LINEAR REGRESSION AND MULTIPLE REGRESSION

Aim of the Experiment

To write Python program for finding linear regression.

First one can write a linear regression for this problem and can verify that the results are same.

Table 5.1: Sample Data

x **(Week)**	**y** **(Sales in Thousands)**
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

In listing 2, A random dataset is taken, and multiple regression is applied. This experiment will help to understand the concepts of multiple regression.

The command

```
X,y = make_regression(n_samples = 50,n_features=1,noise=0.1)
```

Can create a regression dataset with 50 samples and 1 feature. The number of features field can be changed with 2 for multiple regression as

```
X,y = make_regression(n_samples = 50,n_features=2,noise=0.1)
```

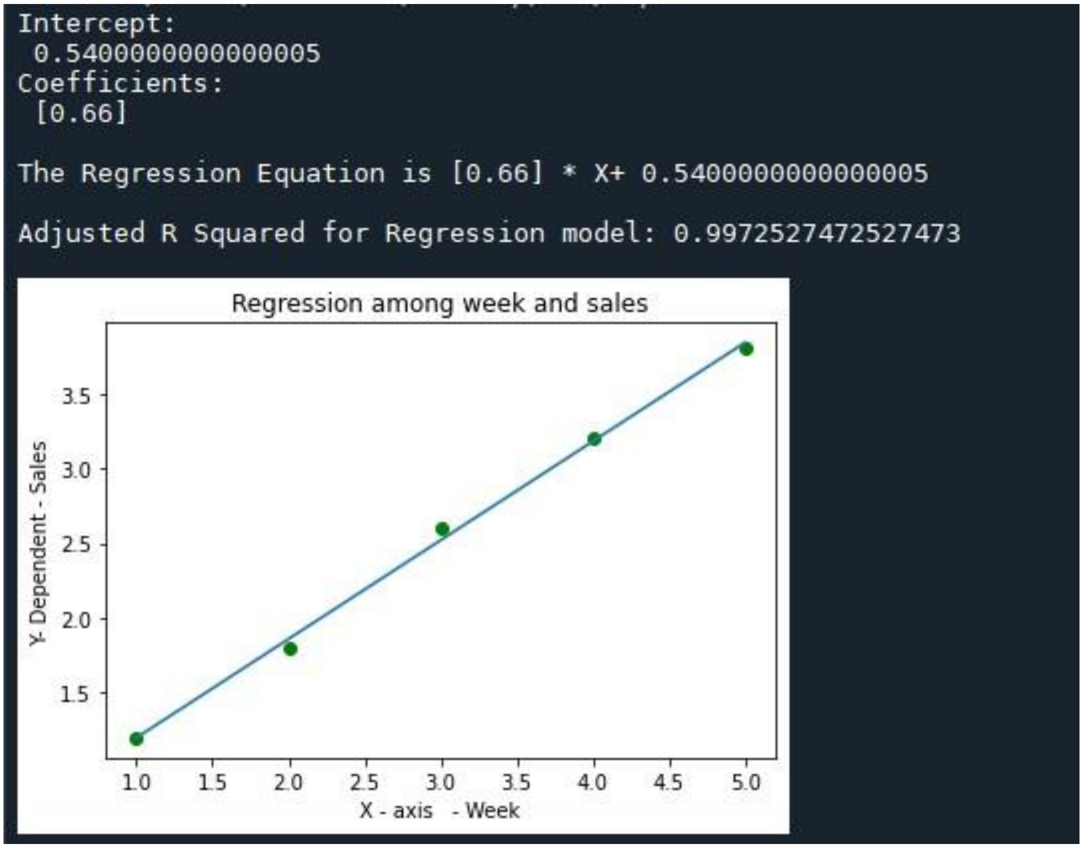
WARNING – Random dataset is used for Listing 2 and 3. So, the dataset would be generated at every run. As dataset is generated again, the results would vary every time the program is run.

Listing - 1

```
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn import linear_model

salesdata = {'week': [1,2,3,4,5],
          'sales': [1.2,1.8,2.6,3.2,3.8]
          }

df = pd.DataFrame(salesdata,columns=['week','sales'])



plt.scatter(df['week'], df['sales'], color='green')
plt.title('Regression among week and sales')
plt.xlabel('X - axis   - Week')
plt.ylabel('Y- Dependent - Sales')



"""

week = df['week'].values.reshape(1,-1)
sales = df['sales'].values.reshape(1,-1)

"""

X = df[['week']]
y = df['sales']

regr = linear_model.LinearRegression()
regr.fit(X,y)
```

```
print('Intercept: \n', regr.intercept_)
print('Coefficients: \n', regr.coef_)

print('\nThe Regression Equation is',regr.coef_,'* X+',regr.intercept_)

# Fit the model for the given data

pred = regr.predict(X)
plt.plot(X,pred)

# Compute Adjusted R squared Error
print("\nAdjusted R Squared for Regression model:",regr.score(X,y))
```

Output



```
Intercept:
 0.5400000000000005
Coefficients:
 [0.66]

The Regression Equation is [0.66] * X+ 0.5400000000000005

Adjusted R Squared for Regression model: 0.9972527472527473
```

Listing 2

WARNING – Random dataset is used for Listing 2. So, the random dataset would be generated at every run. As dataset is generated again, the results would vary every time the program is run.

import matplotlib.pyplot as plt

from sklearn import linear_model

from sklearn.datasets import make_regression

X,y = make_regression(n_samples = 50,n_features=1,noise=0.1)

plt.scatter(X,y,color='green')

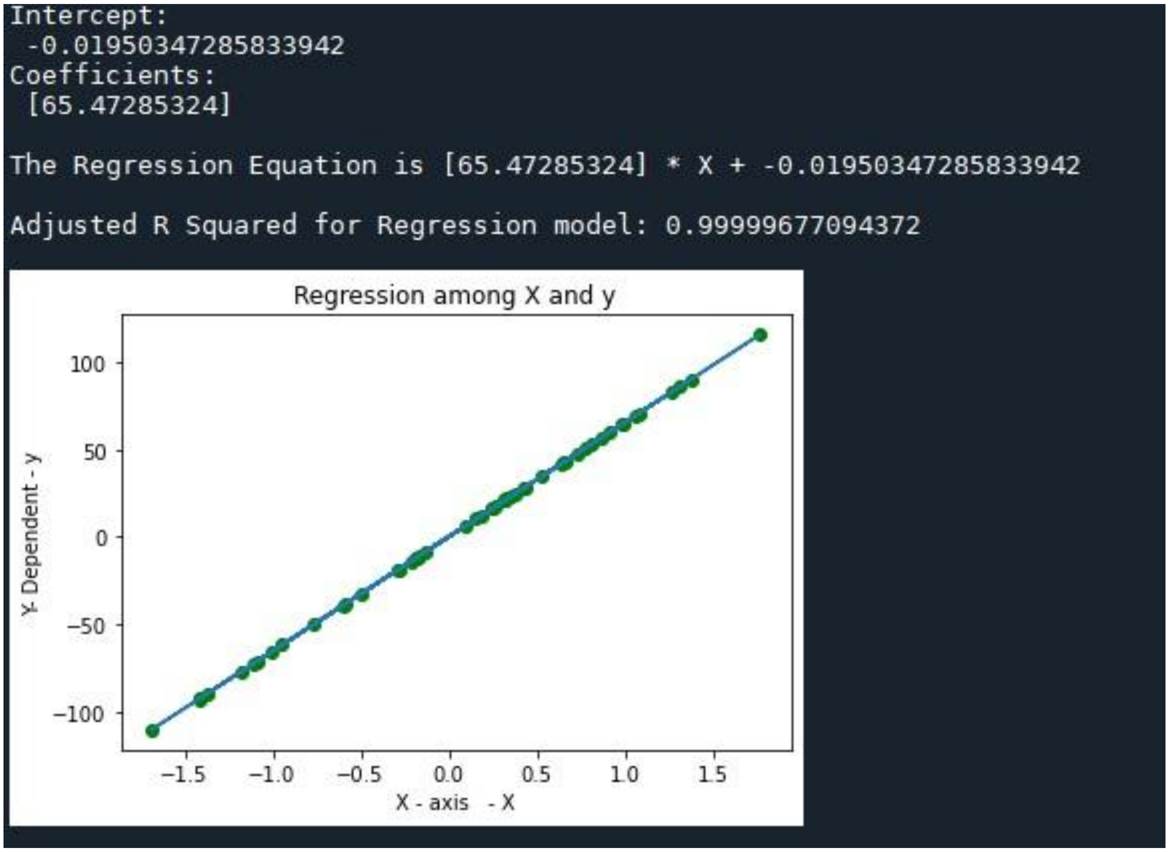
plt.title('Regression among X and y')

plt.xlabel('X - axis   - X')

plt.ylabel('Y- Dependent - y')

```
regr = linear_model.LinearRegression()
regr.fit(X,y)

print('Intercept: \n', regr.intercept_)
print('Coefficients: \n', regr.coef_)
print('\nThe Regression Equation is',regr.coef_,'* X +',regr.intercept_)

# Fit the model for the given data

pred = regr.predict(X)
plt.plot(X,pred)

# Compute Adjusted R squared Error
print("\nAdjusted R Squared for Regression model:",regr.score(X,y))
```

Output



```
Intercept:
 -0.01950347285833942
Coefficients:
 [65.47285324]

The Regression Equation is [65.47285324] * X + -0.01950347285833942

Adjusted R Squared for Regression model: 0.99999677094372
```

Listing 3

WARNING – Random dataset is used for Listing 3. So, the random dataset would be generated at every run. As dataset is generated again, the results would vary every time the program is run.

Multiple Regression

from sklearn import linear_model

from sklearn.datasets import make_regression

print("Multiple regression \n\n")

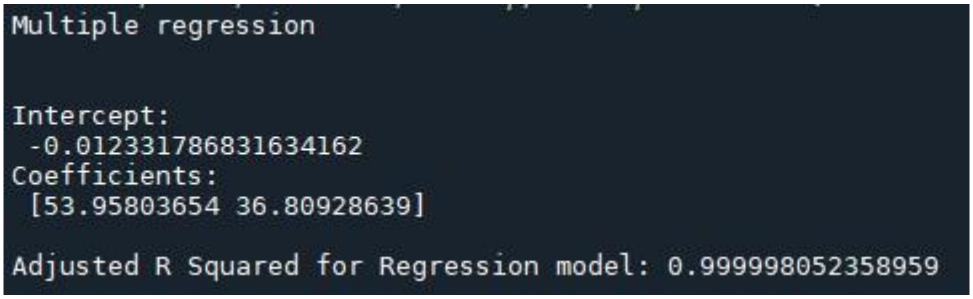
# Multiple Regression

# Create random dataset with 2 features. Dataset has 50 samples with noise 0.1.

X,y = make_regression(n_samples = 50,n_features=2,noise=0.1)

```
regr = linear_model.LinearRegression()

regr.fit(X,y)


print('Intercept: \n', regr.intercept_)

print('Coefficients: \n', regr.coef_)


# Compute Adjusted R squared Error


print("\nAdjusted R Squared for Regression model:",regr.score(X,y))
```

Output



```
Multiple regression


Intercept:
 -0.012331786831634162
Coefficients:
 [53.95803654 36.80928639]

Adjusted R Squared for Regression model: 0.999998052358959
```