Terna Engineering College

Department of Artificial Intelligence and Data Science

Program : Sem VI

Course: Machine Learning Lab

Experiment No.03

PART A

A.1 Aim: To implement Linear Regression using Python/R.

A.2 Theory:

Regression:

Regression in Machine Learning is a supervised learning technique. There are various types of regression like linear, logistic, polynomial, stepwise, ridge, lasso, etc.

Linear Regression:

Linear regression helps us to predict the relationship between two variables by assuming a linear connection between the independent and dependent variables.

It is one of the very simple and easy algorithms that works on regression and shows the relationship between the continuous variables.

It shows the linear relationship between the independent variable (X-axis) and the dependent variable (Y-axis).

There are two types of linear regression- Simple and Multiple.

Simple Linear Regression:

Simple linear regression is an approach for predicting a response using a single feature. It is one of the most basic machine learning models that a machine learning enthusiast gets to know about. In linear regression, we assume that the two variables i.e. dependent and independent variables are linearly related. Hence, we try to find a linear function that predicts the response value(y) as accurately as possible as a function of the feature or independent variable(x).

The formula for a simple linear regression is:

$$y = b_0 + b_1 x$$

- **y** is the predicted value of the dependent variable (**y**) for any given value of the independent variable (**x**).
- **B_0** is the **intercept**, the predicted value of **y** when the **x** is 0.
- **B_1** is the regression coefficient – how much we expect **y** to change as **x** increases.
- **x** is the independent variable (the variable we expect is influencing **y**).

e.g. In the given graph, we can see that height is the independent variable (x) and body weight is the dependent variable(y).
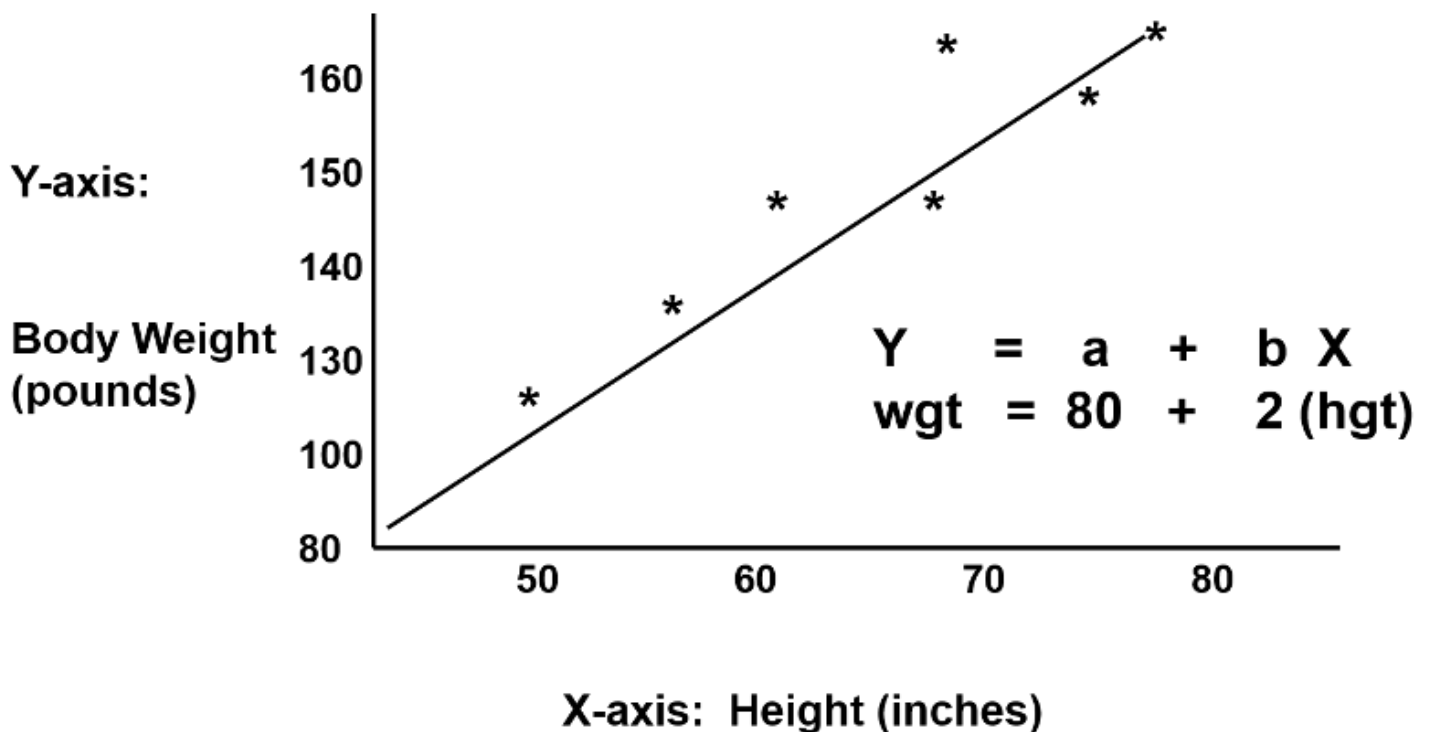
$$Y = a + bX$$
$$wgt = 80 + 2(hgt)$$

We could describe this relationship with the equation for a line, Y = a + bx, where 'a' is the Y-intercept and 'b' is the slope of the line. We could use the equation to predict weight if we knew an individual's height. In this example, if an individual was 70 inches tall, we would predict his weight to be:

Weight = 80 + 2 x (70) = 220 lbs.

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B.1 Input and Output:

Code :

```python
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression

x = np.array([1,3,10,16,26,36]).reshape((-1,1))
y = np.array([42,50,75,100,150,200])

model = LinearRegression()

model.fit(x,y)

print(f'Coefficient of regression: {model.coef_}')
print(f'Y-Intercept: {model.intercept_}')
```

Output:

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS    SEARCH ERROR    JUPYTER

PS D:\> python -u "d:\College\SEM 6\Machine Learning\linear regression.py"
Coefficient of regression: [4.50898634]
Y-Intercept: 33.695542774982016
PS D:\>
```

B.2 Conclusion:

Thus we have successfully implemented linear regression in Python and understood how the model is fitted to the given data.