

## Artificial Intelligence Lab - 10

**Aim :** Implementation of Learning Algorithm – Linear Regression

### Working Principle :

Linear regression shows the linear relationship between the independent variable (X-axis) and the dependent variable (Y-axis). To calculate best-fit line linear regression uses a traditional slope-intercept form. A regression line can be a Positive Linear Relationship or a Negative Linear Relationship.

The goal of the linear regression algorithm is to get the best values for  $a_0$  and  $a_1$  to find the best fit line and the best fit line should have the least error. In Linear Regression, Mean Squared Error (MSE) cost function is used, which helps to figure out the best possible values for  $a_0$  and  $a_1$ , which provides the best fit line for the data points. Using the MSE function, we will change the values of  $a_0$  and  $a_1$  such that the MSE value settles at the minima. Gradient descent is a method of updating  $a_0$  and  $a_1$  to minimize the cost function (MSE).

### Code :

```
import numpy as np
from sklearn.linear_model import LinearRegression
x = np.array([5, 15, 25, 35, 45, 55]).reshape((-1, 1))
y = np.array([5, 20, 14, 32, 22, 38])
model = LinearRegression()
model.fit(x, y)
```

```

r_sq = model.score(x, y)
print('coefficient of determination:', r_sq)
print('intercept:', model.intercept_)
print('slope:', model.coef_)
new_model = LinearRegression().fit(x, y.reshape((-1, 1)))
print('intercept:', new_model.intercept_)
intercept: [5.63333333]
print('slope:', new_model.coef_)
y_pred = model.predict(x)
print('predicted response:', y_pred, sep='\n')
y_pred = model.intercept_ + model.coef_ * x
print('predicted response:', y_pred, sep='\n')
x_new = np.arange(5).reshape((-1, 1))
print(x_new)
y_new = model.predict(x_new)
print(y_new)

```

## Output :

```

coefficient of determination: 0.7158756137479542
intercept: 5.633333333333329
slope: [0.54]
intercept: [5.63333333]
slope: [[0.54]]
predicted response:
[ 8.33333333 13.73333333 19.13333333 24.53333333 29.93333333 35.33333333]
predicted response:
[[ 8.33333333]
 [13.73333333]
 [19.13333333]
 [24.53333333]
 [29.93333333]
 [35.33333333]]
[[0]
 [1]
 [2]
 [3]
 [4]]
[5.63333333 6.17333333 6.71333333 7.25333333 7.79333333]

Process exited with code: 0

```

## Result :

Hence, the Implementation of Linear Regression as a machine learning algorithm is done successfully.