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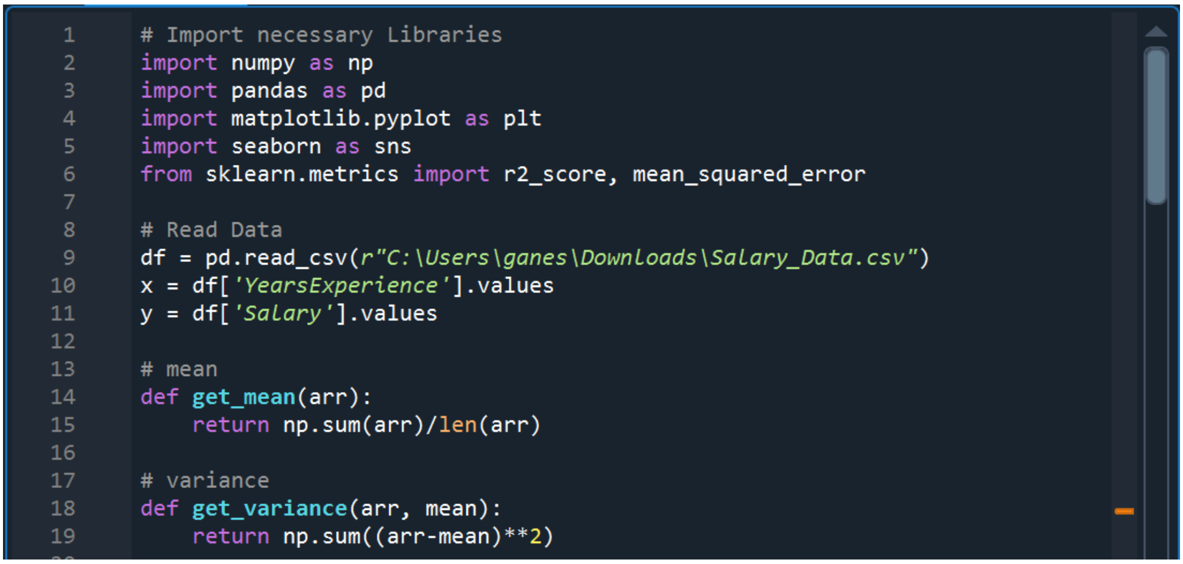
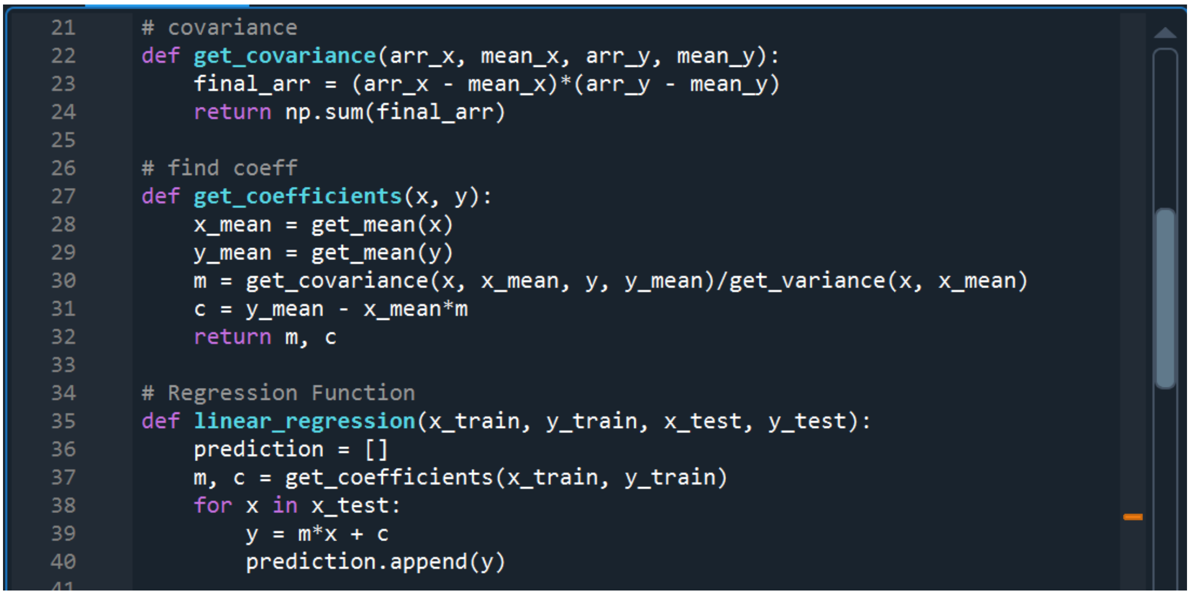
Write a program for linear and logistic regression for the given data set.

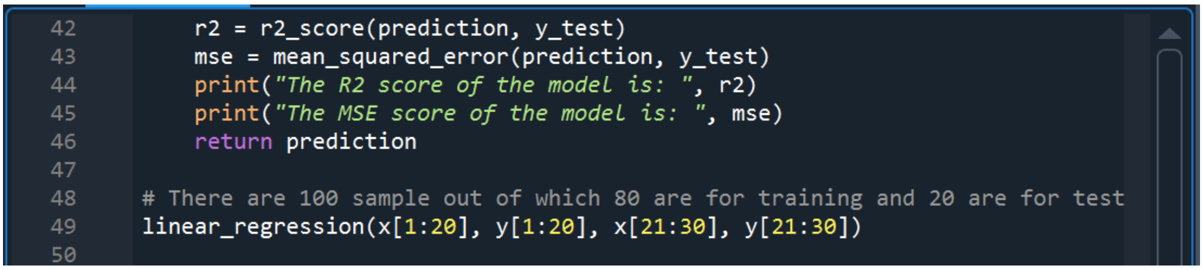
Linear Regression



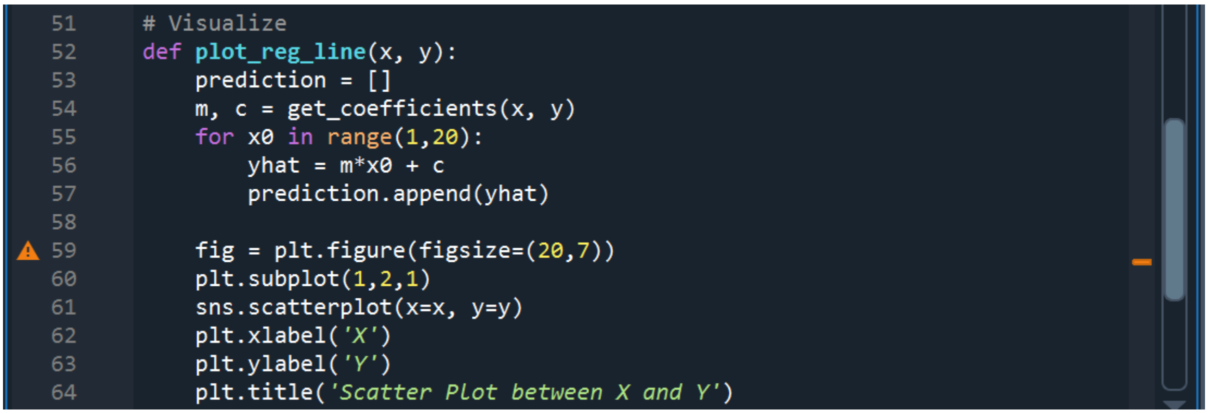
```python
# Import necessary Libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import r2_score, mean_squared_error

# Read Data
df = pd.read_csv(r"C:\Users\ganes\Downloads\Salary_Data.csv")
x = df['YearsExperience'].values
y = df['Salary'].values

# mean
def get_mean(arr):
    return np.sum(arr)/len(arr)

# variance
def get_variance(arr, mean):
    return np.sum((arr-mean)**2)
```



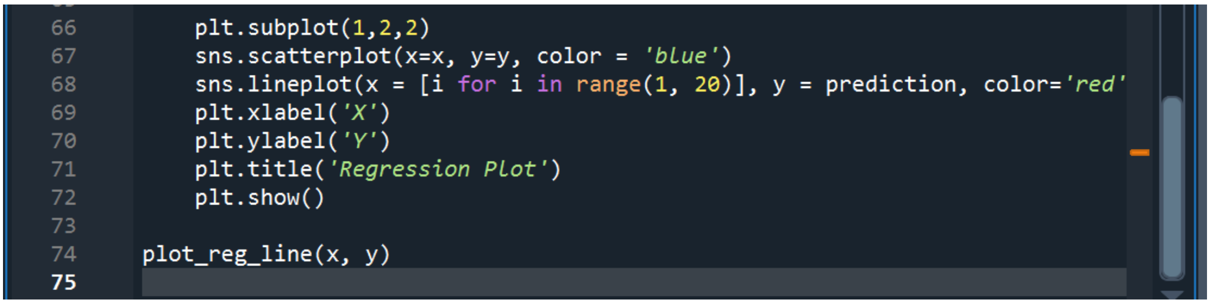
```python
# covariance
def get_covariance(arr_x, mean_x, arr_y, mean_y):
    final_arr = (arr_x - mean_x)*(arr_y - mean_y)
    return np.sum(final_arr)

# find coeff
def get_coefficients(x, y):
    x_mean = get_mean(x)
    y_mean = get_mean(y)
    m = get_covariance(x, x_mean, y, y_mean)/get_variance(x, x_mean)
    c = y_mean - x_mean*m
    return m, c

# Regression Function
def linear_regression(x_train, y_train, x_test, y_test):
    prediction = []
    m, c = get_coefficients(x_train, y_train)
    for x in x_test:
        y = m*x + c
        prediction.append(y)
```



```python
    r2 = r2_score(prediction, y_test)
    mse = mean_squared_error(prediction, y_test)
    print("The R2 score of the model is: ", r2)
    print("The MSE score of the model is: ", mse)
    return prediction

# There are 100 sample out of which 80 are for training and 20 are for test
linear_regression(x[1:20], y[1:20], x[21:30], y[21:30])
```

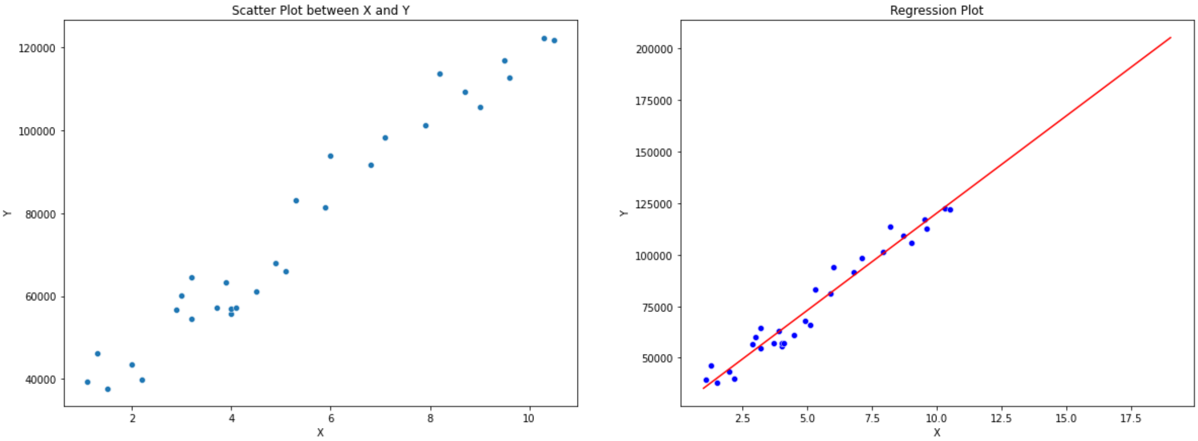


```
# Visualize
def plot_reg_line(x, y):
    prediction = []
    m, c = get_coefficients(x, y)
    for x0 in range(1,20):
        yhat = m*x0 + c
        prediction.append(yhat)

    fig = plt.figure(figsize=(20,7))
    plt.subplot(1,2,1)
    sns.scatterplot(x=x, y=y)
    plt.xlabel('X')
    plt.ylabel('Y')
    plt.title('Scatter Plot between X and Y')
```

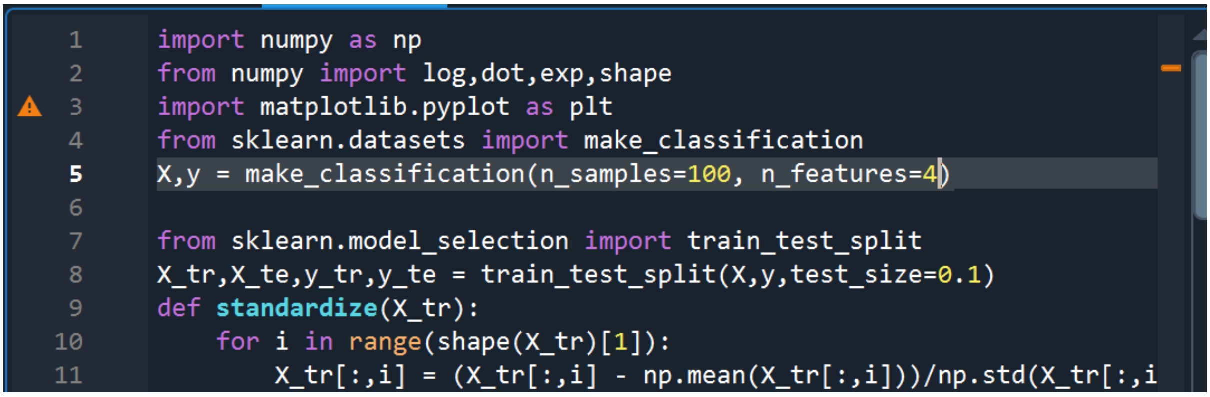


```
    plt.subplot(1,2,2)
    sns.scatterplot(x=x, y=y, color = 'blue')
    sns.lineplot(x = [i for i in range(1, 20)], y = prediction, color='red'
    plt.xlabel('X')
    plt.ylabel('Y')
    plt.title('Regression Plot')
    plt.show()

plot_reg_line(x, y)
```

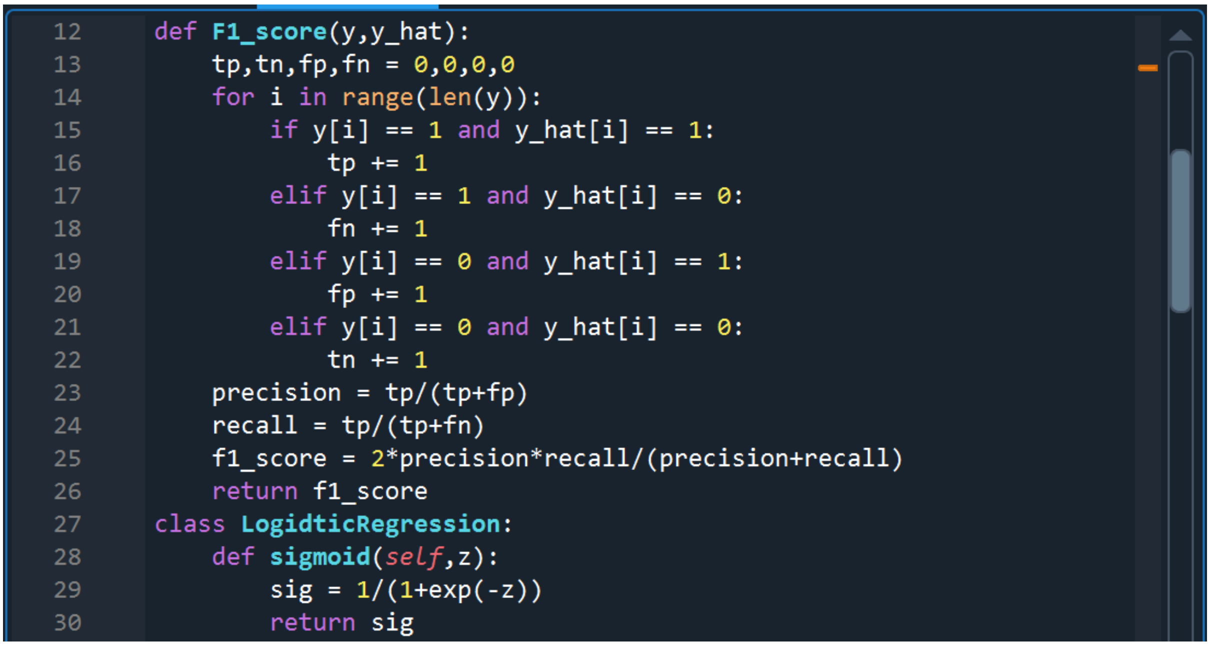
OUTPUT



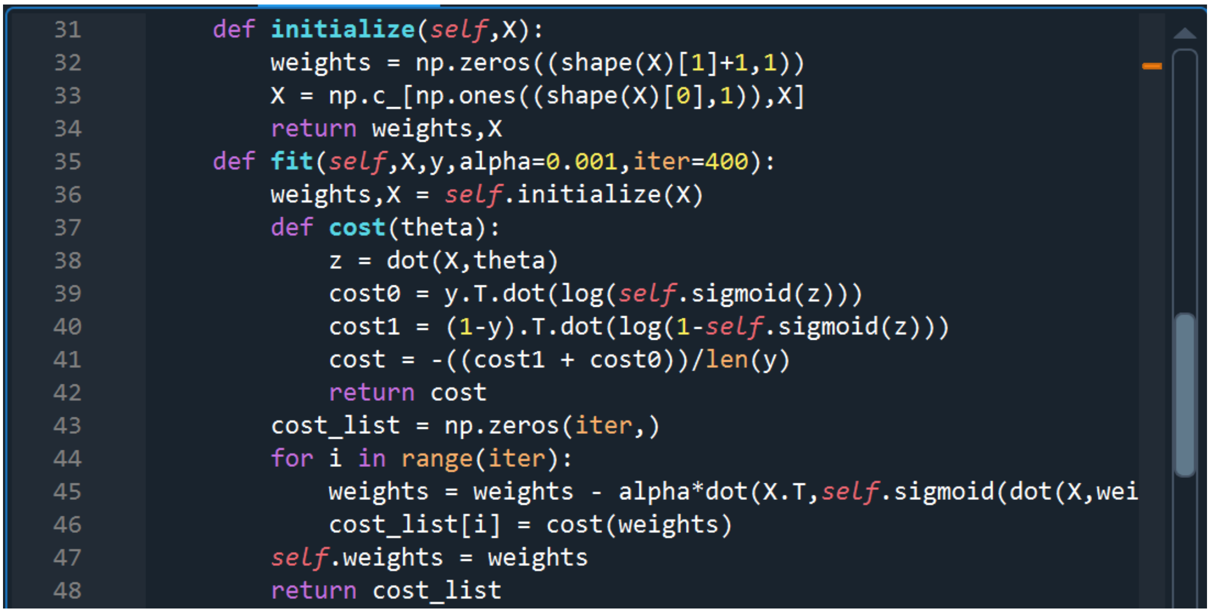
Logistic Regression



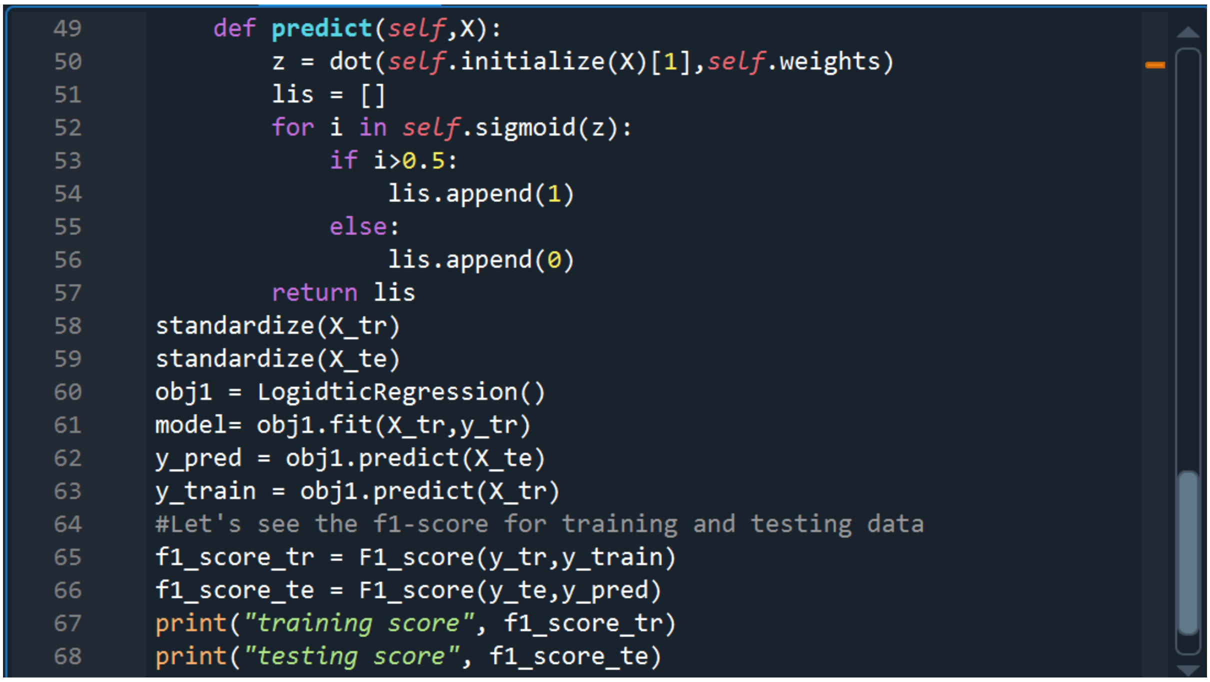
```
import numpy as np
from numpy import log,dot,exp,shape
import matplotlib.pyplot as plt
from sklearn.datasets import make_classification
X,y = make_classification(n_samples=100, n_features=4)

from sklearn.model_selection import train_test_split
X_tr,X_te,y_tr,y_te = train_test_split(X,y,test_size=0.1)
def standardize(X_tr):
    for i in range(shape(X_tr)[1]):
        X_tr[:,i] = (X_tr[:,i] - np.mean(X_tr[:,i]))/np.std(X_tr[:,i
```



```python
def F1_score(y,y_hat):
    tp,tn,fp,fn = 0,0,0,0
    for i in range(len(y)):
        if y[i] == 1 and y_hat[i] == 1:
            tp += 1
        elif y[i] == 1 and y_hat[i] == 0:
            fn += 1
        elif y[i] == 0 and y_hat[i] == 1:
            fp += 1
        elif y[i] == 0 and y_hat[i] == 0:
            tn += 1
    precision = tp/(tp+fp)
    recall = tp/(tp+fn)
    f1_score = 2*precision*recall/(precision+recall)
    return f1_score
class LogidticRegression:
    def sigmoid(self,z):
        sig = 1/(1+exp(-z))
        return sig
```

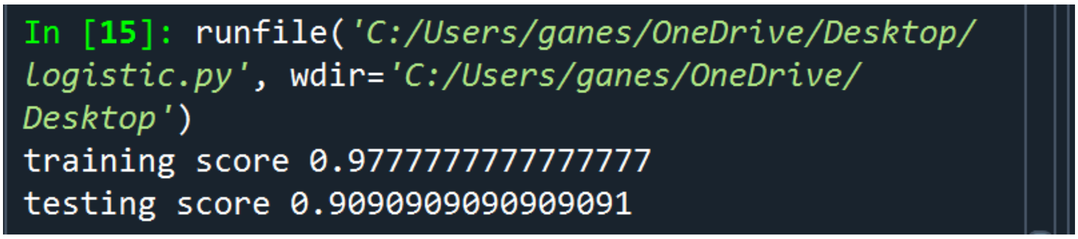


```python
    def initialize(self,X):
        weights = np.zeros((shape(X)[1]+1,1))
        X = np.c_[np.ones((shape(X)[0],1)),X]
        return weights,X
    def fit(self,X,y,alpha=0.001,iter=400):
        weights,X = self.initialize(X)
        def cost(theta):
            z = dot(X,theta)
            cost0 = y.T.dot(log(self.sigmoid(z)))
            cost1 = (1-y).T.dot(log(1-self.sigmoid(z)))
            cost = -((cost1 + cost0))/len(y)
            return cost
        cost_list = np.zeros(iter,)
        for i in range(iter):
            weights = weights - alpha*dot(X.T,self.sigmoid(dot(X,wei
            cost_list[i] = cost(weights)
        self.weights = weights
        return cost_list
```



```python
    def predict(self,X):
        z = dot(self.initialize(X)[1],self.weights)
        lis = []
        for i in self.sigmoid(z):
            if i>0.5:
                lis.append(1)
            else:
                lis.append(0)
        return lis
standardize(X_tr)
standardize(X_te)
obj1 = LogidticRegression()
model= obj1.fit(X_tr,y_tr)
y_pred = obj1.predict(X_te)
y_train = obj1.predict(X_tr)
#Let's see the f1-score for training and testing data
f1_score_tr = F1_score(y_tr,y_train)
f1_score_te = F1_score(y_te,y_pred)
print("training score", f1_score_tr)
print("testing score", f1_score_te)
```

Output-



```
In [15]: runfile('C:/Users/ganes/OneDrive/Desktop/
logistic.py', wdir='C:/Users/ganes/OneDrive/
Desktop')
training score 0.9777777777777777
testing score 0.9090909090909091
```