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ARTIFICIAL INTELLIGENCE LAB

EXPERIMENT NO: 10

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)

SOURCE 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:

Result:

```

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

```

Hence, the Implementation of learning algorithm- linear regression is done successfully