
# GR22 Regulations

## III B.Tech I Semester

## Machine Learning Lab

## (GR22A3142)

Department of Computer Science and Engineering

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**MACHINE LEARNING LAB**

**Course code: GR22A3142** **L/T/P/C: 0/0/3/1.5**

**Prerequisites:**

1. Mastery of introduction-level algebra, statistics, and probability theory
2. Proficiency in basic programming skills and coding experience in Python or R programming

**Course Outcomes:**

1. Illustrate the applications of python's machine learning libraries.
2. Apply dimensionality reduction techniques in machine learning applications.
3. Design and analyze various supervised learning mechanisms.
4. Develop back propagation and Random Forest algorithms.
5. Design and analyze various unsupervised learning algorithms.

**Note:** Implement the following Machine Learning Tasks using Python / R-Tool

**Task 1:** Write a python program to import and export data using Pandas library functions.

**Task 2:** Demonstrate various data pre-processing techniques for a given dataset.

**Task 3:** Implement Dimensionality reduction using Principle Component Analysis (PCA) method.

**Task 4:** Write a Python program to demonstrate various Data Visualization Techniques.

**Task 5:** Implement Simple and Multiple Linear Regression Models.

**Task 6:** Develop Logistic Regression Model for a given dataset.

**Task 7:** Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.

**Task 8:** Implement Naïve Bayes Classification in Python

**Task 9:** Build KNN Classification model for a given dataset.

**Task 10:** Implement Back propagation model in python for a given dataset.

**Task 11:** a) Implement Random Forest classification method in python for a given dataset.

b) Implement Boosting ensemble method on a given dataset.

**Task 12:** a) Write a python program to implement K-Means clustering Algorithm.

b) Write a python program to implement BIRCH algorithm.

# INDEX

# TASK-1

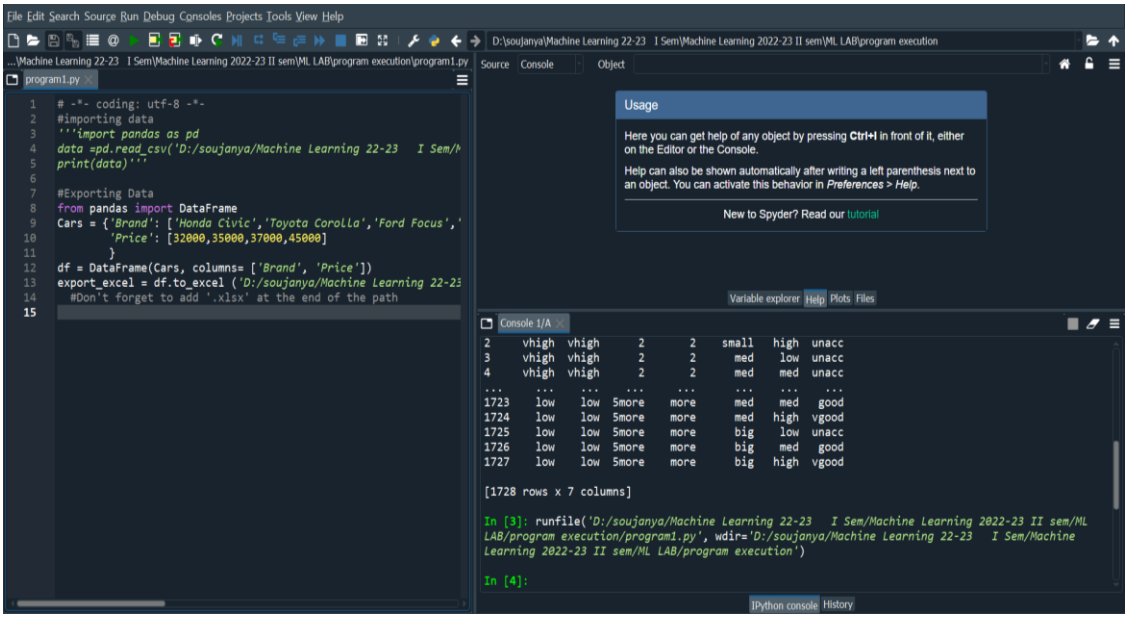
**Task-1:** Write a python program to import and export data using Pandas library functions

**Aim:** To implement a Python script for importing and exporting data using Pandas in Python

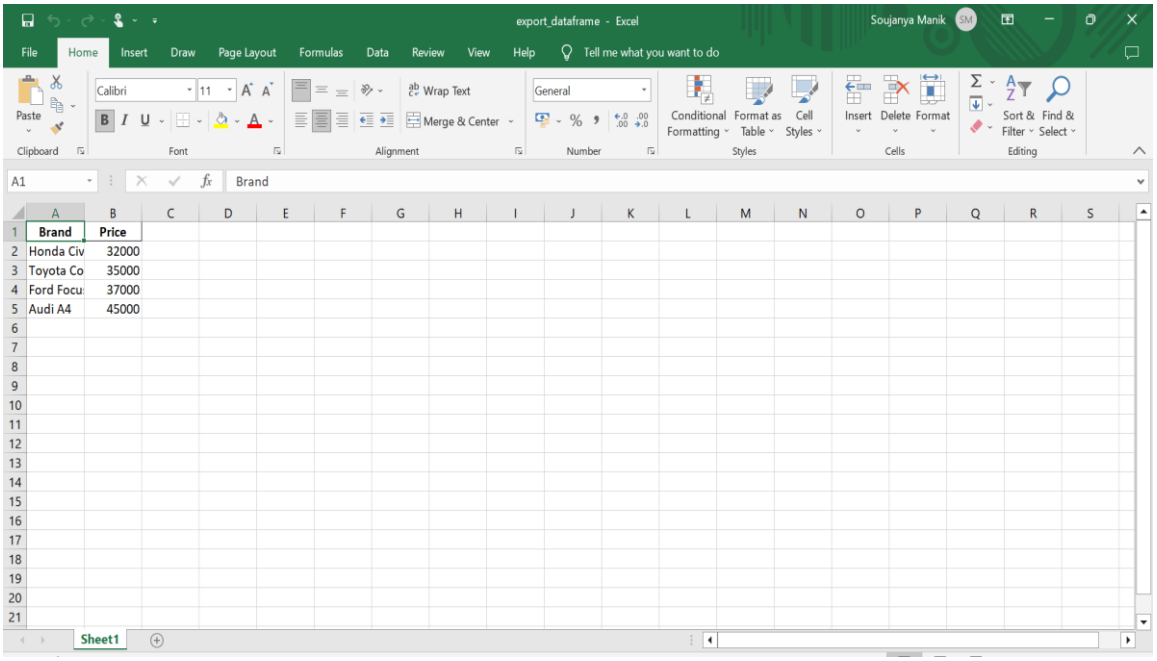
## Program:

```
# Import Data from local disk to Python Environment
#importing data
import pandas as pd

data =pd.read_csv('D:/soujanya/Machine Learning 22-23   I Sem/Machine Learning 2022-23 II sem/ML LAB/cardata.csv', names=['buying','maint','doors','persons','lug_boot','safety','class'])

print(data)

#Exporting Data

from pandas import DataFrame

Cars = {'Brand': ['Honda Civic','Toyota Corolla','Ford Focus','Audi A4'],

        'Price': [32000,35000,37000,45000]

       }

df = DataFrame(Cars, columns= ['Brand', 'Price'])

export_excel = df.to_excel ('D:/soujanya/Machine Learning 22-23   I Sem/Machine Learning 2022-23 II sem/ML LAB/export_dataframe.xlsx', index = None, header=True)

 #Don't forget to add '.xlsx' at the end of the path
```

## Output:



# After Export:



# TASK-2

**Task-2**: Demonstrate various data pre-processing techniques for given dataset

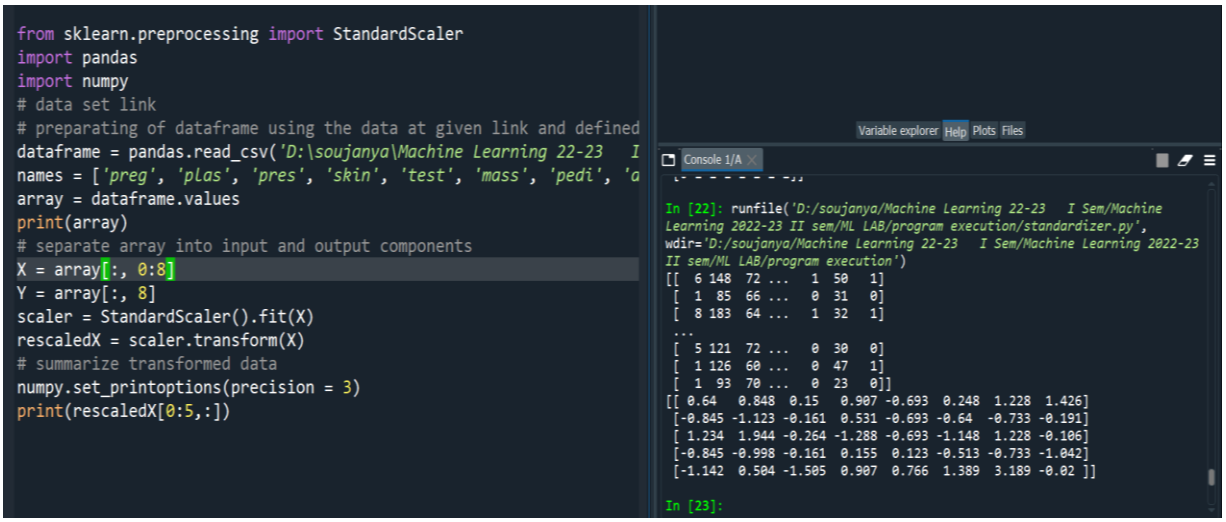
**Aim:** To provide various data pre-processing techniques for a given data set are there.

They are a) **Standard Scaler b) Binarizer c) Min MaxScaler**

**a) Standard Scaler**

```
from sklearn.preprocessing import StandardScaler
import pandas
import numpy
# data set link
# preparating of dataframe using the data at given link and defined columns list
dataframe = pandas.read_csv('D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning 2022-23 II sem\ML LAB\diabetes.csv', names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class'])
array = dataframe.values
print(array)
# separate array into input and output components
X = array[:, 0:8]
Y = array[:, 8]
scaler = StandardScaler().fit(X)
rescaledX = scaler.transform(X)
# summarize transformed data
numpy.set_printoptions(precision = 3)
print(rescaledX[0:5,:])
```

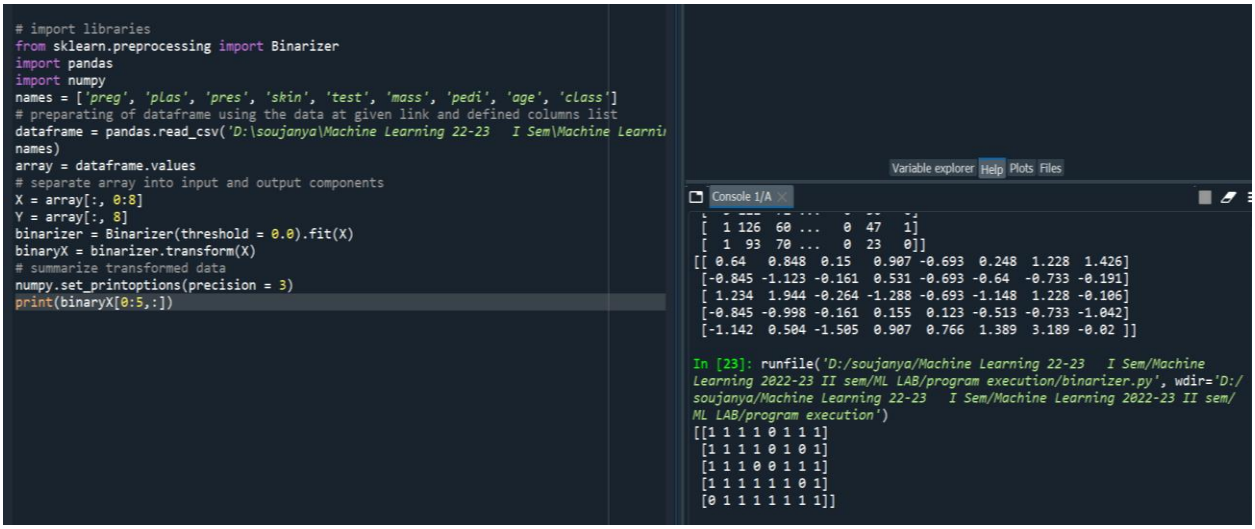
## Output:




### b) Binarizer

```
# import libraries
from sklearn.preprocessing import Binarizer
import pandas
import numpy
names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']
# preparating of dataframe using the data at given link and defined columns list
dataframe = pandas.read_csv('D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning 2022-23 II sem\ML LAB\diabetes.csv', names = names)
array = dataframe.values
# separate array into input and output components
X = array[:, 0:8]
Y = array[:, 8]
binarizer = Binarizer(threshold = 0.0).fit(X)
binaryX = binarizer.transform(X)
# summarize transformed data
numpy.set_printoptions(precision = 3)
print(binaryX[0:5,:])
```

## Output:




### c) MinMaxScaler

```
# import libraries
import pandas
import scipy
import numpy
from sklearn.preprocessing import MinMaxScaler
names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi','age','class']
# preparating of dataframe using the data at given link and defined columns list
dataframe = pandas.read_csv('D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning 2022-23 II sem\ML LAB\diabetes.csv', names = names)
array = dataframe.values
# separate array into input and output components
X = array[:,0:8]
Y = array[:,8]
# initialising the MinMaxScaler
scaler = MinMaxScaler(feature_range=(0, 1))
# learning the statistical parameters for each of the data and transforming
rescaledX = scaler.fit_transform(X)
# summarize transformed data
numpy.set_printoptions(precision=2)
print(rescaledX[0:10,:])
```

## Output:

```
# importing libraries
import pandas
import scipy
import numpy
from sklearn.preprocessing import MinMaxScaler
names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi','age','class']
# preparating of dataframe using the data at given link and defined columns list
dataframe = pandas.read_csv('D:\soujanya\Machine Learning 22-23   I Sem\Machine Learni
names = names)
array = dataframe.values
# separate array into input and output components
X = array[:,0:8]
Y = array[:,8]
# initialising the MinMaxScaler
scaler = MinMaxScaler(feature_range=(0, 1))
# learning the statistical parameters for each of the data and transforming
rescaledX = scaler.fit_transform(X)
# summarize transformed data
numpy.set_printoptions(precision=2)
print(rescaledX[0:10,:])
```

Variable explorer Help Plots Files

Console 1/A

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

In [24]: runfile('D:/soujanya/Machine Learning 22-23   I Sem/Machine
Learning 2022-23 II sem/ML LAB/program execution/minmaz1.py', wdir='D:/
soujanya/Machine Learning 22-23   I Sem/Machine Learning 2022-23 II sem/
ML LAB/program execution')
[[0.35 0.74 0.59 0.35 0.   0.51 0.5  0.48]
 [0.06 0.43 0.54 0.29 0.   0.4  0.   0.17]
 [0.47 0.92 0.52 0.   0.   0.34 0.5  0.18]
 [0.06 0.45 0.54 0.23 0.11 0.42 0.   0.  ]
 [0.   0.69 0.33 0.35 0.2  0.64 1.   0.2 ]
 [0.29 0.58 0.61 0.   0.   0.39 0.   0.15]
 [0.18 0.39 0.41 0.32 0.1  0.46 0.   0.08]
 [0.59 0.58 0.   0.   0.   0.52 0.   0.13]
 [0.12 0.99 0.57 0.45 0.64 0.46 0.   0.53]
 [0.47 0.63 0.79 0.   0.   0.   0.   0.55]]

In [25]:
```

# TASK-3

**Task-3**: Implement Dimensionality reduction using Principle Component Analysis (PCA) method.

**Aim**: To Implement Principle Component Analysis for Dimensionality Reduction

**Program:**

```
from numpy import array
from numpy import mean
from numpy import cov
from numpy.linalg import eig
# define a matrix
A = array([[1, 2], [3, 4], [5, 6]])
print(A)
# calculate the mean of each column
M = mean(A.T, axis=1)
print(M)
# center columns by subtracting column means
C = A - M
print(C)
# calculate covariance matrix of centered matrix
V = cov(C.T)
print(V)
# eigen decomposition of covariance matrix
values, vectors = eig(V)
print(vectors)
print(values)
# project data
P = vectors.T.dot(C.T)
print(P.T)
```

# Output:

```
from numpy import array
from numpy import mean
from numpy import cov
from numpy.linalg import eig
# define a matrix
A = array([[1, 2], [3, 4], [5, 6]])
print(A)
# calculate the mean of each column
M = mean(A.T, axis=1)
print(M)
# center columns by subtracting column means
C = A - M
print(C)
# calculate covariance matrix of centered matrix
V = cov(C.T)
print(V)
# eigendecomposition of covariance matrix
values, vectors = eig(V)
print(vectors)
print(values)
# project data
P = vectors.T.dot(C.T)
print(P.T)
```

```
parenthesis next to an object. You can activate this
behavior in Preferences > Help.

New to Spyder? Read our tutorial

Variable explorer Help Plots Files

Console 1/A
soujanya/Machine Learning 22-23   I Sem/Machine Learning 2022-23 II sem/
ML LAB/program execution')
[[1 2]
 [3 4]
 [5 6]]
[3. 4.]
[[-2. -2.]
 [ 0.  0.]
 [ 2.  2.]]
[[4. 4.]
 [4. 4.]]
[[ 0.70710678 -0.70710678]
 [ 0.70710678  0.70710678]]
[8. 0.]
[[-2.82842712  0.        ]
 [ 0.          0.        ]
 [ 2.82842712  0.        ]]

In [2]:
```

# TASK-4

**Task 4**: Write a Python program to demonstrate various Data Visualization Techniques

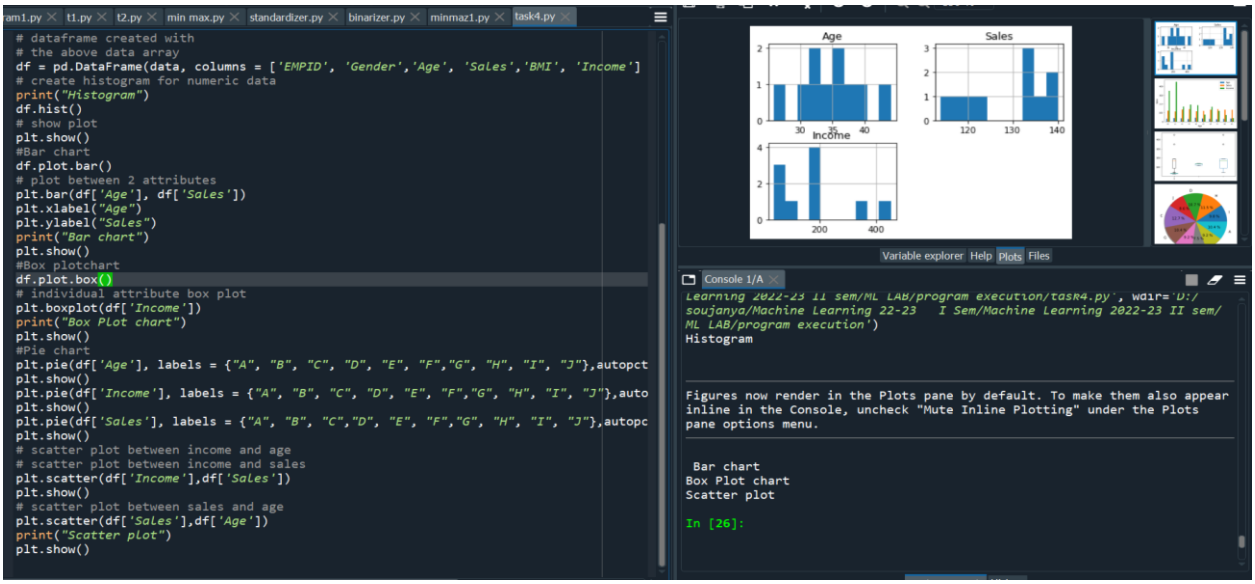
**Aim**: To implement various visualization techniques in python.

**Program:**

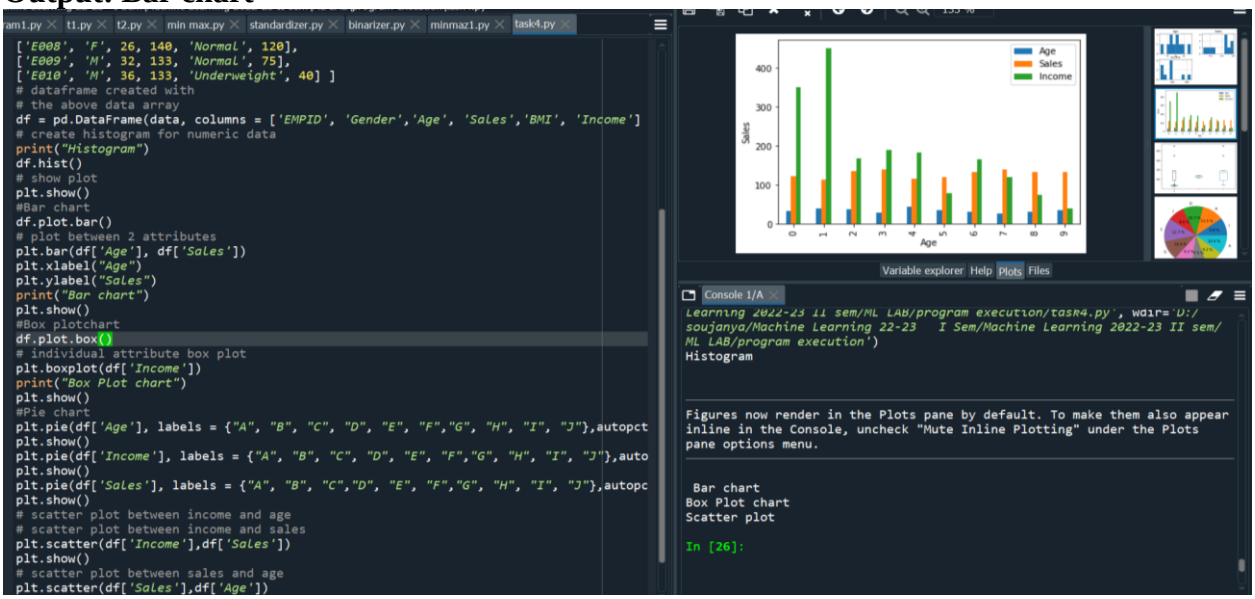
```
import pandas as pd
import matplotlib.pyplot as plt
# create 2D array of table given below
data = [['E001', 'M', 34, 123, 'Normal', 350],
['E002', 'F', 40, 114, 'Overweight', 450],
['E003', 'F', 37, 135, 'Obesity', 169],
['E004', 'M', 30, 139, 'Underweight', 189],
['E005', 'F', 44, 117, 'Underweight', 183],
['E006', 'M', 36, 121, 'Normal', 80],
['E007', 'M', 32, 133, 'Obesity', 166],
['E008', 'F', 26, 140, 'Normal', 120],
['E009', 'M', 32, 133, 'Normal', 75],
['E010', 'M', 36, 133, 'Underweight', 40] ]
# dataframe created with
# the above data array
df = pd.DataFrame(data, columns = ['EMPID', 'Gender','Age', 'Sales','BMI', 'Income'] )
# create histogram for numeric data
print("Histogram")
df.hist()
# show plot
plt.show()
#Bar chart
df.plot.bar()
# plot between 2 attributes
plt.bar(df['Age'], df['Sales'])
plt.xlabel("Age")
plt.ylabel("Sales")
print("Bar chart")
plt.show()
#Box plotchart
df.plot.box()
# individual attribute box plot
```

```
plt.boxplot(df['Income'])
print("Box Plot chart")
plt.show()
#Pie chart
plt.pie(df['Age'], labels = {"A", "B", "C", "D", "E", "F","G", "H", "I", "J"},autopct ='% 1.1f %%',
shadow = True)
plt.show()
plt.pie(df['Income'], labels = {"A", "B", "C", "D", "E", "F","G", "H", "I", "J"},autopct ='% 1.1f %%',
shadow = True)
plt.show()
plt.pie(df['Sales'], labels = {"A", "B", "C","D", "E", "F","G", "H", "I", "J"},autopct ='% 1.1f %%',
shadow = True)
plt.show()
# scatter plot between income and age
# scatter plot between income and sales
plt.scatter(df['Income'],df['Sales'])
plt.show()
# scatter plot between sales and age
plt.scatter(df['Sales'],df['Age'])
print("Scatter plot")
plt.show()
```

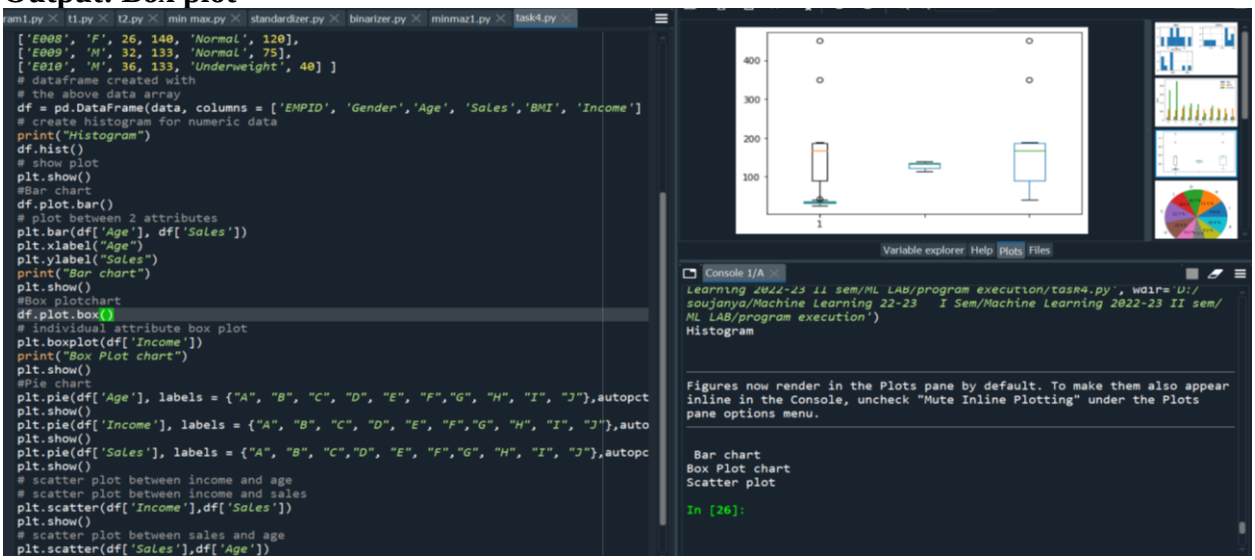
**Output: Histogram**



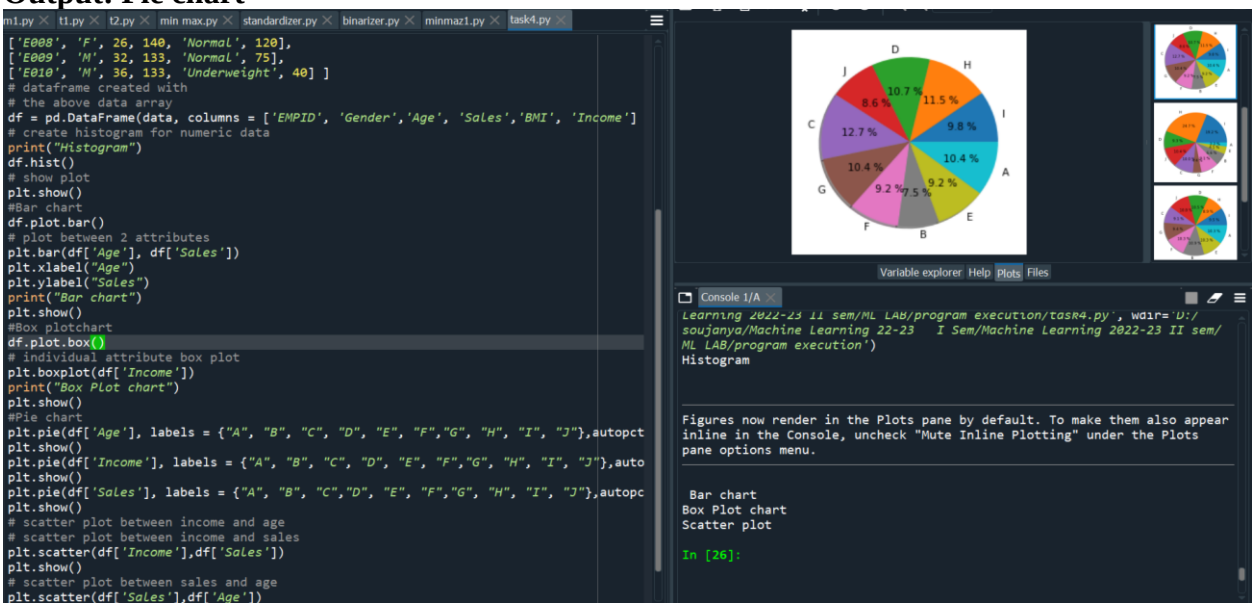
## Output: Bar chart



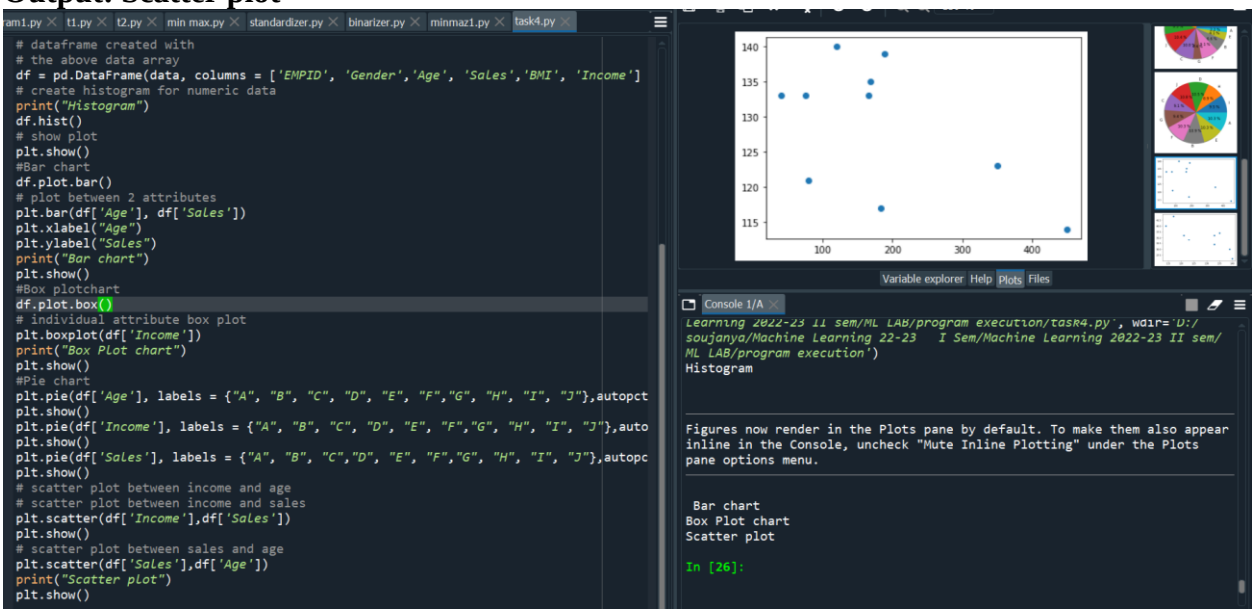

## Output: Box plot




## Output: Pie chart



## Output: Scatter plot



# TASK-5

**Task-5**: Implement Simple and Multiple Linear Regression Models.

**Aim**: To Develop a python program for Simple and Multiple Linear Regression

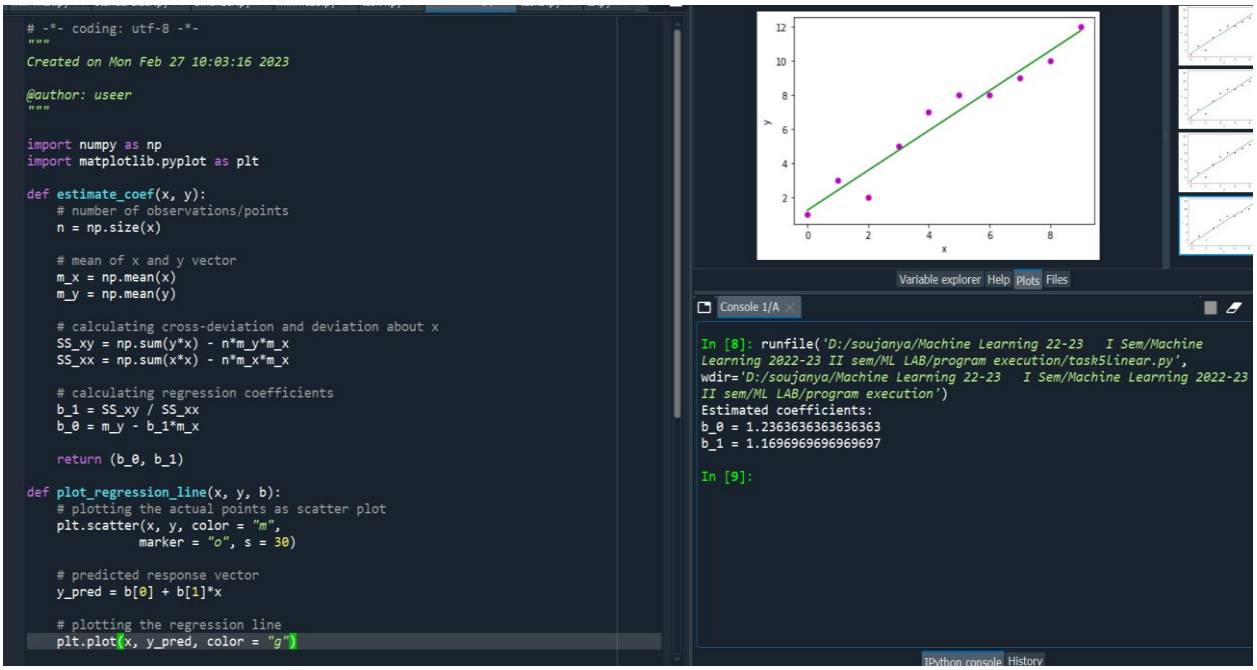
**a) Simple Linear Regression Model**:

**Program:**

```
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()
```

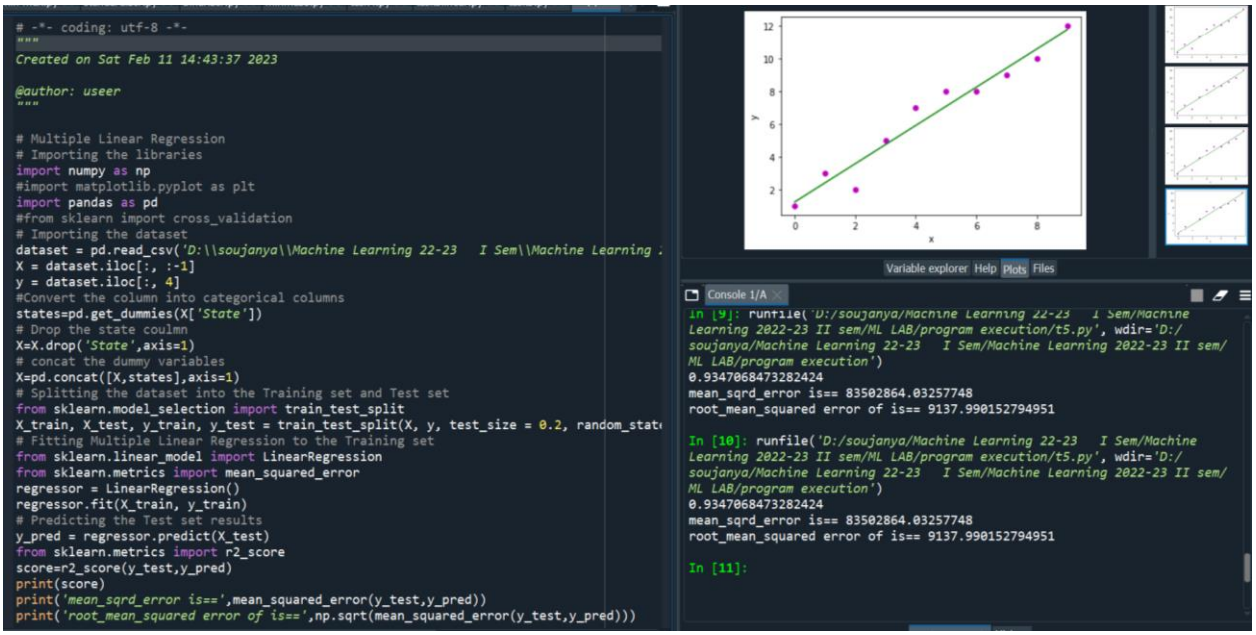
**Output: Linear Regression**



**b) Multiple Linear Regression Model:**

```
# Multiple Linear Regression
# Importing the libraries
import numpy as np
#import matplotlib.pyplot as plt
import pandas as pd
#from sklearn import cross_validation
# Importing the dataset
dataset = pd.read_csv('D:\\soujanya\\Machine Learning 22-23  I Sem\\Machine Learning 2022-23 II
sem\\ML LAB\\50_Startups.csv')
X = dataset.iloc[:, :-1]
y = dataset.iloc[:, 4]
#Convert the column into categorical columns
states=pd.get_dummies(X['State'])
# Drop the state coulmn
X=X.drop('State',axis=1)
# concat the dummy variables
X=pd.concat([X,states],axis=1)
# 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 = 0.2, random_state =0)
# Fitting Multiple Linear Regression to the Training set
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
regressor = LinearRegression()
regressor.fit(X_train, y_train)
# Predicting the Test set results
y_pred = regressor.predict(X_test)
from sklearn.metrics import r2_score
score=r2_score(y_test,y_pred)
print(score)
print('mean_sqrd_error is==',mean_squared_error(y_test,y_pred))
print('root_mean_squared error of is==',np.sqrt(mean_squared_error(y_test,y_pred)))
```

## Output: Multiple Linear Regression



```
# -*- coding: utf-8 -*-
"""
Created on Sat Feb 11 14:43:37 2023

@author: useer
"""

# Multiple Linear Regression
# Importing the libraries
import numpy as np
#import matplotlib.pyplot as plt
import pandas as pd
#from sklearn import cross_validation
# Importing the dataset
dataset = pd.read_csv('D:\\soujanya\\Machine Learning 22-23   I Sem\\Machine Learning .
X = dataset.iloc[:, :-1]
y = dataset.iloc[:, 4]
#Convert the column into categorical columns
states=pd.get_dummies(X['State'])
# Drop the state coulmn
X=X.drop('State',axis=1)
# concat the dummy variables
X=pd.concat([X,states],axis=1)
# 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 = 0.2, random_state
# Fitting Multiple Linear Regression to the Training set
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
regressor = LinearRegression()
regressor.fit(X_train, y_train)
# Predicting the Test set results
y_pred = regressor.predict(X_test)
from sklearn.metrics import r2_score
score=r2_score(y_test,y_pred)
print(score)
print('mean_sqrd_error is==',mean_squared_error(y_test,y_pred))
print('root_mean_squared error of is==',np.sqrt(mean_squared_error(y_test,y_pred)))
```

# TASK-6

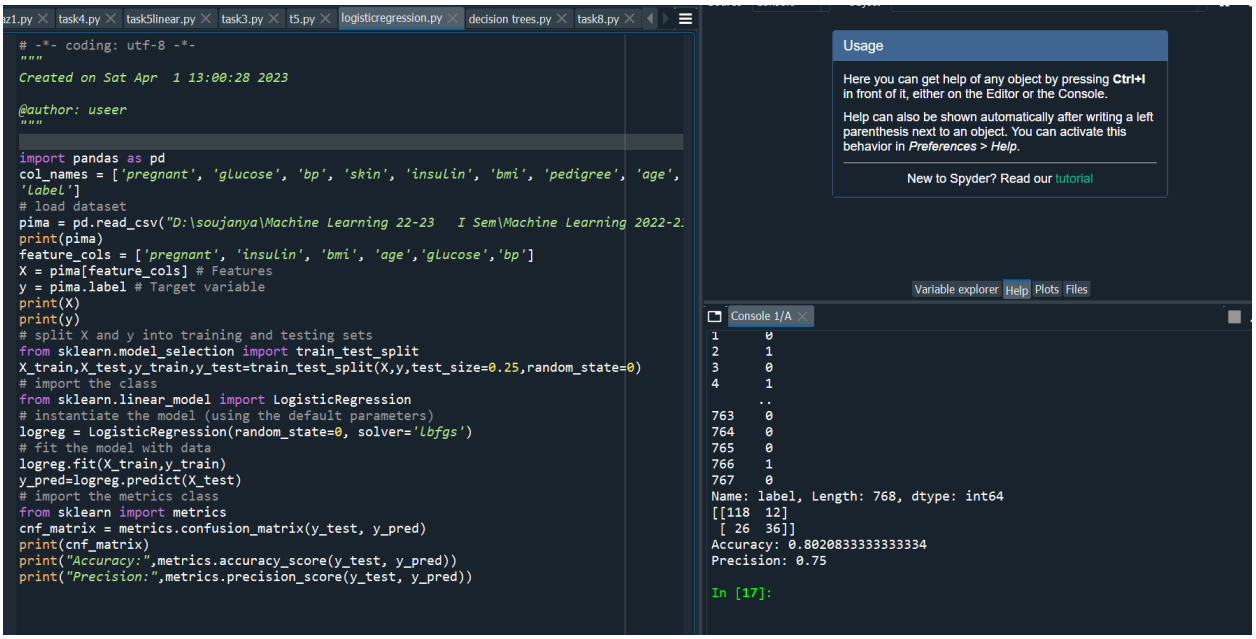
**Task-6**: Develop Logistic Regression Model for a given dataset.

**Aim**: Develop a python program for Logistic Regression

**Program:**

```
import pandas as pd
col_names = ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi', 'pedigree', 'age', 'label']
# load dataset
pima = pd.read_csv("D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning 2022-23 II
sem\ML LAB/diabetes.csv", header=None, names=col_names)
print(pima)
feature_cols = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp']
X = pima[feature_cols]  # Features
y = pima.label  # Target variable
print(X)
print(y)
# split 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=0.25,random_state=0)
# import the class
from sklearn.linear_model import LogisticRegression
# instantiate the model (using the default parameters)
logreg = LogisticRegression(random_state=0, solver='lbfgs')
# fit the model with data
logreg.fit(X_train,y_train)
y_pred=logreg.predict(X_test)
# import the metrics class
from sklearn import metrics
cnf_matrix = metrics.confusion_matrix(y_test, y_pred)
print(cnf_matrix)
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
print("Precision:",metrics.precision_score(y_test, y_pred))
```

## Output:


task4.py
task5linear.py
task3.py
t5.py
logisticregression.py
decision trees.py
task8.py
# -*- coding: utf-8 -*-
"""
Created on Sat Apr 1 13:00:28 2023
@author: useer
"""
import pandas as pd
col_names = ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi', 'pedigree', 'age',
'label']
# load dataset
pima = pd.read_csv("D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning 2022-2
print(pima)
feature_cols = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp']
X = pima[feature_cols] # Features
y = pima.label # Target variable
print(X)
print(y)
# split 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=0.25,random_state=0)
# import the class
from sklearn.linear_model import LogisticRegression
# instantiate the model (using the default parameters)
logreg = LogisticRegression(random_state=0, solver='lbfgs')
# fit the model with data
logreg.fit(X_train,y_train)
y_pred=logreg.predict(X_test)
# import the metrics class
from sklearn import metrics
cnf_matrix = metrics.confusion_matrix(y_test, y_pred)
print(cnf_matrix)
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
print("Precision:",metrics.precision_score(y_test, y_pred))
Usage
Here you can get help of any object by pressing Ctrl+I in front of it, either on the Editor or the Console.
Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in Preferences > Help.
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Help
Plots
Files
Console 1/A
1 0
2 1
3 0
4 1
..
763 0
764 0
765 0
766 1
767 0
Name: label, Length: 768, dtype: int64
[[118 12]
[ 26 36]]
Accuracy: 0.8020833333333334
Precision: 0.75
In [17]:

# TASK-7

**Task-7**: Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.

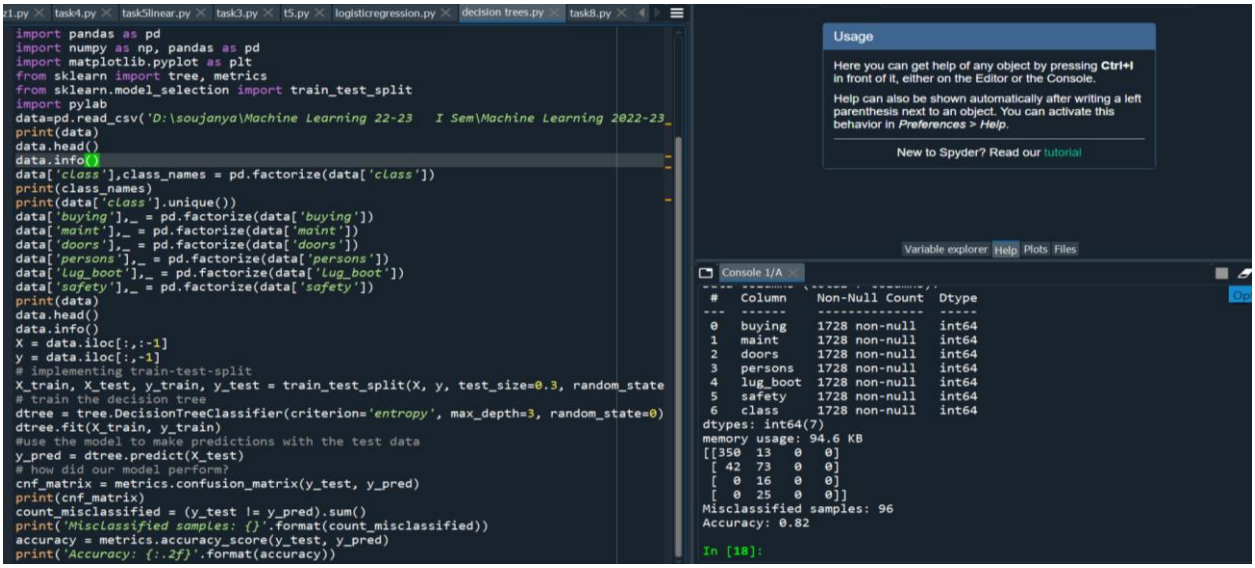
**Aim**: To Construct Decision Tree for Classification of any data set.

**Program:**

```
import os
import numpy as np
import pandas as pd
import numpy as np, pandas as pd
import matplotlib.pyplot as plt
from sklearn import tree, metrics
from sklearn.model_selection import train_test_split
import pylab
data=pd.read_csv('D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning 2022-23 II sem\ML LAB\cardata.csv',names=['buying','maint','doors','persons','lug_boot','safety','class'])
print(data)
data.head()
data.info()
data['class'],class_names = pd.factorize(data['class'])
print(class_names)
print(data['class'].unique())
data['buying'],_ = pd.factorize(data['buying'])
data['maint'],_ = pd.factorize(data['maint'])
data['doors'],_ = pd.factorize(data['doors'])
data['persons'],_ = pd.factorize(data['persons'])
data['lug_boot'],_ = pd.factorize(data['lug_boot'])
data['safety'],_ = pd.factorize(data['safety'])
print(data)
```

```
data.head()

data.info()

X = data.iloc[:,:-1]

y = data.iloc[:,-1]

# implementing train-test-split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=0)

# train the decision tree

dtree = tree.DecisionTreeClassifier(criterion='entropy', max_depth=3, random_state=0)

dtree.fit(X_train, y_train)

#use the model to make predictions with the test data

y_pred = dtree.predict(X_test)

# how did our model perform?

cnf_matrix = metrics.confusion_matrix(y_test, y_pred)

print(cnf_matrix)

count_misclassified = (y_test != y_pred).sum()

print('Misclassified samples: {}'.format(count_misclassified))

accuracy = metrics.accuracy_score(y_test, y_pred)

print('Accuracy: {:.2f}'.format(accuracy))
```

**Output:**



# TASK-8

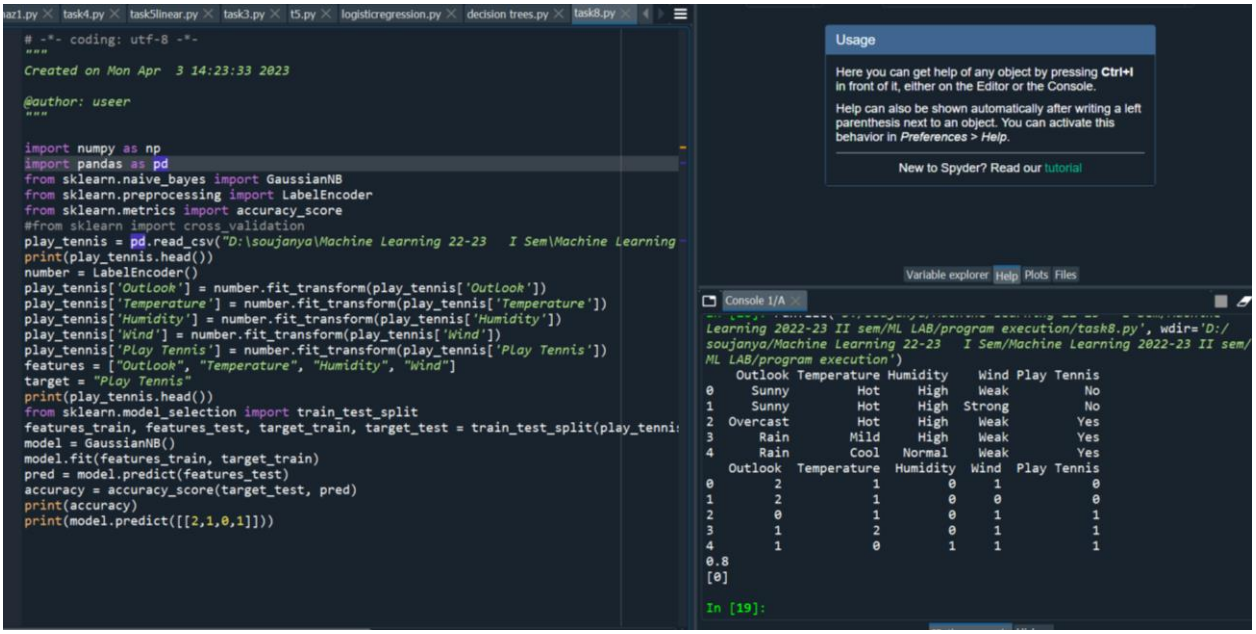
**Task-8**: Implement Naïve Bayes Classification in Python

**Aim**: To develop a python program for Naïve Bayes Classification Model for a given dataset.

**Program:**

```
import numpy as np
import pandas as pd
from sklearn.naive_bayes import GaussianNB
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import accuracy_score
#from sklearn import cross_validation
play_tennis = pd.read_csv("D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning
2022-23 II sem\ML LAB\PlayTennis.csv")
print(play_tennis.head())
number = LabelEncoder()
play_tennis['Outlook'] = number.fit_transform(play_tennis['Outlook'])
play_tennis['Temperature'] = number.fit_transform(play_tennis['Temperature'])
play_tennis['Humidity'] = number.fit_transform(play_tennis['Humidity'])
play_tennis['Wind'] = number.fit_transform(play_tennis['Wind'])
play_tennis['Play Tennis'] = number.fit_transform(play_tennis['Play Tennis'])
features = ["Outlook", "Temperature", "Humidity", "Wind"]
target = "Play Tennis"
print(play_tennis.head())
from sklearn.model_selection import train_test_split
features_train, features_test, target_train, target_test =
train_test_split(play_tennis[features],play_tennis[target],test_size = 0.33,random_state = 54)
model = GaussianNB()
model.fit(features_train, target_train)
pred = model.predict(features_test)
accuracy = accuracy_score(target_test, pred)
print(accuracy)
print(model.predict([[2,1,0,1]]))
```

## Output:


az1.py
task4.py
task5linear.py
task3.py
t5.py
logisticregression.py
decision trees.py
task8.py
# -*- coding: utf-8 -*-
"""
Created on Mon Apr 3 14:23:33 2023
@author: useer
"""
import numpy as np
import pandas as pd
from sklearn.naive_bayes import GaussianNB
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import accuracy_score
#from sklearn import cross_validation
play_tennis = pd.read_csv("D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning
print(play_tennis.head())
number = LabelEncoder()
play_tennis['Outlook'] = number.fit_transform(play_tennis['Outlook'])
play_tennis['Temperature'] = number.fit_transform(play_tennis['Temperature'])
play_tennis['Humidity'] = number.fit_transform(play_tennis['Humidity'])
play_tennis['Wind'] = number.fit_transform(play_tennis['Wind'])
play_tennis['Play Tennis'] = number.fit_transform(play_tennis['Play Tennis'])
features = ["Outlook", "Temperature", "Humidity", "Wind"]
target = "Play Tennis"
print(play_tennis.head())
from sklearn.model_selection import train_test_split
features_train, features_test, target_train, target_test = train_test_split(play_tenni
model = GaussianNB()
model.fit(features_train, target_train)
pred = model.predict(features_test)
accuracy = accuracy_score(target_test, pred)
print(accuracy)
print(model.predict([[2,1,0,1]]))
Usage
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Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in Preferences > Help.
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Console 1/A
Learning 2022-23 II sem/ML LAB/program execution/task8.py', wdir='D:/
soujanya/Machine Learning 22-23 I Sem/Machine Learning 2022-23 II sem/
ML LAB/program execution')
Outlook Temperature Humidity Wind Play Tennis
0 Sunny Hot High Weak No
1 Sunny Hot High Strong No
2 Overcast Hot High Weak Yes
3 Rain Mild High Weak Yes
4 Rain Cool Normal Weak Yes
Outlook Temperature Humidity Wind Play Tennis
0 2 1 0 1 0
1 2 1 0 0 0
2 0 1 0 1 1
3 1 2 0 1 1
4 1 0 1 1 1
0.8
[0]
In [19]:

# TASK-9

**Task-9**: Build KNN Classification model for a given dataset.

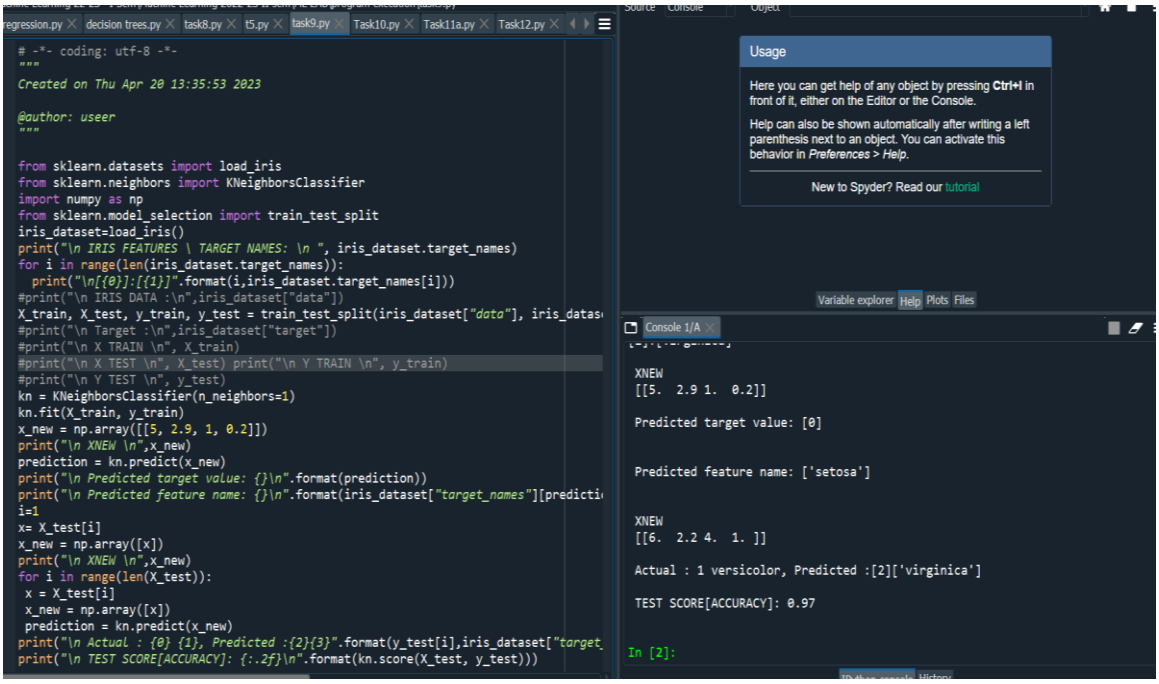
**Aim**: Develop a python program for KNN algorithm to classify Iris data set.

**Program:**

```
from sklearn.datasets import load_iris
from sklearn.neighbors import KNeighborsClassifier
import numpy as np
from sklearn.model_selection import train_test_split
iris_dataset=load_iris()
print("\n IRIS FEATURES \ TARGET NAMES: \n ", iris_dataset.target_names)
for i in range(len(iris_dataset.target_names)):
  print("\n[{0}]:[{1}]".format(i,iris_dataset.target_names[i]))
#print("\n IRIS DATA :\n",iris_dataset["data"])
X_train, X_test, y_train, y_test = train_test_split(iris_dataset["data"], iris_dataset["target"],
random_state=0)
#print("\n Target :\n",iris_dataset["target"])
#print("\n X TRAIN \n", X_train)
#print("\n X TEST \n", X_test) print("\n Y TRAIN \n", y_train)
#print("\n Y TEST \n", y_test)
kn = KNeighborsClassifier(n_neighbors=1)
kn.fit(X_train, y_train)
x_new = np.array([[5, 2.9, 1, 0.2]])
print("\n XNEW \n",x_new)
prediction = kn.predict(x_new)
print("\n Predicted target value: {}\n".format(prediction))
print("\n Predicted feature name: {}\n".format(iris_dataset["target_names"][prediction]))
i=1
x= X_test[i]
x_new = np.array([x])
print("\n XNEW \n",x_new)
```

```
for i in range(len(X_test)):
 x = X_test[i]
 x_new = np.array([x])
 prediction = kn.predict(x_new)
        print("\n Actual : {0} {1}, Predicted
:{2}{3}".format(y_test[i],iris_dataset["target_names"][y_test[i]],prediction,iris_dataset["target_name
s"][prediction]))
 print("\n TEST SCORE[ACCURACY]: {:.2f}\n".format(kn.score(X_test, y_test)))
```

**Output:-**



# TASK-10

**Task-10**: Implement Back propagation model in python for a given dataset.
**Aim**: Develop a Python program to build the Back propagation algorithm and test the same using appropriate data sets.

**Program:**

```
import numpy as np
X = np.array(([2, 9], [1, 5], [3, 6]), dtype=float)
y = np.array(([92], [86], [89]), dtype=float)
X = X/np.amax(X,axis=0) # maximum of X array longitudinally
y = y/100 #Sigmoid Function
def sigmoid (x): return(1/(1 + np.exp(- x))) #Derivative of Sigmoid Function
def derivatives_sigmoid(x):return(x * (1 - x)) #Variable initialization
epoch=7000 #Setting training iterations
lr=0.1 #Setting learning rate
inputlayer_neurons = 2 #number of features in data set
hiddenlayer_neurons = 3 #number of hidden layers neurons
output_neurons = 1 #number of neurons at output layer
 #weight and bias initialization
wh=np.random.uniform(size=(inputlayer_neurons,hiddenlayer_neurons))
bh=np.random.uniform(size=(1,hiddenlayer_neurons))
wout=np.random.uniform(size=(hiddenlayer_neurons,output_neurons))
bout=np.random.uniform(size=(1,output_neurons))
#draws a random range of numbers uniformly of dim x*y
for i in range(epoch):
#Forward Propogation
hinp1=np.dot(X,wh)
 hinp=hinp1 + bh
 hlayer_act = sigmoid(hinp)
 outinp1=np.dot(hlayer_act,wout)
 outinp= outinp1+ bout
 output = sigmoid(outinp) #Backpropagation
 EO = y-output
 outgrad = derivatives_sigmoid(output)
```

d_output = EO* outgrad

EH = d_output.dot(wout.T)

hiddengrad = derivatives_sigmoid(hlayer_act)#how much hidden layer wts

d_hiddenlayer = EH * hiddengrad

wout += hlayer_act.T.dot(d_output) *lr # dotproduct of nextlayererror and currentlayerop # bout += np.sum(d_output, axis=0,keepdims=True)Python program to implement Boosting ensemble method*lr

wh += X.T.dot(d_hiddenlayer) *lr

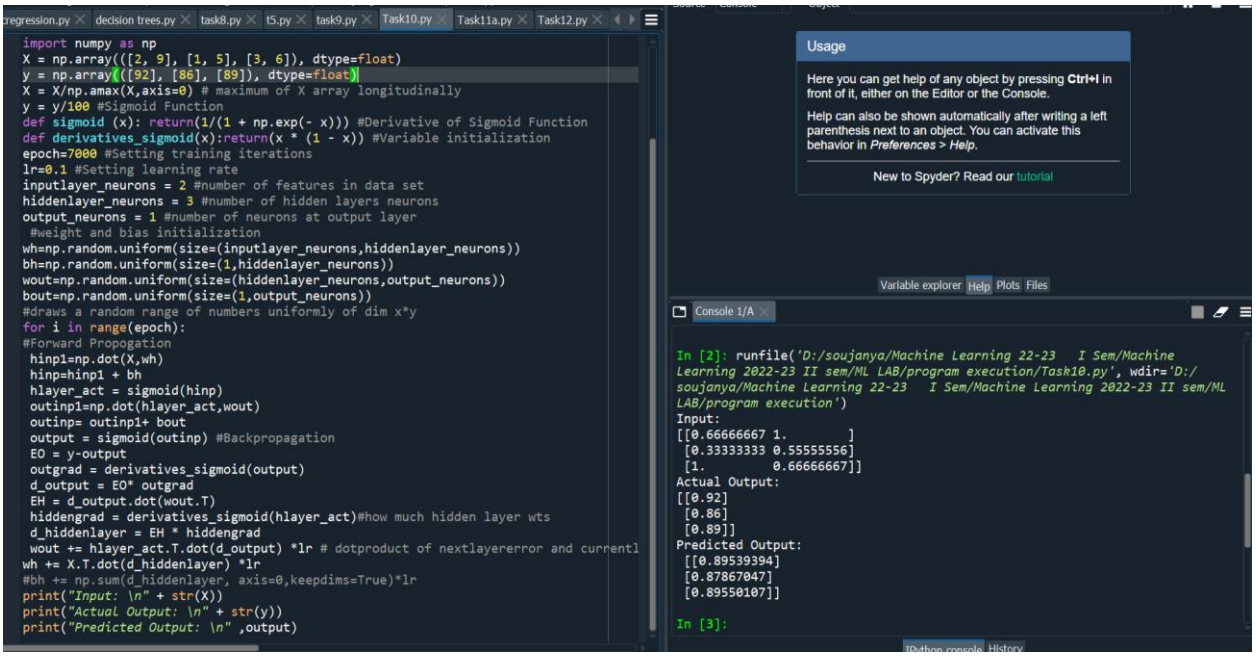
#bh += np.sum(d_hiddenlayer, axis=0,keepdims=True)*lr

print("Input: \n" + str(X))

print("Actual Output: \n" + str(y))

print("Predicted Output: \n" ,output)

**Output:**



# TASK-11

**Task-11**: a) Implement Random Forest classification method in python for a given dataset.

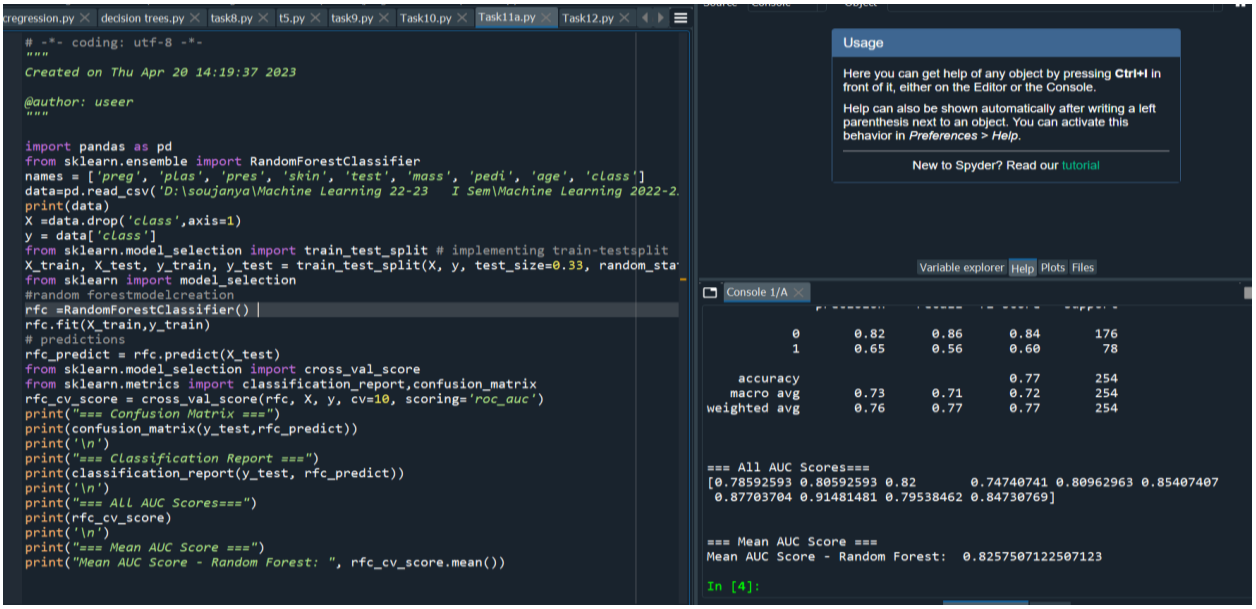
b) Implement Boosting ensemble method on a given dataset.

**Aim**: a) Implement Random Forest classification method in python for a given dataset.

**Program:**

```
import pandas as pd
from sklearn.ensemble import RandomForestClassifier
names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']
data=pd.read_csv('D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning 2022-23 II
sem\ML LAB\Datasets\diabetes.csv',names=names)
print(data)
X =data.drop('class',axis=1)
y = data['class']
from sklearn.model_selection import train_test_split # implementing train-testsplit
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.33, random_state=66)
from sklearn import model_selection
#random forestmodelcreation
rfc =RandomForestClassifier()
rfc.fit(X_train,y_train)
# predictions
rfc_predict = rfc.predict(X_test)
from sklearn.model_selection import cross_val_score
from sklearn.metrics import classification_report,confusion_matrix
rfc_cv_score = cross_val_score(rfc, X, y, cv=10, scoring='roc_auc')
print("=== Confusion Matrix ===")
print(confusion_matrix(y_test,rfc_predict))
print('\n')
print("=== Classification Report ===")
print(classification_report(y_test, rfc_predict))
print('\n')
print("=== All AUC Scores===")
print(rfc_cv_score)
print('\n')
print("=== Mean AUC Score ===")
print("Mean AUC Score - Random Forest: ", rfc_cv_score.mean())
```

## Output:


cregression.py
decision trees.py
task8.py
t5.py
task9.py
Task10.py
Task11a.py
Task12.py
# -*- coding: utf-8 -*-
"""
Created on Thu Apr 20 14:19:37 2023
@author: useer
"""
import pandas as pd
from sklearn.ensemble import RandomForestClassifier
names = ['preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']
data=pd.read_csv('D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning 2022-2
print(data)
X =data.drop('class',axis=1)
y = data['class']
from sklearn.model_selection import train_test_split # implementing train-testsplit
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.33, random_sta
from sklearn import model_selection
#random forestmodelcreation
rfc =RandomForestClassifier()
rfc.fit(X_train,y_train)
# predictions
rfc_predict = rfc.predict(X_test)
from sklearn.model_selection import cross_val_score
from sklearn.metrics import classification_report,confusion_matrix
rfc_cv_score = cross_val_score(rfc, X, y, cv=10, scoring='roc_auc')
print("=== Confusion Matrix ===")
print(confusion_matrix(y_test,rfc_predict))
print('\n')
print("=== Classification Report ===")
print(classification_report(y_test, rfc_predict))
print('\n')
print("=== All AUC Scores===")
print(rfc_cv_score)
print('\n')
print("=== Mean AUC Score ===")
print("Mean AUC Score - Random Forest: ", rfc_cv_score.mean())
Usage
Here you can get help of any object by pressing Ctrl+I in front of it, either on the Editor or the Console.
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Console 1/A
0 0.82 0.86 0.84 176
1 0.65 0.56 0.60 78
accuracy 0.77 254
macro avg 0.73 0.71 0.72 254
weighted avg 0.76 0.77 0.77 254
=== All AUC Scores===
[0.78592593 0.80592593 0.82 0.74740741 0.80962963 0.85407407
0.87703704 0.91481481 0.79538462 0.84730769]
=== Mean AUC Score ===
Mean AUC Score - Random Forest: 0.8257507122507123
In [4]:

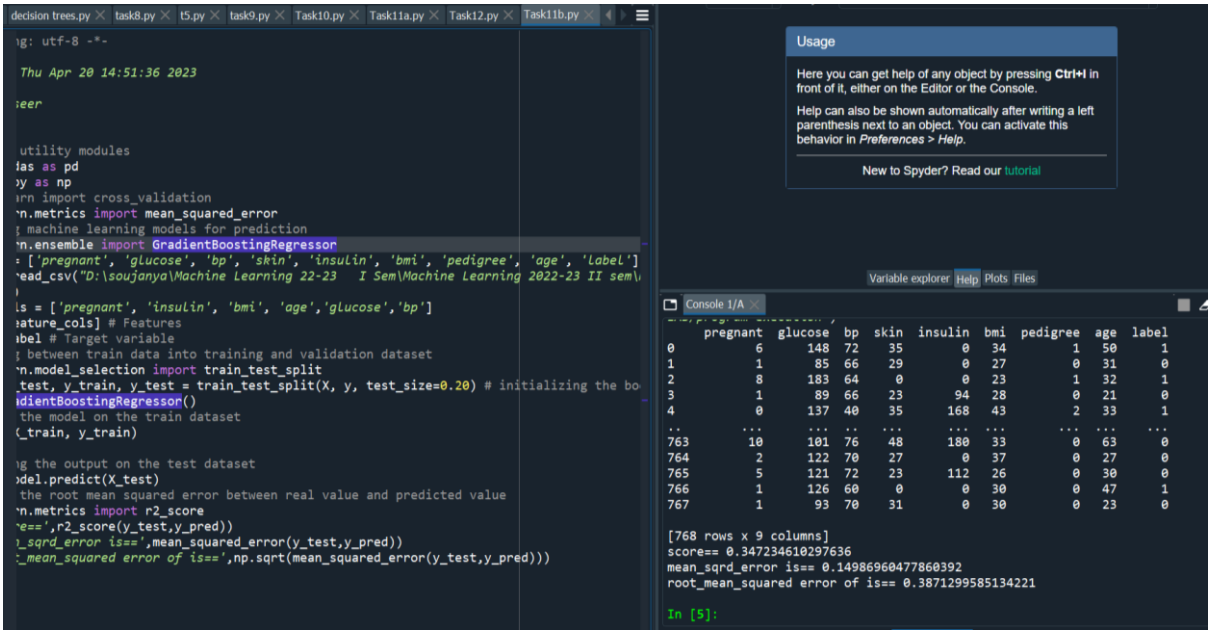
b) Implement Boosting ensemble method on a given dataset

**Aim**: Develop a Python program to implement Boosting ensemble method

**Program:**

```
#importing utility modules
import pandas as pd
import numpy as np
#from sklearn import cross_validation
from sklearn.metrics import mean_squared_error
# importing machine learning models for prediction
from sklearn.ensemble import GradientBoostingRegressor
col_names = ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi', 'pedigree', 'age', 'label'] # load dataset
pima = pd.read_csv("D:\soujanya\Machine Learning 22-23  I Sem\Machine Learning 2022-23 II
sem\ML LAB\Datasets/diabetes.csv", header=None, names=col_names)
print(pima)
feature_cols = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp']
X = pima[feature_cols] # Features
y = pima.label # Target variable
# Splitting between train data into training and validation dataset
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) # initializing the boosting
module with default parameters
model = GradientBoostingRegressor()
# training the model on the train dataset
model.fit(X_train, y_train)
# predicting the output on the test dataset
y_pred = model.predict(X_test)
# printing the root mean squared error between real value and predicted value
from sklearn.metrics import r2_score
print('score==',r2_score(y_test,y_pred))
print('mean_sqrd_error is==',mean_squared_error(y_test,y_pred))
print('root_mean_squared error of is==',np.sqrt(mean_squared_error(y_test,y_pred)))
```

## Output:


decision trees.py
task8.py
t5.py
task9.py
Task10.py
Task11a.py
Task12.py
Task11b.py
ıg: utf-8 -*-
Thu Apr 20 14:51:36 2023
ieer
utility modules
las as pd
ɔy as np
ırn import cross_validation
ɔn.metrics import mean_squared_error
machine learning models for prediction
ɔn.ensemble import GradientBoostingRegressor
= ['pregnant', 'glucose', 'bp', 'skin', 'insulin', 'bmi', 'pedigree', 'age', 'label']
ead_csv("D:\soujanya\Machine Learning 22-23 I Sem\Machine Learning 2022-23 II sem\
is = ['pregnant', 'insulin', 'bmi', 'age','glucose','bp']
ature_cols] # Features
bel # Target variable
between train data into training and validation dataset
ɔn.model_selection import train_test_split
_test, y_train, y_test = train_test_split(X, y, test_size=0.20) # initializing the bo
idientBoostingRegressor()
the model on the train dataset
(_train, y_train)
ıg the output on the test dataset
del.predict(X_test)
the root mean squared error between real value and predicted value
ɔn.metrics import r2_score
'e==',r2_score(y_test,y_pred))
ı_sqrd_error is==',mean_squared_error(y_test,y_pred))
:_mean_squared error of is==',np.sqrt(mean_squared_error(y_test,y_pred)))
Usage
Here you can get help of any object by pressing Ctrl+I in front of it, either on the Editor or the Console.
Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in Preferences > Help.
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Files
Console 1/A
pregnant glucose bp skin insulin bmi pedigree age label
0 6 148 72 35 0 34 1 50 1
1 1 85 66 29 0 27 0 31 0
2 8 183 64 0 0 23 1 32 1
3 1 89 66 23 94 28 0 21 0
4 0 137 40 35 168 43 2 33 1
763 10 101 76 48 180 33 0 63 0
764 2 122 70 27 0 37 0 27 0
765 5 121 72 23 112 26 0 30 0
766 1 126 60 0 0 30 0 47 1
767 1 93 70 31 0 30 0 23 0
[768 rows x 9 columns]
score== 0.347234610297636
mean_sqrd_error is== 0.14986960477860392
root_mean_squared error of is== 0.387129585134221
In [5]:

# TASK-12

**Task-12**: a) Write a python program to implement K-Means Clustering Algorithm

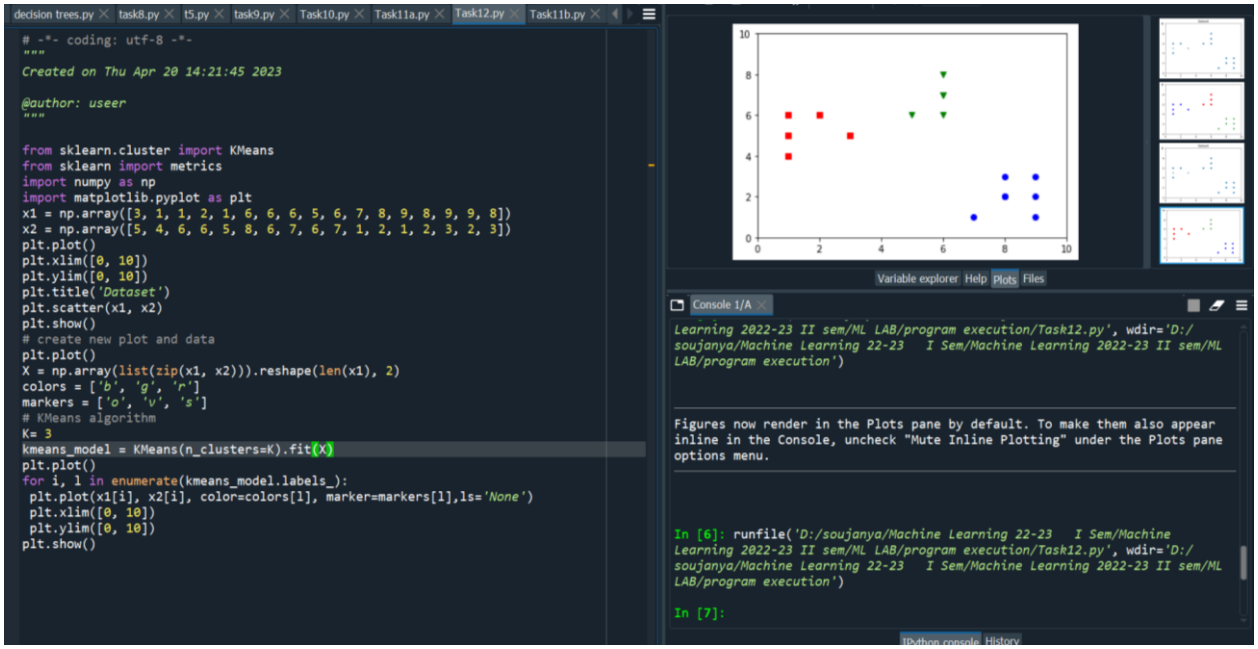
b) Write a python program to implement BIRCH algorithm.

**a) Aim:** Develop a Python program to implement K-means Clustering Algorithm

**Program:**

```
from sklearn.cluster import KMeans
from sklearn import metrics
import numpy as np
import matplotlib.pyplot as plt
x1 = np.array([3, 1, 1, 2, 1, 6, 6, 6, 5, 6, 7, 8, 9, 8, 9, 9, 8])
x2 = np.array([5, 4, 6, 6, 5, 8, 6, 7, 6, 7, 1, 2, 1, 2, 3, 2, 3])
plt.plot()
plt.xlim([0, 10])
plt.ylim([0, 10])
plt.title('Dataset')
plt.scatter(x1, x2)
plt.show()
# create new plot and data
plt.plot()
X = np.array(list(zip(x1, x2))).reshape(len(x1), 2)
colors = ['b', 'g', 'r']
markers = ['o', 'v', 's']
# KMeans algorithm
K= 3
kmeans_model = KMeans(n_clusters=K).fit(X)
plt.plot()
for i, l in enumerate(kmeans_model.labels_):
 plt.plot(x1[i], x2[i], color=colors[l], marker=markers[l],ls='None')
 plt.xlim([0, 10])
 plt.ylim([0, 10])
plt.show()
```

**Output:**

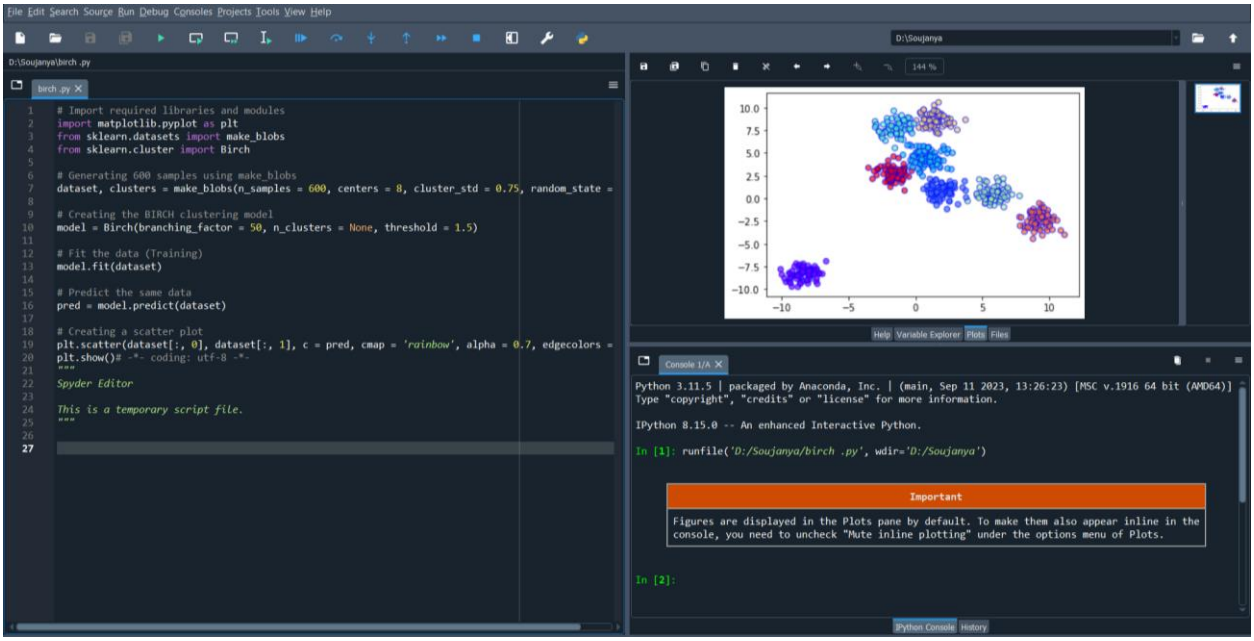



**b) Aim:** Develop a Python program to implement BIRCH algorithm.

**Program:**

```
# Import required libraries and modules
import matplotlib.pyplot as plt
from sklearn.datasets import make_blobs
from sklearn.cluster import Birch
 # Generating 600 samples using make_blobs
dataset, clusters = make_blobs(n_samples = 600, centers = 8, cluster_std = 0.75, random_state = 0)
 # Creating the BIRCH clustering model
model = Birch(branching_factor = 50, n_clusters = None, threshold = 1.5)
 # Fit the data (Training)
model.fit(dataset)
 # Predict the same data
pred = model.predict(dataset)
 # Creating a scatter plot
plt.scatter(dataset[:, 0], dataset[:, 1], c = pred, cmap = 'rainbow', alpha = 0.7, edgecolors = 'b')
plt.show()
```

## Output:


File Edit Search Source Run Debug Consoles Projects Tools View Help
D:\Soujanya\birch .py
birch .py
# Import required libraries and modules
import matplotlib.pyplot as plt
from sklearn.datasets import make_blobs
from sklearn.cluster import Birch
# Generating 600 samples using make_blobs
dataset, clusters = make_blobs(n_samples = 600, centers = 8, cluster_std = 0.75, random_state =
# Creating the BIRCH clustering model
model = Birch(branching_factor = 50, n_clusters = None, threshold = 1.5)
# Fit the data (Training)
model.fit(dataset)
# Predict the same data
pred = model.predict(dataset)
# Creating a scatter plot
plt.scatter(dataset[:, 0], dataset[:, 1], c = pred, cmap = 'rainbow', alpha = 0.7, edgecolors =
plt.show()# -*- coding: utf-8 -*-
"""
Spyder Editor
This is a temporary script file.
"""
D:\Soujanya
144 %
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
−10
−5
0
5
10
Help Variable Explorer Plots Files
Console 1/A
Python 3.11.5 | packaged by Anaconda, Inc. | (main, Sep 11 2023, 13:26:23) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.
IPython 8.15.0 -- An enhanced Interactive Python.
In [1]: runfile('D:/Soujanya/birch .py', wdir='D:/Soujanya')
Important
Figures are displayed in the Plots pane by default. To make them also appear inline in the console, you need to uncheck "Mute inline plotting" under the options menu of Plots.
In [2]:
IPython Console History