

Implementation of Univariate Linear Regression

› Aim:

To implement univariate Linear Regression to fit a straight line using least squares.

› Equipment's required:

1. Hardware – PCs
2. Anaconda – Python 3.7 Installation / Moodle-Code Runner

› Algorithm:

1. Get the independent variable X and dependent variable Y.
2. Calculate the mean of the X -values and the mean of the Y -values.
3. Find the slope m of the line of best fit using the formula.

$$m = \frac{\sum_{i=1}^n (x_i - \bar{X})(y_i - \bar{Y})}{\sum_{i=1}^n (x_i - \bar{X})^2}$$

4. Compute the y -intercept of the line by using the formula:

$$b = \bar{Y} - m\bar{X}$$

5. Use the slope m and the y -intercept to form the equation of the line.
6. Obtain the straight line equation $Y=mX+b$ and plot the scatterplot.

Program

```
# Program for Univariate linear regression using the least squares method
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import numpy as np
X = np.array(eval(input()))
Y = np.array(eval(input()))
X_mean=np.mean(X)
Y_mean=np.mean(Y)
num=0
denom=0

for i in range(len(X)):
    num+=(X[i]-X_mean)*(Y[i]-Y_mean)
    denom+=(X[i]-X_mean)**2
m=num/denom
c=Y_mean-m*X_mean
print (m, c)
Y_pred=m*X+c
print (Y_pred)
```

Input:

Input	Result
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]	1.1696969696969697 1.2363636363636363
[1, 3, 2, 5, 7, 8, 8, 9, 10, 12]	[1.23636364 2.40606061 3.57575758 4.74545455 5.91515152 7.08484848 8.25454545 9.42424242 10.59393939 11.76363636]

Output:

	Input	Expected	Got	
✓	[0, 1, 2, 3, 4, 5, 6, 7, 8, 9] [1, 3, 2, 5, 7, 8, 8, 9, 10, 12]	1.1696969696969697 1.2363636363636363 [1.23636364 2.40606061 3.57575758 4.74545455 5.91515152 7.08484848 8.25454545 9.42424242 10.59393939 11.76363636]	1.1696969696969697 1.2363636363636363 [1.23636364 2.40606061 3.57575758 4.74545455 5.91515152 7.08484848 8.25454545 9.42424242 10.59393939 11.76363636]	✓
Passed all tests! ✓				

' Result

Thus the univariate Linear Regression was implemented to fit a straight line using least squares.