20MCA241 DATA SCIENCE LAB

Lab Report Submitted By

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Reg. No.:AJC20MCA-2009

In Partial fulfillment for the Award of the Degree Of

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

AMAL JYOTHI COLLEGE OF ENGINEERING
KANJIRAPPALLY

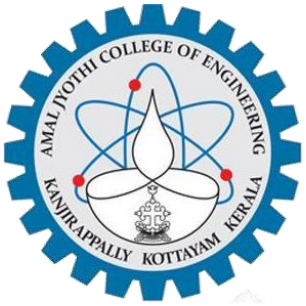
[Affiliated to APJ Abdul Kalam Technological University, Kerala. Approved by AICTE, Accredited by NAAC with 'A' grade. Koovappally, Kanjirappally, Kottayam, Kerala – 686518]

2020-2022

DEPARTMENT OF COMPUTER APPLICATIONS

AMAL JYOTHI COLLEGE OF ENGINEERING

KANJIRAPPALLY



CERTIFICATE

This is to certify that the Lab report, "**20MCA241 DATA SCIENCE LAB"** is the bonafide work of ALEX THOMAS (Reg.No:AJC20MCA-2009) 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.

Ms. Meera Rose Mathew

Lab In-Charge

CONTENT

PROGRAM NO : 01 **Date:24/11/2021**

AIM : Perform all matrix operation using python.

PROGRAM CODE

```
import numpy as np
import random
def PrintMatrix(matrix_in):
    for x in range(0, matrix_in.shape[0]):
        for y in range(0, matrix_in.shape[1]):
            print("%d \t" % (matrix_in[x][y]), end='')
            if (y % 3 > 1):
                print("\n")
def FillMatrix(matrix_in):
    for x in range(0, matrix_in.shape[0]):
        for y in range(0, matrix_in.shape[1]):
            matrix_in[x][y] = random.randrange(2, 10) + 2
matrix1 = np.ndarray((3,3))
matrix2 = np.ndarray((3,3))
FillMatrix(matrix1)
FillMatrix(matrix2)
add_results = np.add(matrix1,matrix2)
sub_results=np.subtract(matrix1,matrix2)
mult_results=np.multiply(matrix1,matrix2)
div_results=np.divide(matrix1,matrix2)
dot_results=np.dot(matrix1,matrix2)
sqrt1_results=np.sqrt(matrix1)
sqrt2_results=np.sqrt(matrix2)
trans_results=add_results.T
print("Matrix1:")
PrintMatrix(matrix1)
print("Matrix2:")
PrintMatrix(matrix2)
print("Adding")
```

```
PrintMatrix(add_results)
print("Subtraction")
PrintMatrix(sub_results)
print("Multiplication")
PrintMatrix(mult_results)
print("Dot Operation")
PrintMatrix(dot_results)
print("squareroot Operation")
print("matrix 1")
PrintMatrix(sqrt1_results)
print("matrix 2")
PrintMatrix(sqrt2_results)
print("Transpose")
PrintMatrix(trans_results)
```

OUTPUT

```
Matrix1:
4       4       11
6       4       6
9       11      5
Matrix2:
8       10      10
11      9       8
8       11      10
Adding
12      14      21
17      13      14
17      22      15

Subtraction
-4      -6      1
-5      -5      -2
1       0       -5
```

Multiplication

32 40 110

66 36 48

72 121 50

Dot Operation

164 197 182

140 162 152

233 244 228

Squareroot Operation

matrix 1

2 2 3

2 2 2

3 3 2

matrix 2

2 3 3

3 3 2

2 3 3

Transpose

12 17 17

14 13 22

21 14 15

Process finished with exit code

PROGRAM NO : 02 **Date :01/12/2021**

AIM: Program to perform SVD (Singular value Decomposition) using Python.

PROGRAM CODE

```
from scipy. linalg import svd
from numpy import array
A= ([[1,2,5], [2,0,1], [1,4,4]])
print(A)
X, B, T=svd(A)
print("decomposition")
print(X)
print("inverse")
print(B)
print("transpose")
print(T)
```

OUTPUT

```
 [[1, 2, 5], [2, 0, 1], [1, 4, 4]]
decomposition
[[-0.68168247 -0.26872313 -0.68051223]
 [-0.15885378 -0.85356116  0.49618427]
 [-0.71419499  0.44634205  0.53916999]]
inverse
[7.87492    2.01650097 1.38540929]
transpose
[[-0.21760031 -0.53589686 -0.81576017]
 [-0.75849376  0.61885512 -0.20421939]
 [ 0.61427789  0.5743108  -0.54113749]]
Process finished with exit code
```

PROGRAM NO : 03 **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 build function.

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
iris = load_iris()
x=iris.data
y=iris.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
knn=KNeighborsClassifier(n_neighbors=7)
knn.fit(x_train,y_train)
print(knn.predict(x_test))
V=knn.predict(x_test)
result=accuracy_score (y_test, V)
print ("accuracy:", result)
```

OUTPUT

```
[1 0 2 1 1 0 1 2 2 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0]
accuracy: 0.9666666666666667
Process finished with exit code 0
```

PROGRAM NO : 04 **Date :01/12/2021**

AIM : Program to implement k-NN Classification using any random dataset without using in-build functions.

PROGRAM CODE

```
from math import sqrt
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 = [[2.781, 2.550,0],
        [1.465, 2.326,3],
        [3.398, 4.429,5],
```

```
        [1.388, 1.857,11],
        [3.064, 3.393,3],
        [7.624, 2.235,4],
        [5.338, 2.775,8]]
prediction = predict_classification(dataset, dataset[0], 3)

print('Expected %d, Got %d.' % (dataset[0][-1], prediction))
```

OUTPUT

```
Expected 2, Got 3.
Process finished with exit code 0
```

PROGRAM NO : 05 **Date :08/12/2021**

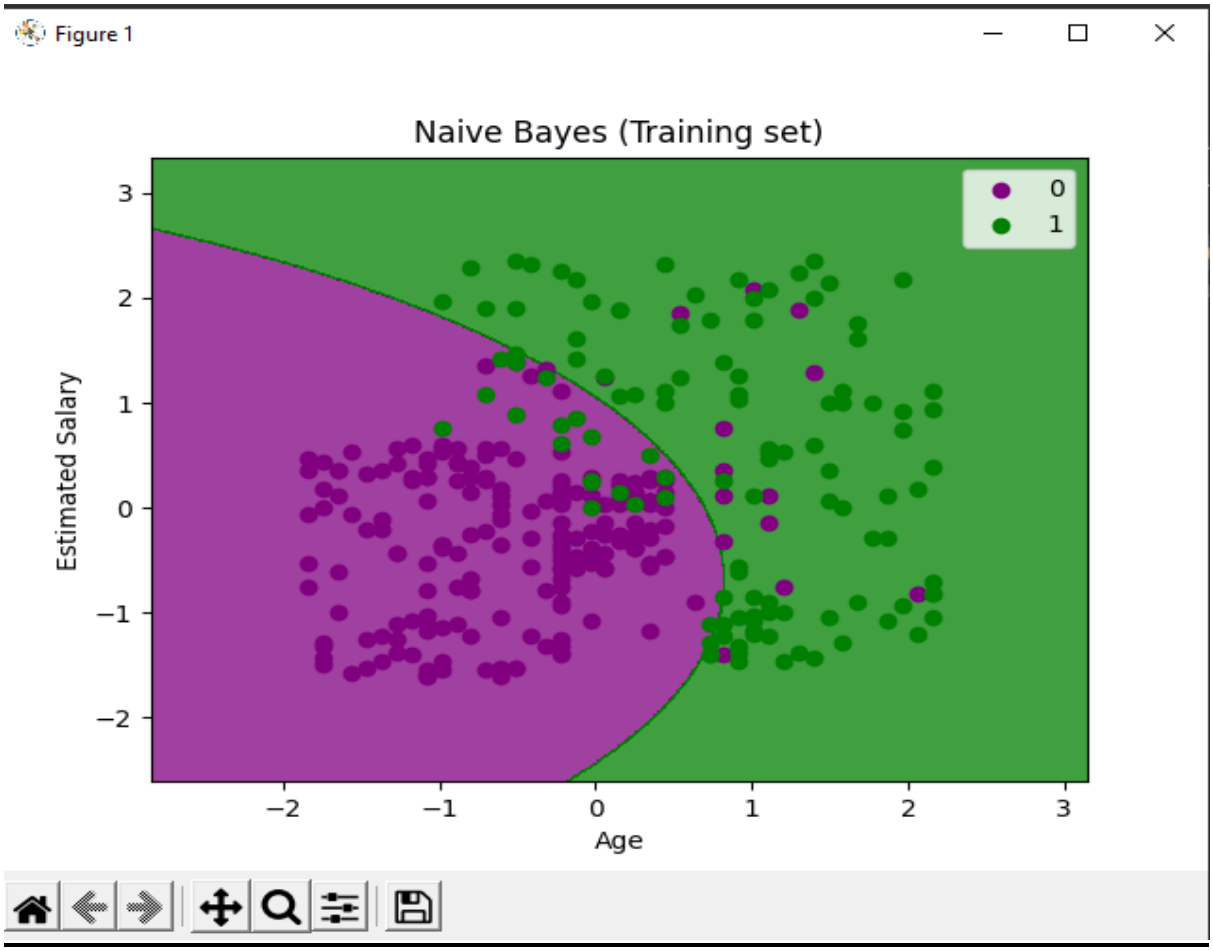
AIM : Program to implement Naïve Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm.

PROGRAM CODE

```
import pandas as pd
dataset = pd.read_csv('Social_Network_Ads.csv')
x = dataset.iloc[:, [2,3]].values
y = dataset.iloc[:,-1].values
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state=10)
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
from sklearn.naive_bayes import GaussianNB
gnb = GaussianNB()
gnb.fit(x_train, y_train)
y_pred = gnb.predict(x_test)
print(y_pred)
from sklearn import metrics
print("Accuracy", metrics.accuracy_score(y_test, y_pred) * 100)
import numpy as nm
import matplotlib.pyplot as mtp
from matplotlib.colors import ListedColormap
x_set, y_set = x_train, y_train
X1, X2 = nm.meshgrid(nm.arange(start = x_set[:, 0].min() - 1, stop = x_set[:, 0].max() + 1, step =
0.01),
  nm.arange(start = x_set[:, 1].min() - 1, stop = x_set[:, 1].max() + 1, step = 0.01))
mtp.contourf(X1, X2, gnb.predict(nm.array([X1.ravel(), X2.ravel()]).T).reshape(X1.shape),
alpha = 0.75, cmap = ListedColormap(('purple', 'green')))
mtp.xlim(X1.min(), X1.max())
mtp.ylim(X2.min(), X2.max())
```

```
for i, j in enumerate(nm.unique(y_set)):
    mtp.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1],
  c = ListedColormap(('purple', 'green'))(i), label = j)
mtp.title('Naive Bayes (Training set)')
mtp.xlabel('Age')
mtp.ylabel('Estimated Salary')
mtp.legend()
mtp.show()
x_set, y_set = x_test, y_test
X1, X2 = nm.meshgrid(nm.arange(start = x_set[:, 0].min() - 1, stop = x_set[:, 0].max() + 1, step =
0.01),
 nm.arange(start = x_set[:, 1].min() - 1, stop = x_set[:, 1].max() + 1, step = 0.01))
mtp.contourf(X1, X2, gnb.predict(nm.array([X1.ravel(), X2.ravel()]).T).reshape(X1.shape),
 alpha = 0.75, cmap = ListedColormap(('purple', 'green')))
mtp.xlim(X1.min(), X1.max())
mtp.ylim(X2.min(), X2.max())
for i, j in enumerate(nm.unique(y_set)):
mtp.scatter(x_set[y_set == j, 0], x_set[y_set == j, 1],
 c = ListedColormap(('purple', 'green'))(i), label = j)
mtp.title('Naive Bayes (test set)')
mtp.xlabel('Age')
mtp.ylabel('Estimated Salary')
mtp.legend()
mtp.show()
```

OUTPUT



C:/Users/ajcemca/PycharmProjects/Aravind/naive.py

[0 0 1 1 0 1 0 1 0 0 0 0 1 1 1 0 0 0 0 1 0 0 0 1 1 0 0 1 1 0 0 0 0 1 1 0 1
1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 1 0 1 1 0 1 0 1 1 1 0 1 0 0 0 0 0 0
0 0 0 0 1 1]

Accuracy 91.25

PROGRAM NO : 06 **Date :08/12/2021**

AIM : Program to implement linear and multiple regression techniques using any standard dataset available in the public domain.

PROGRAM CODE

```
import numpy as np
from sklearn.linear_model import LinearRegression
x  = np.array([2,6,7,8]).reshape((-1,1))
y = np.array([16,7,8,9])
model = LinearRegression()
model.fit(x,y)
r_sq = model.score(x,y)
print("Score: ",r_sq)
print("Intercept: ",model.intercept_)
print("Slope: ",model.coef_)
y_pred = model.predict(x)
print("Y-prediction : ",y_pred)
```

OUTPUT

```
C:/Users/ajcemca/PycharmProjects/Aravind/linear_regression.py
Score:  0.7556626506024098
Intercept:  17.759036144578314
Slope:  [-1.34939759]
Y-prediction :  [15.06024096  9.6626506   8.31325301  6.96385542]
Process finished with exit code 0
```

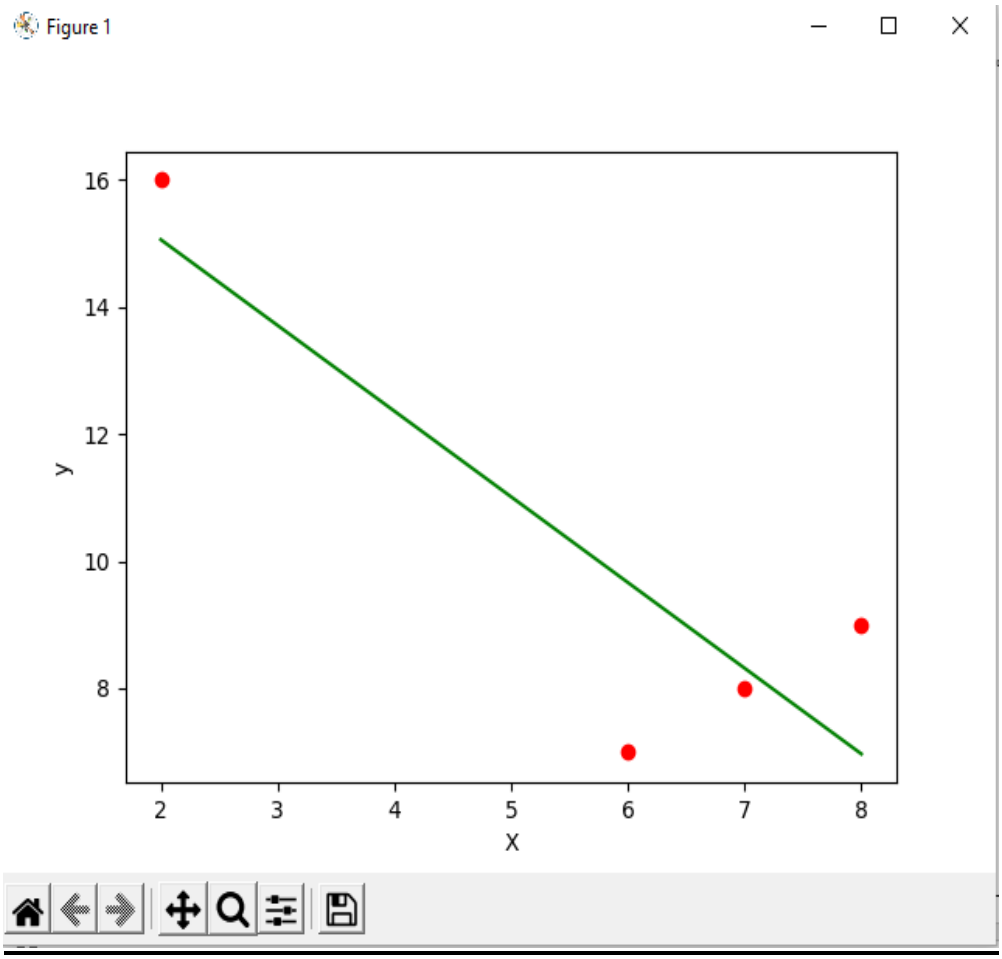
PROGRAM NO : 07 **Date :08/12/2021**

AIM : Program to implement Linear and Multiple regression techniques using any standard dataset available in public domain and evaluate its performance.

PROGRAM CODE

```
import numpy as np

import matplotlib.pyplot as plt

x  = np.array([2,6,7,8])

y = np.array([16,7,8,9])

n = np.size(x)

n_x = np.mean(x)

n_y = np.mean(y)

SS__xy = np.sum(y*x)-n* n_y*n_x

SS__xx = np.sum(x*x)-n* n_x*n_x

b_1 = SS__xy/SS__xx

b_0 = n_y - b_1*n_x

y_pred = b_1 * x + b_0

print(y_pred)

plt.scatter(x, y, color='red')

plt.plot(x, y_pred, color='green')

plt.xlabel('X')

plt.ylabel('y')

plt.show()
```

OUTPUT



C:/Users/ajcemca/PycharmProjects/Aravind/linear2.py

[15.06024096 9.6626506 8.31325301 6.96385542]

PROGRAM NO : 08 **Date :15/12/2021**

AIM : Program to implement Linear and Multiple regression techniques using cars dataset available in public domain and evaluate its performance

PROGRAM CODE

```
import pandas

from sklearn import linear_model

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

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

y = df['CO2']

regr = linear_model.LinearRegression()

regr.fit(X, y)

#predict the CO2

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

print(predictedCO2)
```

OUTPUT

```
C:/Users/ajcemca/PycharmProjects/Aravind/MLR.py

 [107.2087328]

Process finished with exit code 0
```

PROGRAM NO : 09 **Date :15/12/2021**

AIM : Program to implement multiple linear regression techniques using Boston dataset available in the public domain and evaluate its performance and plotting graph.

PROGRAM CODE

```
import matplotlib.pyplot as plt

import numpy as np

from sklearn import datasets, linear_model, metrics

from sklearn.metrics import r2_score

boston = datasets.load_boston(return_X_y=False)

X = boston.data

y = boston.target

from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.4,random_state=1)

reg = linear_model.LinearRegression()

reg.fit(X_train, y_train)

V=reg.predict(X_test)

result=r2_score(y_test, V)

print("accuracy :", result)

print('Coefficients: ', reg.coef_)

print('Variance score:{}'.format(reg.score(X_test, y_test)))
```

OUTPUT

accuracy : 0.7209056672661767

Coefficients: [-8.95714048e-02 6.73132853e-02 5.04649248e-02 2.18579583e+00

-1.72053975e+01 3.63606995e+00 2.05579939e-03 -1.36602886e+00

2.89576718e-01 -1.22700072e-02 -8.34881849e-01 9.40360790e-03

-5.04008320e-01]

Variance score:0.7209056672661767

Process finished with exit code 0

PROGRAM NO : 10 **Date :22/12/2021**

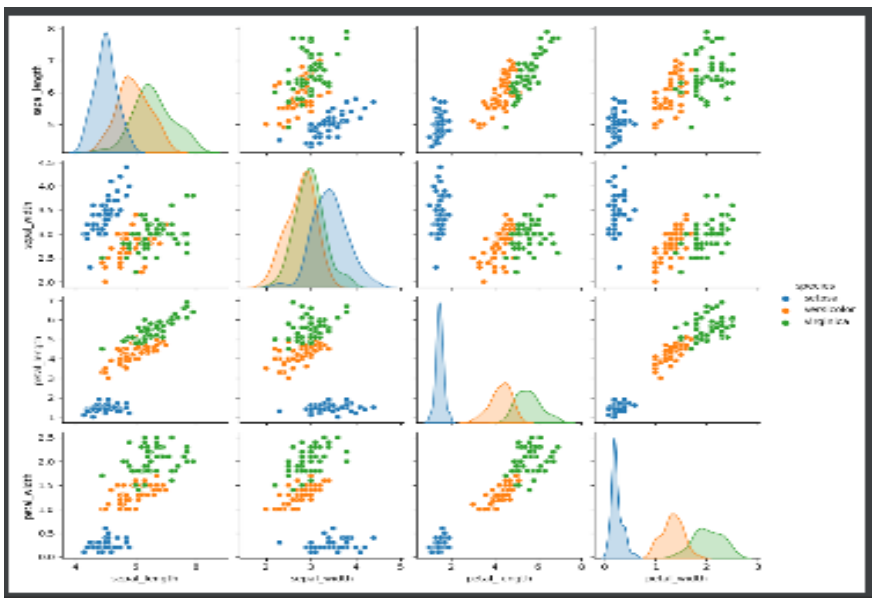
AIM : Program to implement decision tree using any standard dataset available in the public domain and find the accuracy of the algorithm

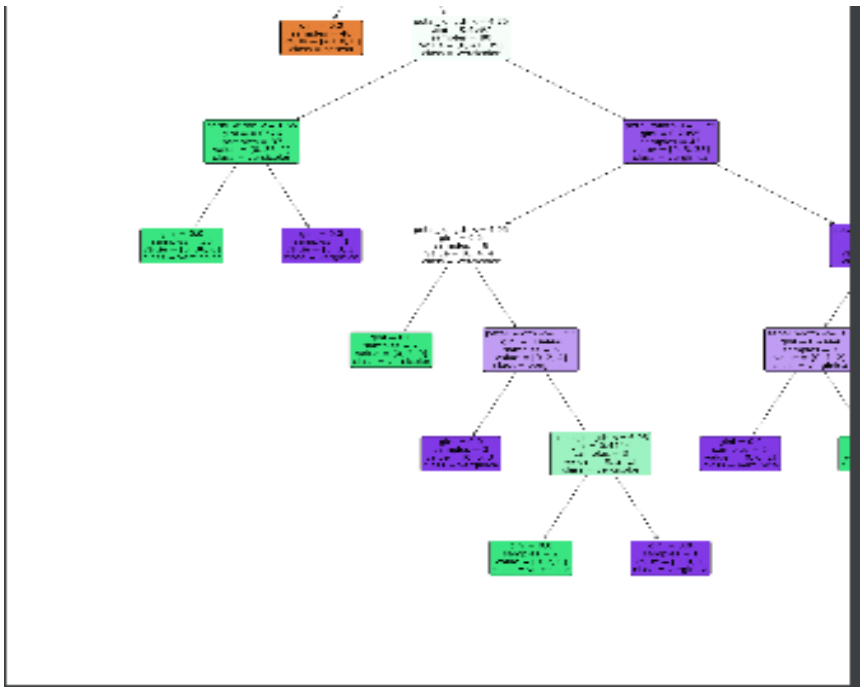
PROGRAM CODE

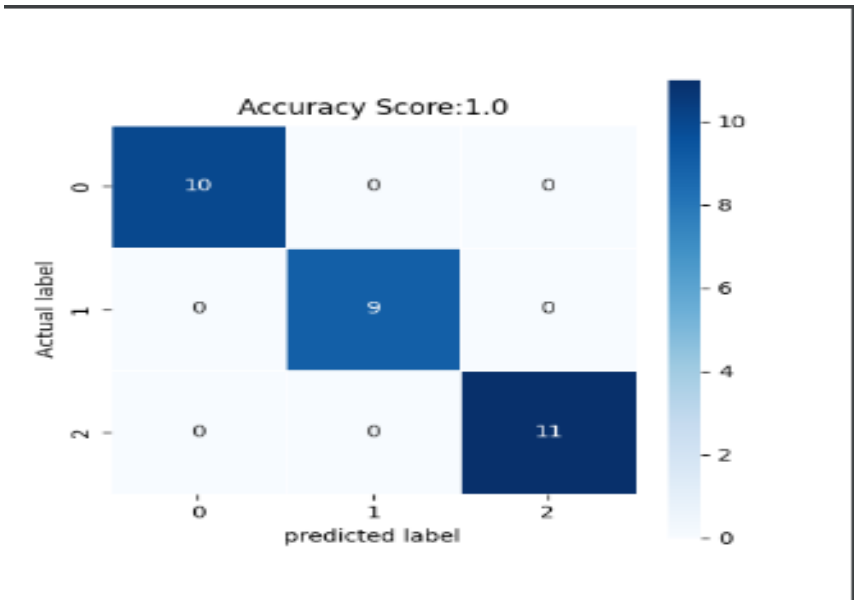
```
Import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from  sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from  sklearn.tree import DecisionTreeClassifier
from  sklearn.metrics import classification_report, confusion_matrix
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("next.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("test split input",x_test.shape)
dtree=DecisionTreeClassifier()
dtree.fit(x_train, y_train)
print("decision tree classifer 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=12)
plt.savefig("two.png")
plt.figure(figsize=(20,20))
dec_tree=plot_tree(decision_tree=dtree,feature_names=df1.columns,class_names=["setosa","vercic
olor","verginica"],filled=True ,precision=4,rounded=True)
plt.savefig("three.png")
```

OUTPUT






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

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 CODE

```
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('predict=',y_predict)

mtp.scatter(x[y_predict==0,0],x[y_predict==0,1],s=100,c='blue',label='Cluster 1')

mtp.scatter(x[y_predict==1,0],x[y_predict==1,1],s=100,c='red',label='Cluster 2')

mtp.scatter(x[y_predict==2,0],x[y_predict==2,1],s=100,c='green',label='Cluster 3')

mtp.scatter(x[y_predict==3,0],x[y_predict==3,1],s=100,c='yellow',label='Cluster 4')

mtp.scatter(x[y_predict==4,0],x[y_predict==4,1],s=100,c='magenta',label='Cluster 5')

mtp.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],s=300,c='black')

mtp.title('Clusters of Customer')

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

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

mtp.legend();

mtp.show()
```

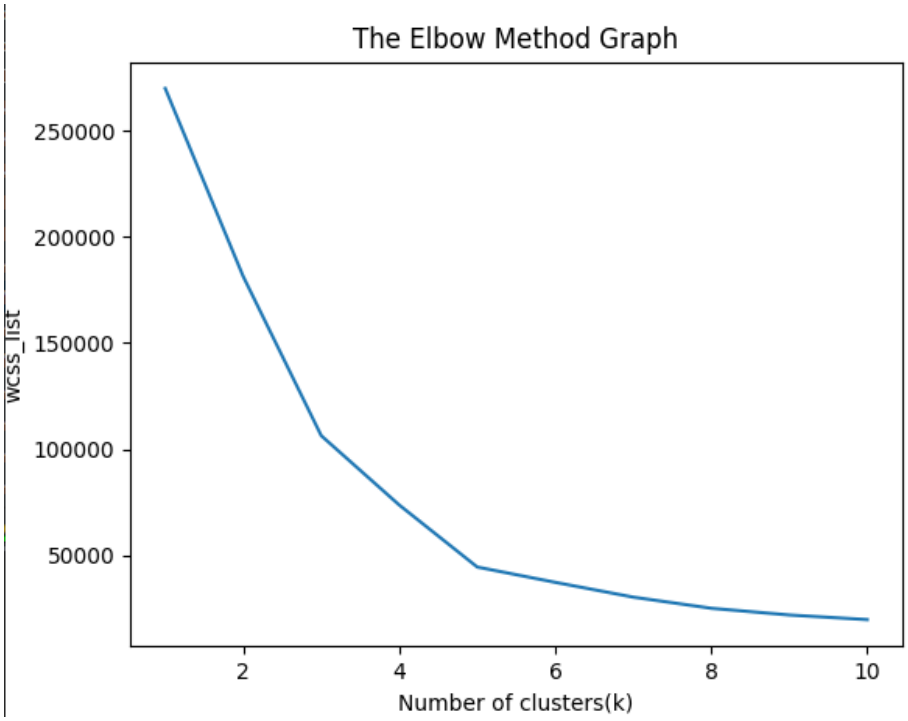
OUTPUT

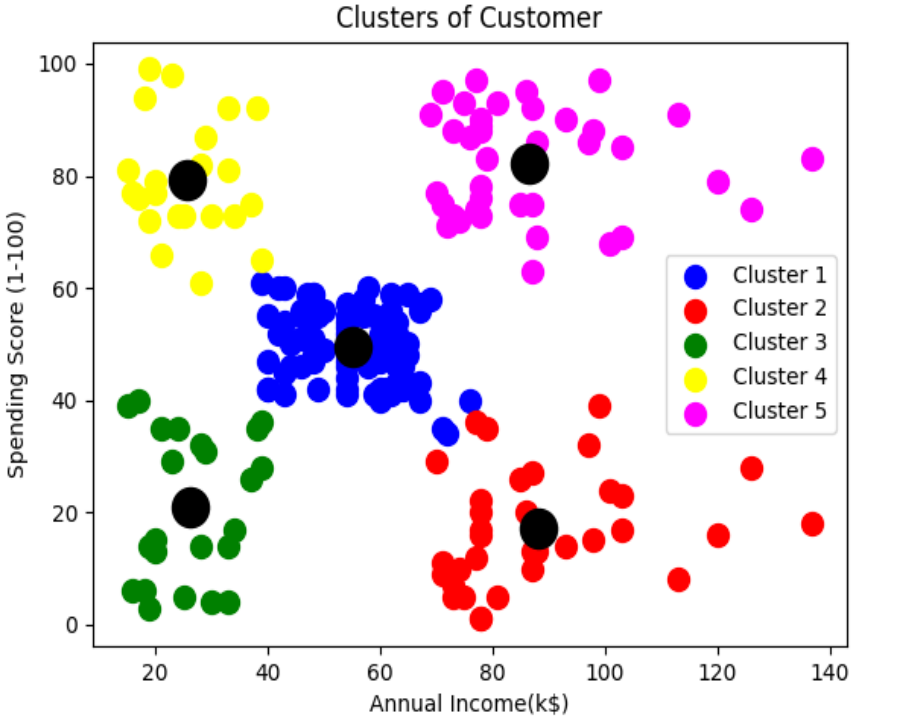
```
C:/Users/ajcemca/PycharmProjects/Aravind/kmeans.py

[[ 15  39]….

 [137  18]

 [137  83]]

predict= [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 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]





PROGRAM NO : 12 **Date :05/01/2022**

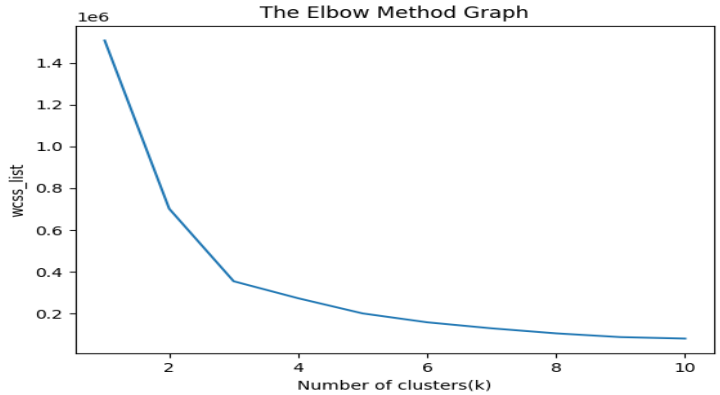
AIM : Program to implement K-Means clustering technique using any standard dataset available in the public domain.

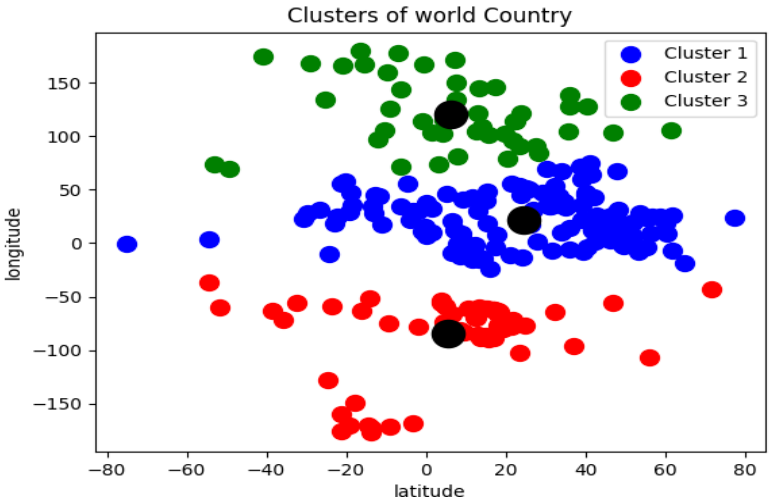
PROGRAM CODE

```
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('predict=',y_predict)
```

```
mtp.scatter(x[y_predict==0,0],x[y_predict==0,1],s=100,c='blue',label='Cluster 1')

mtp.scatter(x[y_predict==1,0],x[y_predict==1,1],s=100,c='red',label='Cluster 2')

mtp.scatter(x[y_predict==2,0],x[y_predict==2,1],s=100,c='green',label='Cluster 3')

mtp.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],s=300,c='black')

mtp.title('Clusters of world Country')

mtp.xlabel('latitude')

mtp.ylabel('longitude')

mtp.legend();

mtp.show()
```

OUTPUT





PROGRAM NO : 13 **Date :02/02/2022**

AIM : Programs on convolutional neural network to classify images from any standard dataset in the public domain.

PROGRAM CODE

```
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

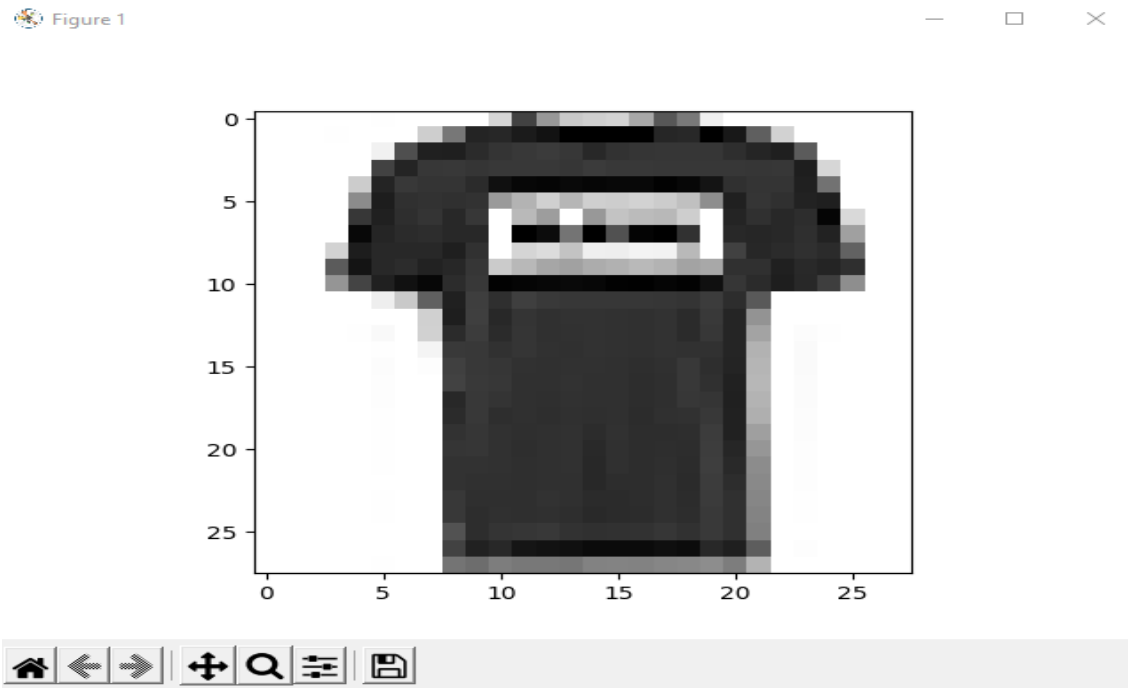
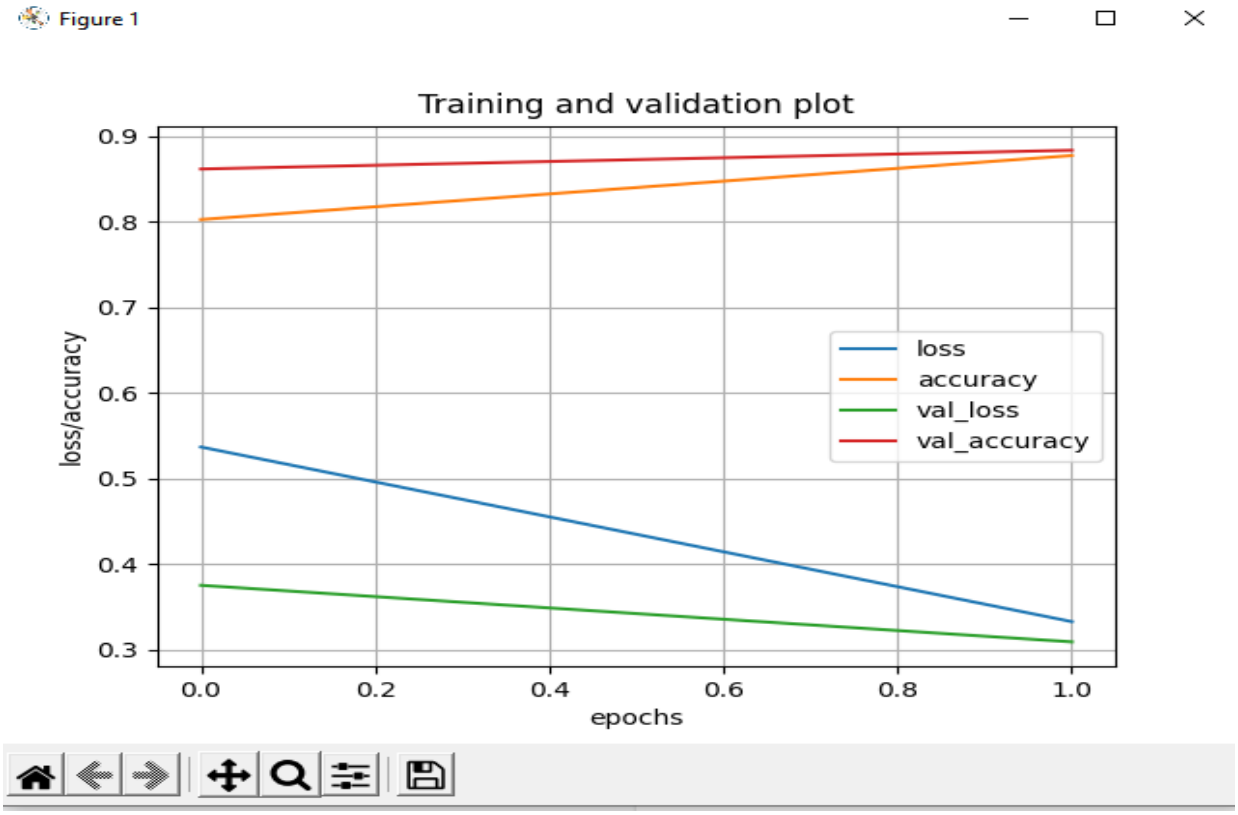


Figure 1
0
5
10
15
20
25
0
5
10
15
20
25


Figure 1
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




```
 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 [==============================] - 104s 61ms/step - loss: 0.5369 - accuracy: 0.8024 - val_loss: 0.3755 - val_accuracy: 0.8613
Epoch 2/2
1688/1688 [==============================] - 103s 61ms/step - loss: 0.3332 - accuracy: 0.8770 - val_loss: 0.3096 - val_accuracy: 0.8832
```

PROGRAM NO : 14 **Date :16/02/2022**

AIM : Program to implement a simple web crawler using python.

PROGRAM CODE

```
import requests

import lxml

from bs4 import BeautifulSoup

#import beautifulsoup4

url = "https://www.rottentomatoes.com/top/bestofrt/"

headers = { 'User-Agents' : 'Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/63.0.3239.132 Safari/537.36 QIHU 36OSE'}

f = requests.get(url, headers = headers)

movies_list = []

soup = BeautifulSoup(f.content, 'html.parser')

movies = soup.find('table', {'class' : 'table'}) .find_all('a')

print(movies)

num = 0

for anchor in movies:

        urls = 'https://www.rottentomatoes.com' + anchor['href']

   movies_list.append(urls)

print(movies_list)

num +=1

movie_url=urls

#movie_url=movies_lst

movie_f=requests.get(movie_url,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 info:' + movie_content.string.strip())
```

OUTPUT

PROGRAM NO : 15 **Date :16/02/2022**

AIM : Program to implement a 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.wikipedia.org{link['href']}"
            pages_crawled.append(link['href'])
            try:
               with open('data.csv','a') as file:
                    file.write(f'{soup.title.text}:{link["href"]}\n')
                crawler(new_link)
            except:
               continue

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

OUTPUT


Reader Mode
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/SS_Choctaw
Wikipedia, the free encyclopedia; Main Page; /wiki/Cargo_ship
Wikipedia, the free encyclopedia; Main Page; /wiki/Great_Lakes
Wikipedia, the free encyclopedia; Main Page; /wiki/Lake_freighter
Wikipedia, the free encyclopedia; Main Page; /wiki/Whaleback
Wikipedia, the free encyclopedia; Main Page; /wiki/Alexander_McDougall_(ship_designer)
Wikipedia, the free encyclopedia; Main Page; /wiki/American_Ship_Building_Company
Wikipedia, the free encyclopedia; Main Page; /wiki/Cleveland
Wikipedia, the free encyclopedia; Main Page; /wiki/Michigan
Wikipedia, the free encyclopedia; Main Page; /wiki/Detroit
Wikipedia, the free encyclopedia; Main Page; /wiki/Escanaba,_Michigan
Wikipedia, the free encyclopedia; Main Page; /wiki/Marquette,_Michigan
Wikipedia, the free encyclopedia; Main Page; /wiki/Glossary_of_nautical_terms#upbound
Wikipedia, the free encyclopedia; Main Page; /wiki/Iron_ore
Wikipedia, the free encyclopedia; Main Page; /wiki/Lake_Huron
Wikipedia, the free encyclopedia; Main Page; /wiki/New_Presque_Isle_Light
Wikipedia, the free encyclopedia; Main Page; /wiki/Glossary_of_nautical_terms#canaller
Wikipedia, the free encyclopedia; Main Page; /wiki/National_Register_of_Historic_Places

PROGRAM NO : 16 **Date :16/02/2022**

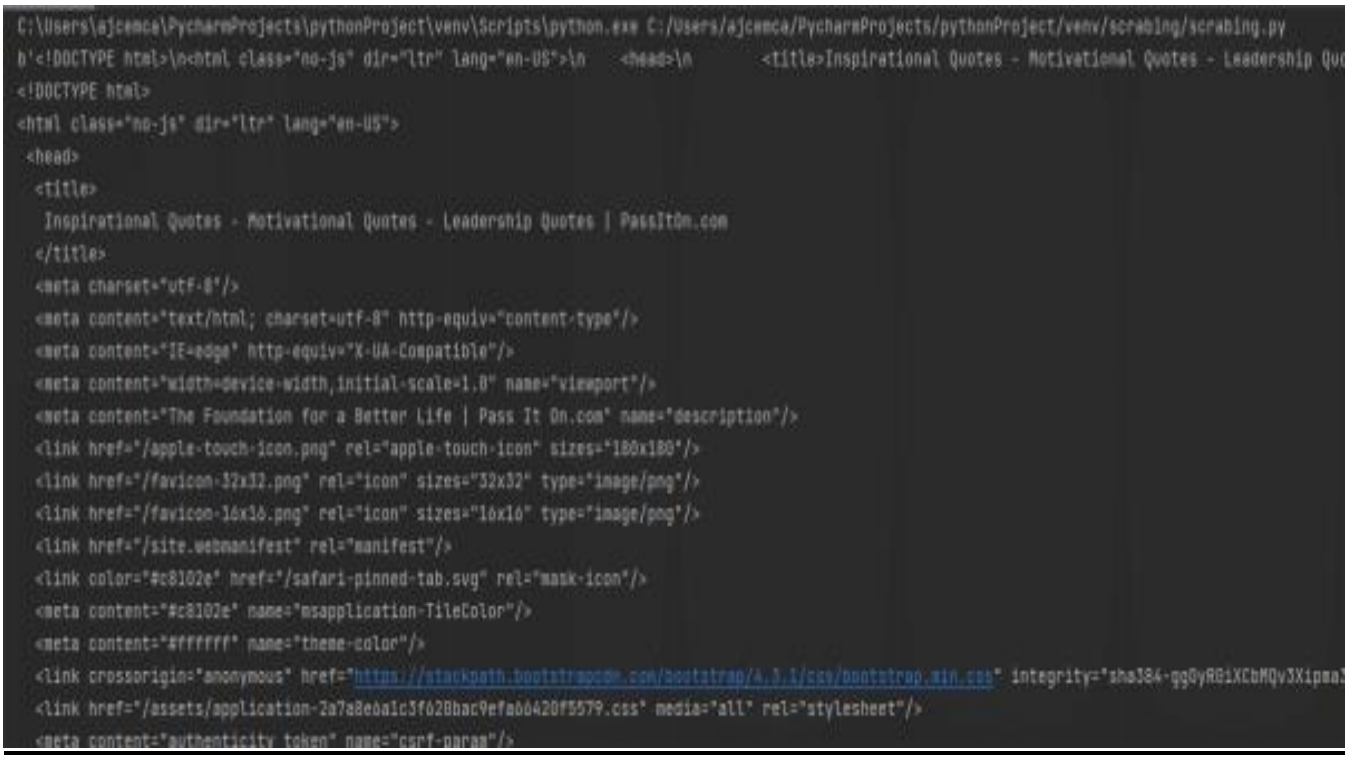
AIM : Program to implement scrap of any website.

PROGRAM CODE

```
import requests
from bs4 import BeautifulSoup
import csv
URL = "http://www.values.com/inspirational-quotes"
r = requests.get(URL)
print(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'].split(" #")[1]
    quotes.append(quote)
```

```
filename = 'inspirational_quotes.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



PROGRAM NO : 17 **Date :16/02/2022**

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:i +WordsToCombine])
        return output
x=generate_ngrams(text='this is a very good book to study',WordsToCombine=3)
print(x)
```

OUTPUT

```
[['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 NO : 18 **Date :16/02/2022**

AIM : Program for Natural Language Processing which performs n-grams (Using in built functions).

PROGRAM CODE

```
import nltk

nltk.download('punkt')

from nltk.util import ngrams

sampleText='this is a very good book to study'

NGRAMS=ngrams(sequence=nltk.word_tokenize(sampleText),n=2)

for grams in NGRAMS:

        print(grams)
```

OUTPUT

```
('this', 'is')

('is', 'a')

('a', 'very')

('very', 'good')

('good', 'book')

('book', 'to')

('to', 'study')

Process finished with exit code 0
```

PROGRAM NO : 19 **Date :16/02/2022**

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('averaged_perceptron_tagger')
stop_words=set(stopwords.words('english'))
txt="Ammu,How are you."\
        "Archana,i am fine.How are you"\
        "Sukanya is getting married next year"\
        "Marriage is a big step in ones life"\
        "yes it is a big event"\
        "okey bye Ammu."
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

[('Ammu', 'NNP'), (',', ','), ('How', 'NNP'), ('you.Archana', 'NNP'), (',', ','), ('fine.How', 'NN'), ('youSukanya', 'RB'), ('getting', 'VBG'), ('married', 'VBN'), ('next', 'JJ'), ('yearMarriage', 'NN'), ('big', 'JJ'), ('step', 'NN'), ('ones', 'NNS'), ('lifeyes', 'RB'), ('big', 'JJ'), ('eventokey', 'NN'), ('bye', 'NN'), ('Ammu', 'NNP'), ('.', '.')]

Process finished with exit code 0

PROGRAM NO : 20 **Date :23/02/2022**

AIM : Program for Natural Language Processing which performs Chunking.

PROGRAM CODE

```
import nltk
new="The big cat ate the little 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()
```

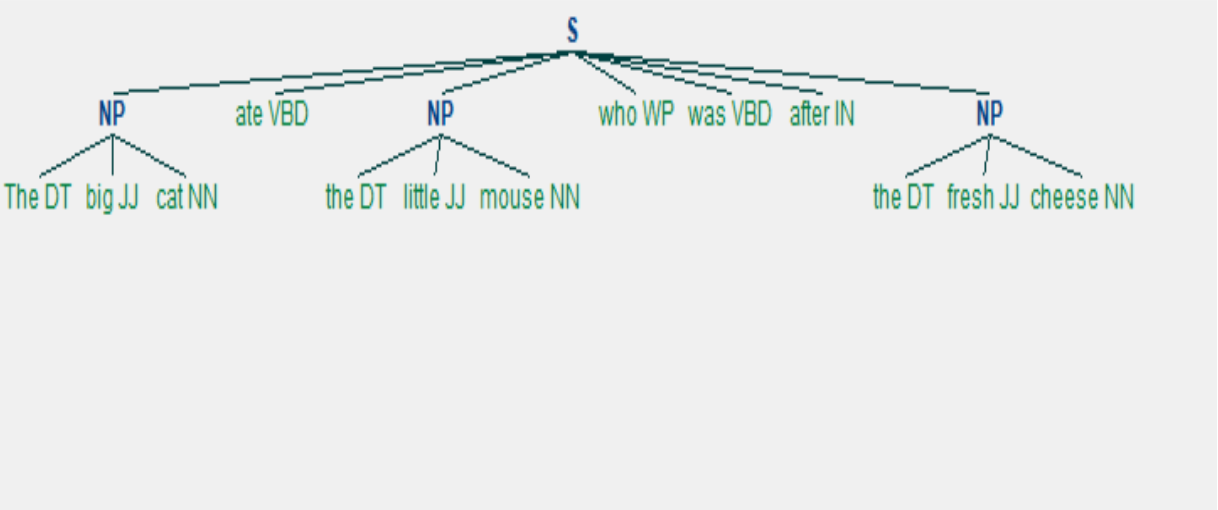
OUTPUT

```
['The', 'big', 'cat', 'ate', 'the', 'little', 'mouse', 'who', 'was', 'after', 'the', 'fresh', 'cheese']

[('The', 'DT'), ('big', 'JJ'), ('cat', 'NN'), ('ate', 'VBD'), ('the', 'DT'), ('little', 'JJ'), ('mouse', 'NN'), ('who', 'WP'), ('was', 'VBD'), ('after', 'IN'), ('the', 'DT'), ('fresh', 'JJ'), ('cheese', 'NN')]

(S
  (NP The/DT big/JJ cat/NN)
  ate/VBD
  (NP the/DT little/JJ mouse/NN)
  who/WP
```

was/VBD

after/IN

(NP the/DT fresh/JJ cheese/NN))



PROGRAM NO : 21 **Date: 23-02-2022**

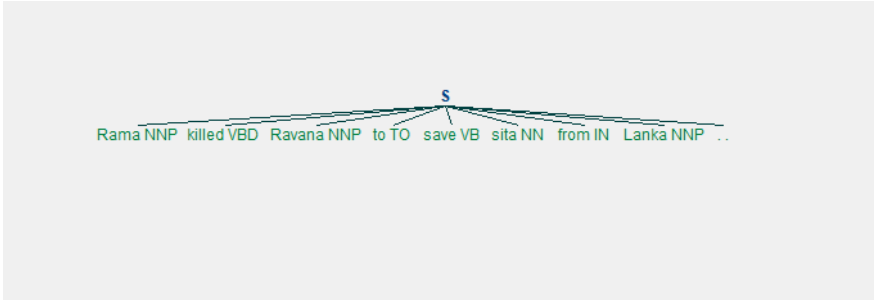
Aim: Write a python program for natural program language processing with chunking.

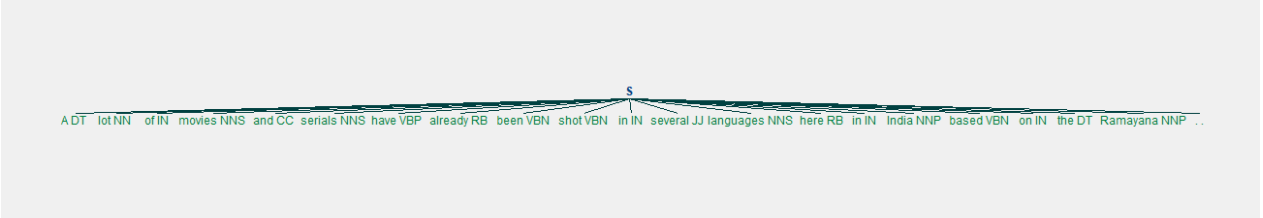
Program:

```
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: {}"""

    chunkParser = nltk.RegexpParser(chunkGram)

    chunked = chunkParser.parse(tagged_words)

    print(chunked)

    chunked.draw()
```

Output:

```
C:\Users\ajcemca\PycharmProjects\Anilect\venv\Scripts\python.exe C:/Users/ajcemca/PycharmProjects/Anilect/chunk2.py
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     C:\Users\ajcemca\AppData\Roaming\nltk_data...
[nltk_data]   Package averaged_perceptron_tagger is already up-to-
[nltk_data]       date!
(S
  Rama/NNP
  killed/VBD
  Ravana/NNP
  to/TO
  save/VB
  sita/NN
  from/IN
  Lanka/NNP
  ./.)
```


S
Rama NNP killed VBD Ravana NNP to TO save VB sita NN from IN Lanka NNP .


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 .