

Practical no 2

Aim: Demo of Simple/Multiple Linear Regression

Theory –

Simple Linear Regression:

Simple linear regression is used to estimate the relationship between two quantitative variables. You can use simple linear regression when you want to know:

- How strong the relationship is between two variables (e.g., the relationship between rainfall and soil erosion).
- The value of the dependent variable at a certain value of the independent variable (e.g., the amount of soil erosion at a certain level of rainfall). Regression models describe the relationship between variables by fitting a line to the observed data.

Linear regression models use a straight line, while logistic and nonlinear regression models use a curved line. Regression allows you to estimate how a dependent variable changes as the independent variable(s) change.

Multiple Linear Regression:

Multiple linear regression is used to estimate the relationship between two or more independent variables and one dependent variable. You can use multiple linear regression when you want to know:

- How strong the relationship is between two or more independent variables and one dependent variable (e.g. how rainfall, temperature, and amount of fertilizer added affect crop growth).
- The value of the dependent variable at a certain value of the independent variables (e.g. the expected yield of a crop at certain levels of rainfall, temperature, and fertilizer addition).

Code:

```
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])

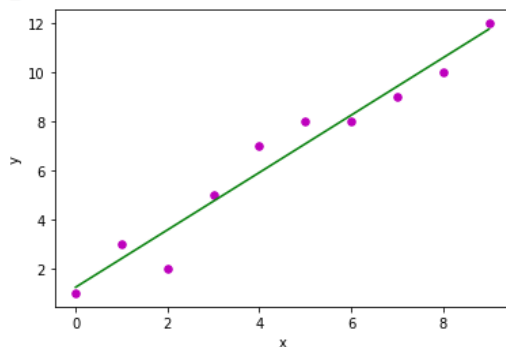
# estimating coefficients
b = estimate_coef(x, y)
print("Estimated coefficients:\nb_0 = {} \
\nb_1 = {}".format(b[0], b[1]))

# plotting regression line
plot_regression_line(x, y, b)

main()
```

Output:

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



Conclusion: Hence we have successfully learnt and performed Simple/Multiple Linear Regression.