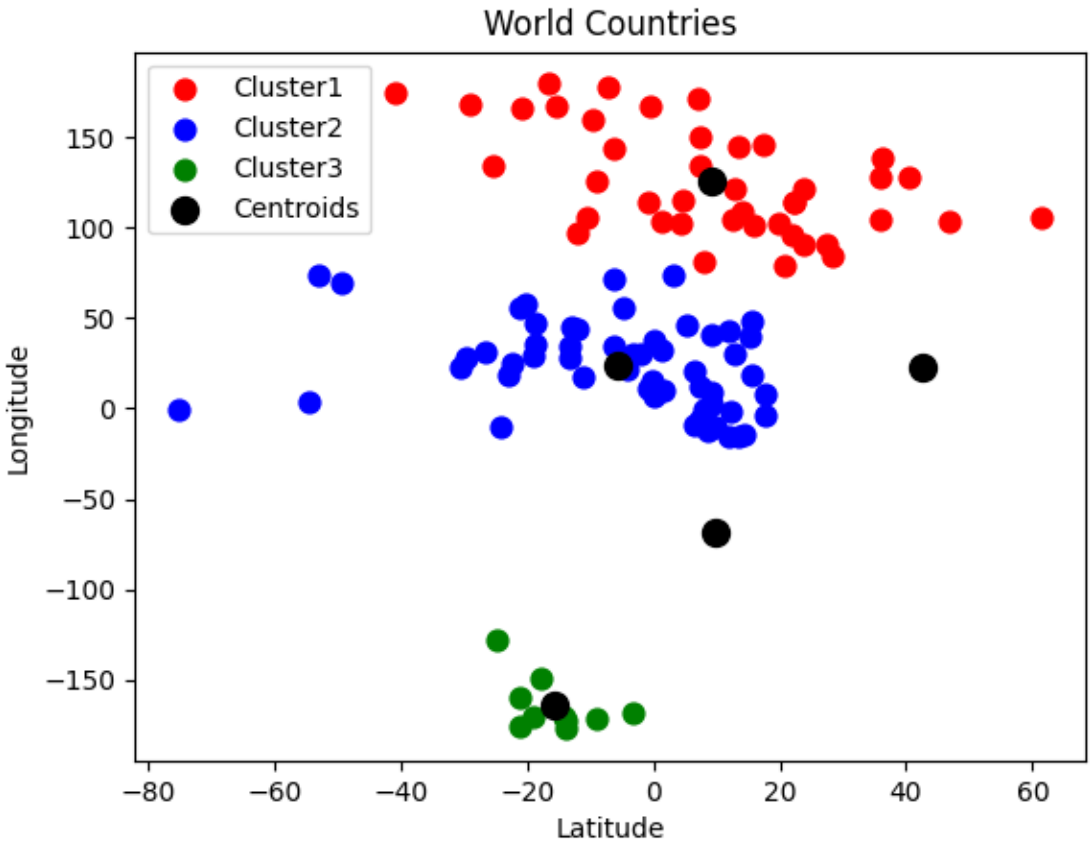
PROGRAM

```
import numpy as nm

import matplotlib.pyplot as mtp

import pandas as pd

dataset = pd.read_csv('world_country_and_usa_states_latitude_and_longitude_values.csv')

X = dataset.iloc[:, [1,2]].values

print(X)


from sklearn.cluster import KMeans


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(k)')

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=60, c='red', label='Cluster1')

mtp.scatter(X[y_predict == 1, 0], X[y_predict == 1, 1], s=60, c='blue', label='Cluster2')

mtp.scatter(X[y_predict == 2, 0], X[y_predict == 2, 1], s=60, c='green', label='Cluster3')

mtp.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s=100, c='black', label='Centroids')


mtp.title('World Countries')

mtp.xlabel('Latitude')

mtp.ylabel('Longitude')

mtp.legend()

mtp.show ()
```

OUTPUT


The Elbow Method graph
1e6
wcss_list
Number of Clusters(k)


World Countries
Cluster1
Cluster2
Cluster3
Centroids
Longitude
Latitude

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scr
[[ 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]
 [ 1.40583240e+01  1.08277199e+02]
 [-1.53767060e+01  1.66959158e+02]
 [-1.37687520e+01 -1.77156097e+02]
 [-1.37590290e+01 -1.72104629e+02]
 [ 4.26026360e+01  2.09029770e+01]
 [ 1.55527270e+01  4.85163880e+01]
 [-1.28275000e+01  4.51662440e+01]
 [-3.05594820e+01  2.29375060e+01]
 [-1.31338970e+01  2.78493320e+01]
 [-1.90154380e+01  2.91548570e+01]]
[4 4 4 3 3 4 4 3 1 1 3 2 4 0 3 4 4 3 0 4 1 4 4 1 1 3 0 3 3 3 0 1 1 4 3 3 0
 1 1 1 4 1 2 3 1 0 3 3 3 3 0 4 4 4 1 4 3 3 4 3 4 4 4 1 4 1 4 0 3 0 4 4 1 4
 3 4 3 4 1 4 3 1 1 3 1 4 3 3 0 1 3 4 0 1 3 4 3 4 0 4 4 4 0 1 4 4 4 4 4 3 4
 0 1 4 0 2 1 3 0 0 4 3 4 0 4 3 4 0 1 1 4 4 4 4 4 4 4 4 1 0 4 1 0 0 0 0 3 4
 3 4 1 1 1 3 0 1 1 0 1 0 1 3 4 4 0 0 2 0 4 3 3 2 0 0 4 4 3 2 3 4 4 0 3 4 1
 4 4 0 1 4 0 1 1 4 0 1 4 4 4 1 4 1 1 3 1 3 4 1 3 1 1 1 0 4 2 0 4 4 2 4 3 0
 0 1 4 1 3 3 4 4 3 3 3 3 0 0 2 2 4 1 1 1 1 1]
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 13 DATE:19/01/2022

AIM: PROGRAMS ON FEEDFORWARD NETWORK TO CLASSIFY ANY STANDARD DATASET AVAILABLE IN THE PUBLIC DOMAIN

PROGRAM

```
from tensorflow import keras
print('Tensorflow/keras : %s'%keras.version)
from keras.models import Sequential
from keras import Input
from  keras.layers import Dense

import pandas as pd
print('pandas : %s' %pd.version)
import numpy as np
print('numpy : %s' %np.version)

import sklearn
print('sklearn : %s' %sklearn.version)
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report

import plotly
import plotly.express as px
import plotly.graph_objects as go
print('plotly : %s' %plotly.version)

pd.options.display.max_columns=50
```

```
df=pd.read_csv('weatherAUS.csv', encoding='utf-8')

df=df[pd.isnull(df['RainTomorrow'])==False]
#df=df.fillna(df.mean())

df['RainTodayFlag']=df['RainToday'].apply(lambda x: 1 if x=='Yes' else 0)
df['RainTomorrowFlag']=df['RainTomorrow'].apply(lambda x: 1 if x=='Yes' else 0)

print(df)

X = df[['Humidity3pm']]
Y = df['RainTomorrowFlag'].values

X_train, X_test, Y_train, Y_test = train_test_split(X,Y, test_size=0.2, random_state=0)

model = Sequential(name="Model-with-One-Input")
model.add(Input(shape=(1,), name='Input-Layer'))
model.add(Dense(2, activation='softplus', name='Hidden-Layer'))
model.add(Dense(1, activation='sigmoid', name='Output-Layer'))
```

OUTPUT

```
...            ...       ...       ...      ...      ...       ...
145454      1021.2       NaN       NaN      9.4     20.9        No
145455      1020.3       NaN       NaN     10.1     22.4        No
145456      1019.1       NaN       NaN     10.9     24.5        No
145457      1016.8       NaN       NaN     12.5     26.1        No
145458      1016.5       3.0       2.0     15.1     26.0        No

       RainTomorrow  RainTodayFlag  RainTomorrowFlag
0                No              0                 0
1                No              0                 0
2                No              0                 0
3                No              0                 0
4                No              0                 0
...             ...            ...               ...
145454           No              0                 0
145455           No              0                 0
145456           No              0                 0
145457           No              0                 0
145458           No              0                 0

[142193 rows x 25 columns]
```

```
145456       NaN          NNW           22.0          SE           N
145457       NaN            N           37.0          SE         WNW
145458       NaN           SE           28.0         SSE           N

        WindSpeed9am  WindSpeed3pm  Humidity9am  Humidity3pm  Pressure9am  \
0               20.0          24.0         71.0         22.0       1007.7
1                4.0          22.0         44.0         25.0       1010.6
2               19.0          26.0         38.0         30.0       1007.6
3               11.0           9.0         45.0         16.0       1017.6
4                7.0          20.0         82.0         33.0       1010.8
...              ...           ...          ...          ...          ...
145454          15.0          13.0         59.0         27.0       1024.7
145455          13.0          11.0         51.0         24.0       1024.6
145456          13.0           9.0         56.0         21.0       1023.5
145457           9.0           9.0         53.0         24.0       1021.0
145458          13.0           7.0         51.0         24.0       1019.4

        Pressure3pm  Cloud9am  Cloud3pm  Temp9am  Temp3pm RainToday  \
0            1007.1       8.0       NaN     16.9     21.8        No
1            1007.8       NaN       NaN     17.2     24.3        No
2            1008.7       NaN       2.0     21.0     23.2        No
3            1012.8       NaN       NaN     18.1     26.5        No
4            1006.0       7.0       8.0     17.8     29.7        No
...             ...       ...       ...      ...      ...       ...
145454       1021.2       NaN       NaN      9.4     20.9        No
145455       1020.3       NaN       NaN     10.1     22.4        No
145456       1019.1       NaN       NaN     10.9     24.5        No
145457       1016.8       NaN       NaN     12.5     26.1        No
145458       1016.5       3.0       2.0     15.1     26.0        No

       RainTomorrow  RainTodayFlag  RainTomorrowFlag
```

```
Tensorflow/keras : 2.7.0
pandas : 1.2.3
numpy : 1.20.1
sklearn : 1.0.1
plotly : 5.5.0
             Date Location  MinTemp  MaxTemp  Rainfall  Evaporation  \
0      2008-12-01   Albury     13.4     22.9       0.6          NaN
1      2008-12-02   Albury      7.4     25.1       0.0          NaN
2      2008-12-03   Albury     12.9     25.7       0.0          NaN
3      2008-12-04   Albury      9.2     28.0       0.0          NaN
4      2008-12-05   Albury     17.5     32.3       1.0          NaN
...           ...      ...      ...      ...       ...          ...
145454 2017-06-20    Uluru      3.5     21.8       0.0          NaN
145455 2017-06-21    Uluru      2.8     23.4       0.0          NaN
145456 2017-06-22    Uluru      3.6     25.3       0.0          NaN
145457 2017-06-23    Uluru      5.4     26.9       0.0          NaN
145458 2017-06-24    Uluru      7.8     27.0       0.0          NaN

       Sunshine WindGustDir  WindGustSpeed WindDir9am WindDir3pm  \
0           NaN           W           44.0          W        WNW
1           NaN         WNW           44.0        NNW        WSW
2           NaN         WSW           46.0          W        WSW
3           NaN          NE           24.0         SE          E
4           NaN           W           41.0        ENE         NW
...         ...         ...            ...        ...        ...
145454      NaN           E           31.0        ESE          E
145455      NaN           E           31.0         SE        ENE
145456      NaN         NNW           22.0         SE          N
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 14 DATE:02/02/2022

AIM: PROGRAMS ON CONVOLUTIONAL NEURAL NETWORK TO CLASSIFY IMAGES FROM ANY STANDARD DATASET IN THE PUBLIC DOMAIN.

PROGRAM

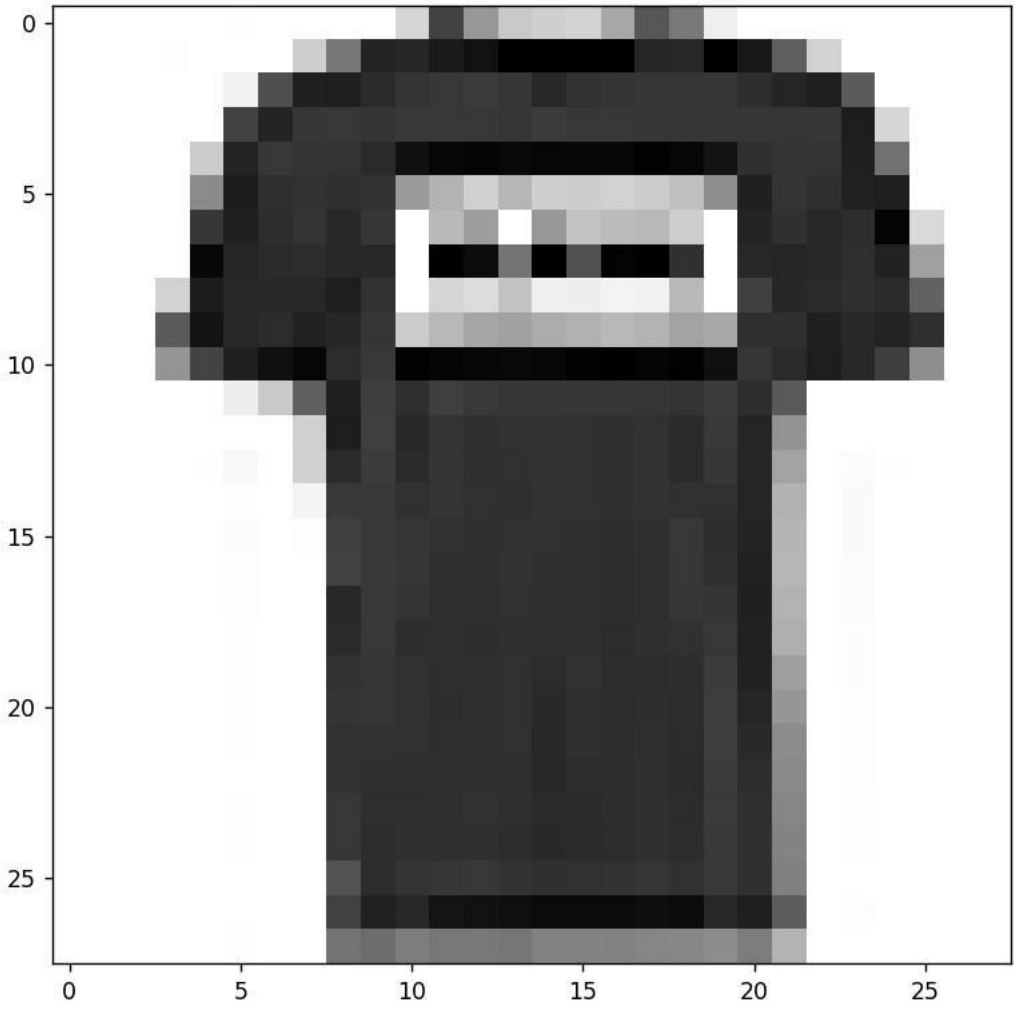
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow import keras

np.random.seed(42)
# tf.set.random. seed(42)
fashion_mnist = keras.datasets.fashion_mnist
(X_train, y_train), (X_test, y_test) = fashion_mnist.load_data()
print(X_train.shape, X_test.shape)
X_train = X_train / 255.0
X_test = X_test / 255.0
plt.imshow(X_train[1], cmap='binary')
plt.show()
np.unique(y_test)

class_names = ['T-Shirt/Top', 'Trouser', 'Pullover', 'Dress', 'Coat', 'Sandal', 'Shirt', 'Sneaker', '8ag', 'Ankle Boot']
n_rows = 5
n_cols = 10
plt.figure(figsize=(n_cols * 1.4, n_rows * 1.6))
for row in range(n_rows):
    for col in range(n_cols):
        index = n_cols * row + col
```

```
        plt.subplot(n_rows, n_cols, index + 1)
        plt.imshow(X_train[index], cmap='binary', interpolation='nearest')
        plt.axis('off')
        plt.title(class_names[y_train[index]])
plt.show()

model_CNN = keras.models.Sequential()
model_CNN.add(keras.layers.Conv2D(filters=32, kernel_size=7, padding='same', activation='relu', input_shape=[28, 28, 1]))
model_CNN.add(keras.layers.MaxPooling2D(pool_size=2))
model_CNN.add(keras.layers.Conv2D(filters=64, kernel_size=3, padding='same', activation='relu'))
model_CNN.add(keras.layers.MaxPooling2D(pool_size=2))
model_CNN.add(keras.layers.Conv2D(filters=32, kernel_size=3, padding='same', activation='relu'))
model_CNN.add(keras.layers.MaxPooling2D(pool_size=2))

model_CNN.summary()

model_CNN.add(keras.layers.Flatten())
model_CNN.add(keras.layers.Dense(units=128, activation='relu'))
model_CNN.add(keras.layers.Dense(units=64, activation='relu'))
model_CNN.add(keras.layers.Dense(units=10, activation='softmax'))

model_CNN.summary()

model_CNN.compile(loss='sparse_categorical_crossentropy', optimizer='adam', metrics=['accuracy'])

X_train = X_train[..., np.newaxis]
X_test = X_test[..., np.newaxis]

history_CNN = model_CNN.fit(X_train, y_train, epochs=2, validation_split=0.1)
pd.DataFrame(history_CNN.history).plot()
```

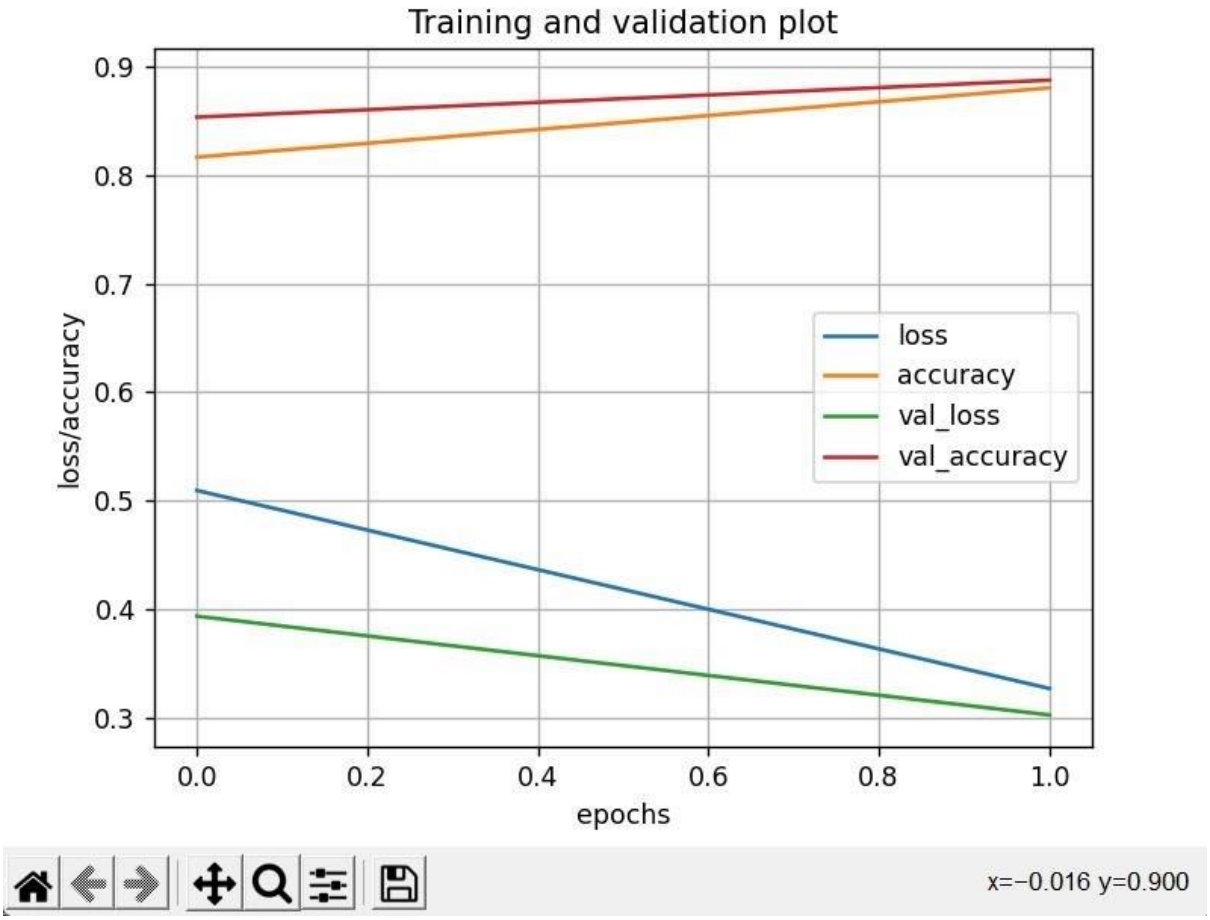
```
plt.grid(True)
plt.xlabel('epochs')
plt.ylabel('loss/accuracy')
plt.title('Training and validation plot')
plt.show()
test_loss, test_accuracy = model_CNN.evaluate(X_test, y_test)
print(' Test Loss :{}, Test Accuracy : {}'.format(test_loss, test_accuracy))
```

OUTPUT

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-labels-idx1-ubyte.gz
32768/29515 [==============================] - 0s 2us/step
40960/29515 [==========================================] - 0s 2us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-images-idx3-ubyte.gz
26427392/26421880 [==============================] - 12s 0us/step
26435584/26421880 [==============================] - 12s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-labels-idx1-ubyte.gz
16384/5148 [================================================================================================] - 0s 0s/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-images-idx3-ubyte.gz
4423680/4422102 [==============================] - 2s 0us/step
4431872/4422102 [==============================] - 2s 0us/step
(60000, 28, 28) (10000, 28, 28)
```


0
5
10
15
20
25
0
5
10
15
20
25


Ankle Boot
T-Shirt/Top
T-Shirt/Top
Dress
T-Shirt/Top
Pullover
Sneaker
Pullover
Sandal
Sandal
T-Shirt/Top
Ankle Boot
Sandal
Sandal
Sneaker
Ankle Boot
Trouser
T-Shirt/Top
Shirt
Coat
Dress
Trouser
Coat
8ag
Coat
Dress
T-Shirt/Top
Pullover
Coat
Coat
Sandal
Dress
Shirt
Shirt
T-Shirt/Top
8ag
Sandal
Pullover
Trouser
Shirt
Shirt
Sneaker
Ankle Boot
Sandal
Ankle Boot
Pullover
Sneaker
Dress
T-Shirt/Top
Dress


Training and validation plot
loss/accuracy
epochs
loss
accuracy
val_loss
val_accuracy
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.0
0.2
0.4
0.6
0.8
1.0
x=−0.016 y=0.900

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 28, 28, 32)        1600

 max_pooling2d (MaxPooling2D  (None, 14, 14, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 14, 14, 64)        18496

 max_pooling2d_1 (MaxPooling  (None, 7, 7, 64)         0
 2D)

 conv2d_2 (Conv2D)           (None, 7, 7, 32)          18464

 max_pooling2d_2 (MaxPooling  (None, 3, 3, 32)         0
 2D)

=================================================================
Total params: 38,560
Trainable params: 38,560
Non-trainable params: 0
_________________________________________________________________
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 28, 28, 32)        1600
```

```
max_pooling2d (MaxPooling2D  (None, 14, 14, 32)       0
)

conv2d_1 (Conv2D)           (None, 14, 14, 64)        18496

max_pooling2d_1 (MaxPooling  (None, 7, 7, 64)         0
2D)

conv2d_2 (Conv2D)           (None, 7, 7, 32)          18464

max_pooling2d_2 (MaxPooling  (None, 3, 3, 32)         0
2D)

flatten (Flatten)           (None, 288)               0

dense (Dense)               (None, 128)               36992

dense_1 (Dense)             (None, 64)                8256

dense_2 (Dense)             (None, 10)                650

=================================================================
Total params: 84,458
Trainable params: 84,458
Non-trainable params: 0
_________________________________________________________________
Epoch 1/2
1688/1688 [==============================] - 55s 32ms/step - loss: 0.5097 - accuracy: 0.8164 - val_loss: 0.3940 - val_accuracy: 0.8532
Epoch 2/2
1688/1688 [==============================] - 60s 36ms/step - loss: 0.3274 - accuracy: 0.8801 - val_loss: 0.3031 - val_accuracy: 0.8872
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

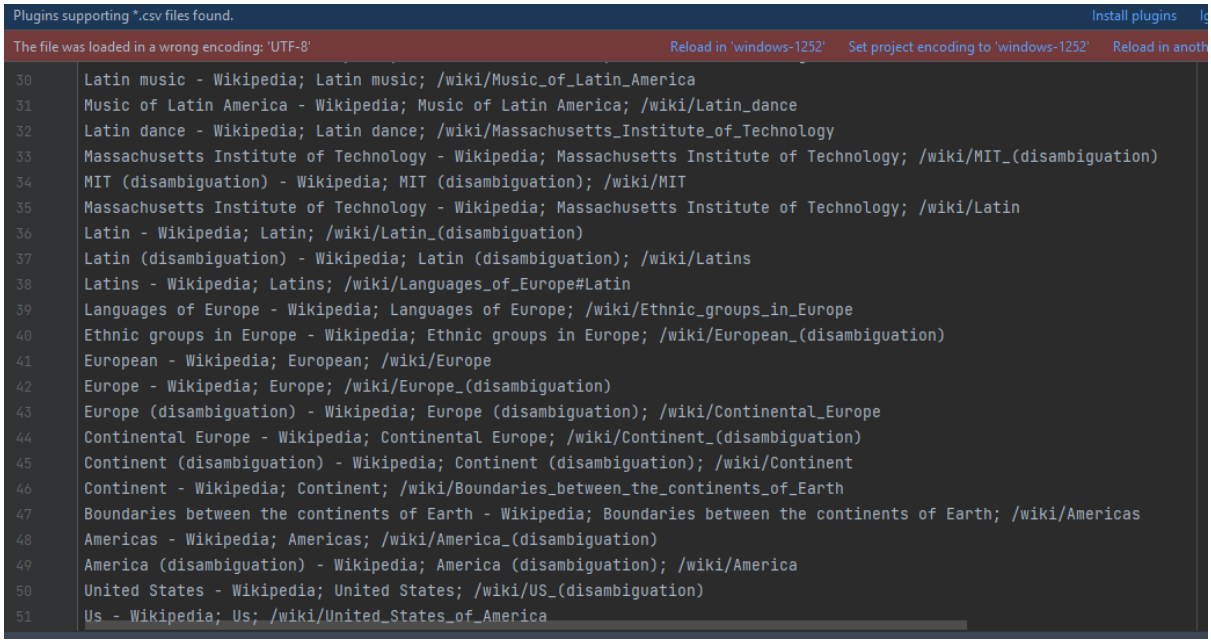
PROGRAM NO: 15 DATE:16/02/2022

AIM: IMPLEMENT A SIMPLE WEB CRAWLER

PROGRAM

```
from bs4 import BeautifulSoup
import requests

pages_crawler = []

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_crawler:
                    new_link = f"https://en.wikipedia.org{link['href']}"
                    pages_crawler.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



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 16 DATE:16/02/2022

AIM: IMPLEMENT A PROGRAM TO SCRAP THE WEB PAGE OF ANY POPULAR WEBSITE-SUGGESTED PYTHON PACKAGE IS SCRAPPY

PROGRAM

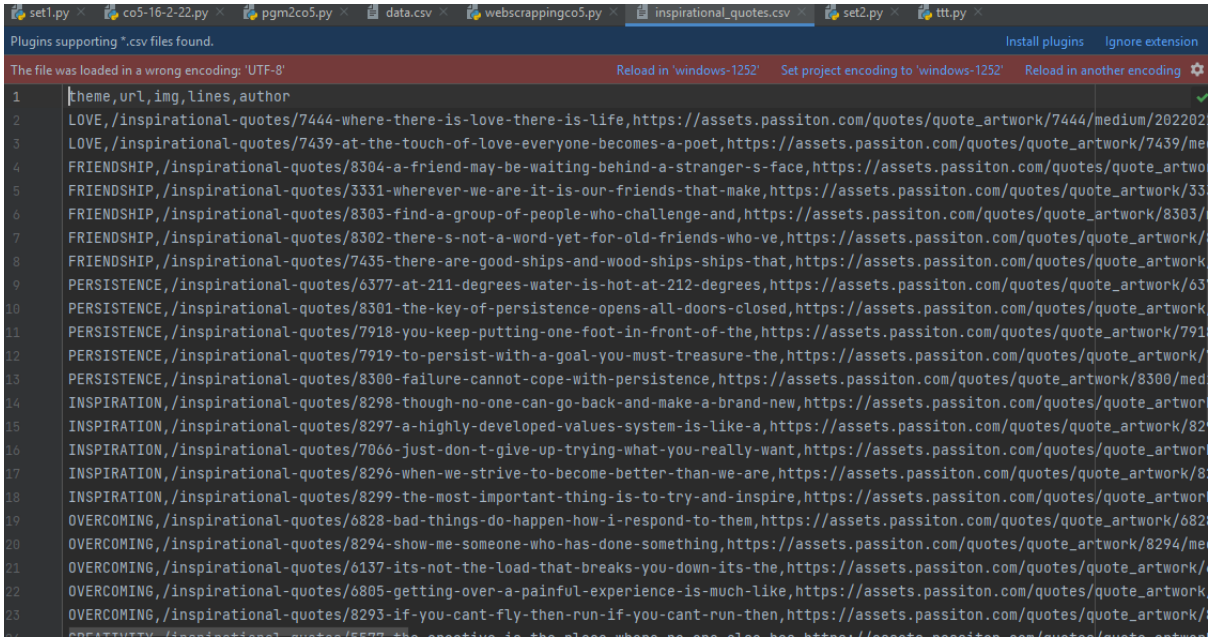
```
import requests
from bs4 import BeautifulSoup
import csv
import lxml

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

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

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

for row in table.findAll('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'].aplit("#")[1]
    quotes.append(quote)

filename = 'inspirational_quote.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\ajcemca\AppData\Local\Programs\Python\Python39\python.exe C:/Users/ajcemca/PycharmProjects/pythonProject/webscrappingco5.py
b'<!DOCTYPE html>\n<html class="no-js" dir="ltr" lang="en-US">\n    <head>\n        <title>Inspirational Quotes - Motivational Quotes - Leadership Quotes | Pa
<!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+dH/1
  <link href="/assets/application-2a7a8e6a1c3f620bac9efa66420f5579.css" media="all" rel="stylesheet"/>
  <meta content="authenticity_token" name="csrf-param"/>
  <meta content="1JpquOpW3DNYfC4WBYKLkzCQkiGqZx9lTiFrqiGluSOdEl2dGR28oCTHuHd2XFIn/CzB1TYeRc8j8Xv8o7egmg==" name="csrf-token"/>
  <!-- Global site tag (gtag.js) - Google Analytics -->
  <script async="" src="https://www.googletagmanager.com/gtag/js?id=UA-1179606-29">
```

```
        Terms of Use
       </a>
      </div>
     </div>
    </div>
   </div>
  </div>
 </footer>
 <a class="scroll-top-arrow" href="javascript:void(0);">
  <i class="ti-arrow-up">
  </i>
 </a>
 <script src="https://cdnjs.cloudflare.com/ajax/libs/jquery/1.12.4/jquery.js">
 </script>
 <script crossorigin="anonymous" integrity="sha384-UO2eT0CpHqdSJQ6hJty5KVphtPhzWj9WO1clHTMGa3JDZwrnQq4sF86dIHNDz0W1" src="https://cdnjs.cloudflare.
 </script>
 <script crossorigin="anonymous" integrity="sha384-JjSmVgyd0p3pXB1rRibZUAYoIIy6OrQ6VrjIEaFf/nJGzIxFDsf4x0xIM+B07jRM" src="https://stackpath.bootstr
 </script>
 <script src="/assets/pofo-1a7dc0d9251926b568dcfcc8a6e53534.js">
 </script>
</body>
</html>


Process finished with exit code 0
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED.

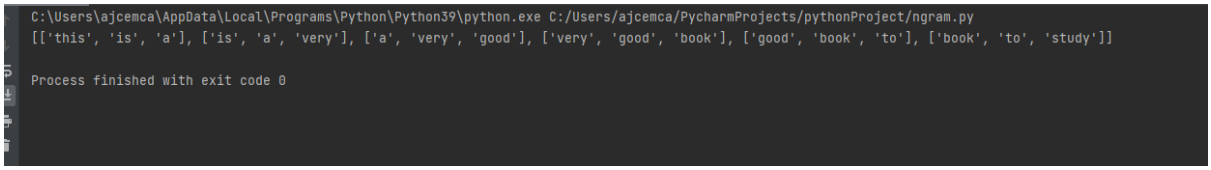
PROGRAM NO: 17 DATE:16/02/2022

AIM:PYTHON PROGRAM FOR NATURAL PROGRAM LANGUAGE PROCESSING N-GRAMS

PROGRAM

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

    return output

x=generate_ngrams(text= 'this is a very good book to study', WordsToCombine=3)
print(x)
```

OUTPUT



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED

PROGRAM NO: 18 DATE:16/02/2022

AIM:PYTHON PROGRAM FOR NATURAL PROGRAM LANGUAGE PROCESSING N-GRAMS [USING IN BUILT FUNCTION]

PROGRAM

```
import nltk
nltk.download()
from nltk.util import ngrams

samplText = 'this is a very good book to study'
NGRAMS = ngrams(sequence=nltk.word_tokenize(samplText), n=2)
for grams in NGRAMS:
    print(grams)
```

OUTPUT

```
C:\Users\ajcemca\AppData\Local\Programs\Python\Python39\python.exe C:/Users/ajcemca/PycharmProjects/pythonProject/co5nltk.py
('this', 'is')
('is', 'very')
('very', 'good')
('good', 'book')
('book', 'to')
('to', 'study')

Process finished with exit code 0
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED.

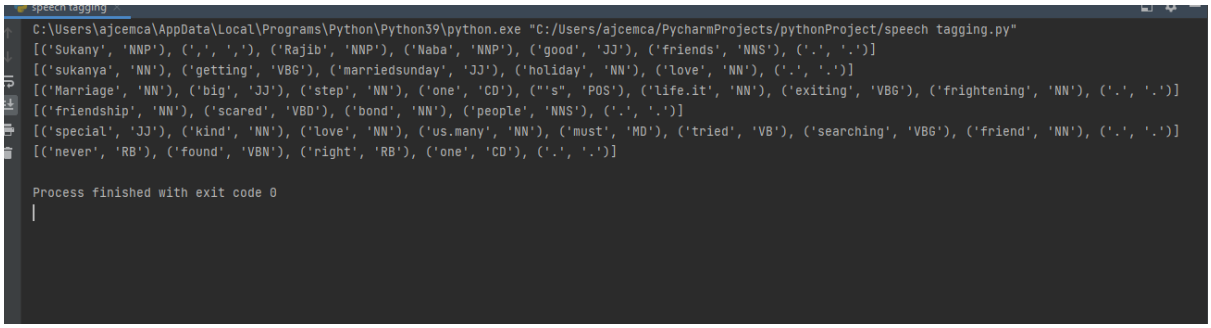
PROGRAM NO: 19 DATE:16/02/2022

AIM:PYTHON PROGRAM FOR NATURAL PROGRAM LANGUAGE PROCESSING PART OF SPEECH TAGGING

PROGRAM

```
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize, sent_tokenize

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 exciting 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



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED.

PROGRAM NO: 20 DATE:23/02/2022

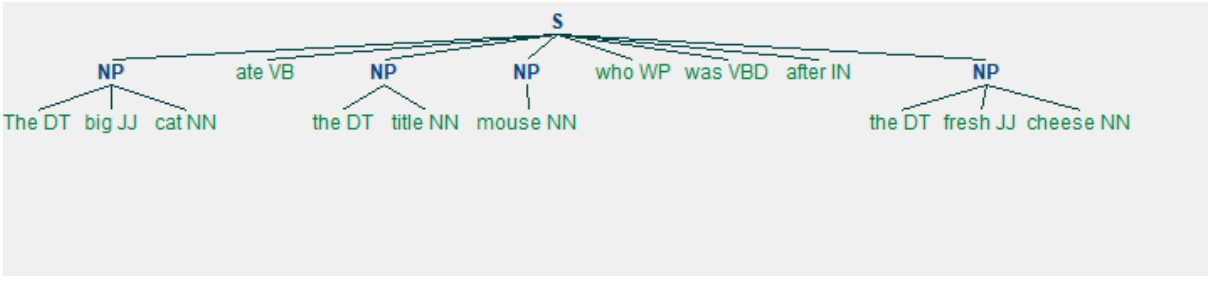
AIM:PYTHON PROGRAM FOR NATURAL PROGRAM LANGUAGE PROCESSING CHUNKING

PROGRAM

```
import nltk
new = "The big cat ate the title mouse who was after the fresh cheese"
new_tokens = nltk.word_tokenize(new)
print(new_tokens)

new_tag=nltk.pos_tag(new_tokens)
print(new_tag)

grammer=r"NP: {<DT>?<JJ>*<NN>}"
chunkParser=nltk.RegexpParser(grammer)
chunked = chunkParser.parse(new_tag)
print(chunked)
chunked.draw()
```

OUTPUT

```
C:\Users\ajcemca\PycharmProjects\pythonProject\venv\Scripts\python.exe C:/Users/ajcemca/PycharmProjects/pythonProject/venv/chun
['The', 'big', 'cat', 'ate', 'the', 'title', 'mouse', 'who', 'was', 'after', 'the', 'fresh', 'cheese']
[('The', 'DT'), ('big', 'JJ'), ('cat', 'NN'), ('ate', 'VB'), ('the', 'DT'), ('title', 'NN'), ('mouse', 'NN'), ('who', 'WP'), ('
(S
  (NP The/DT big/JJ cat/NN)
  ate/VB
  (NP the/DT title/NN)
  (NP mouse/NN)
  who/WP
  was/VBD
  after/IN
  (NP the/DT fresh/JJ cheese/NN))
```



RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED.

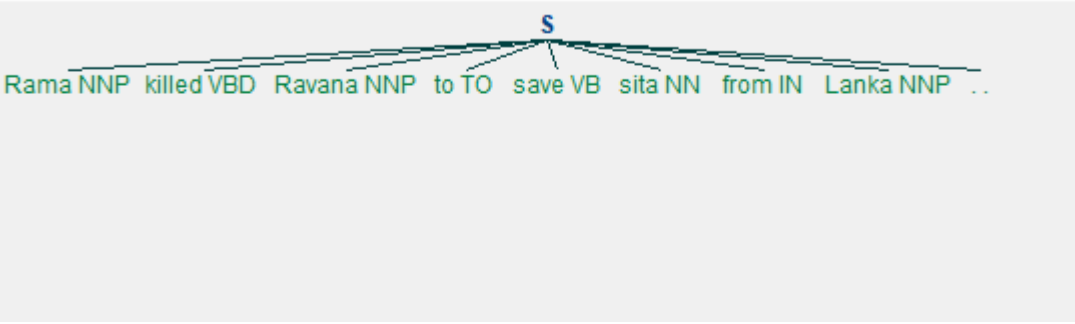
PROGRAM NO: 21 DATE:23/02/2022

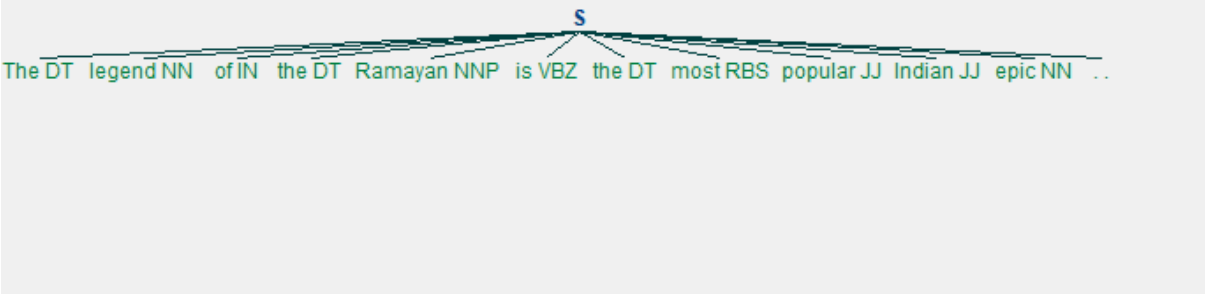
AIM:PYTHON PROGRAM FOR NATURAL PROGRAM LANGUAGE PROCESSING CHUNKING

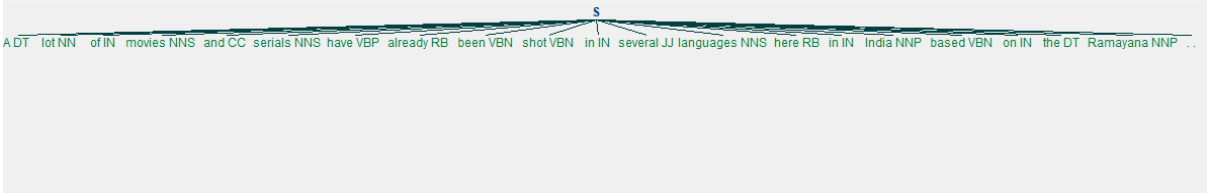
PROGRAM

```
import nltk
nltk.download('averaged_perceptron_tagger')
sample_text = """Rama killed Ravana to save sita from Lanka. The legend of the Ramayan is the most popular Indian epic. A lot of movies and serials have already been shot in several languages here in India based on the Ramayana."""

tokenized = nltk.sent_tokenize(sample_text)
for i in  tokenized:
    words = nltk.word_tokenize(i)
    tagged_words=nltk.pos_tag(words)
    chunkGram=r"""VB:{}"""
    chunkParse=nltk.RegexpParser(chunkGram)
    chunked=chunkParse.parse(tagged_words)
    print(chunked)
    chunked.draw()
```

OUTPUT








```
(S
  Rama/NNP
  killed/VBD
  Ravana/NNP
  to/TO
  save/VB
  sita/NN
  from/IN
  Lanka/NNP
  ./.)
(S
  The/DT
  legend/NN
  of/IN
  the/DT
  Ramayan/NNP
  is/VBZ
  the/DT
  most/RBS
  popular/JJ
  Indian/JJ
  epic/NN
  ./.)
(S
  A/DT
  lot/NN
  of/IN
  movies/NNS
  and/CC
  serials/NNS
  have/VBP
  already/RB
  been/VBN
  shot/VBN
  in/IN
  several/JJ
  languages/NNS
  here/RB
  in/IN
  India/NNP
  based/VBN
  on/IN
  the/DT
  Ramayana/NNP
  ./.)
```

RESULT: THE PROGRAM HAS BEEN EXECUTED AND OUTPUT VERIFIED.