

multilinear regression

①

ex:

x_1	x_2	y
1	2	6
2	3	7
3	6	8

step 1:-

	y	x_1	x_2	x_1^2	x_2^2	$x_1 y$	$x_2 y$	$x_1 x_2$
obj1	6	1	2	1	4	6	12	2
obj2	7	2	3	4	9	14	21	6
obj3	8	3	6	9	36	24	48	18
<u>Sum</u>	21	6	11	14	49	44	81	26
<u>mean</u>	7	2	3.6	7.3	-24	-27.3	-50	-13.33

Step 2:- regression sum calculations.

$$\sum x_1^2 = \frac{\sum x_1^2 - (\sum x_1)^2}{n} = \frac{14 - 36}{3} = 7.3$$

$$\sum x_2^2 = \frac{\sum x_2^2 - (\sum x_2)^2}{n} = \frac{49 - 121}{3} = -\frac{72}{3} = -24$$

$$\sum x_1 y = \frac{\sum x_1 y - \sum x_1 \cdot \sum y}{n} = \frac{44 - 6 \times 21}{3} = \frac{44 - 126}{3} = -27.3$$

$$\sum x_2 y = \frac{\sum x_2 y - \sum x_2 \cdot \sum y}{n} = \frac{81 - 11 \times 21}{3} = \frac{81 - 231}{3} = -\frac{150}{3} = -50$$

②

$$\sum x_1 x_2 = \frac{\sum x_1 \cdot x_2 - \sum x_1 \cdot \sum x_2}{n}$$

$$= \frac{26 - 6 \times 11}{3}$$

$$= \frac{26 - 66}{3} = -13.33$$

Step 3:

Calculate b_0, b_1, b_2

to calculate b_0 , first b_1, b_2 should be known as

$\bar{y}, \bar{x}_1, \bar{x}_2$
= mean

$$b_0 \text{ is } \boxed{\bar{y} - b_1 \bar{x}_1 - b_2 \bar{x}_2}$$

$$\underline{b_1} = \frac{\sum x_2^2 \cdot \sum x_1 y - \sum x_1 x_2 \sum x_2 y}{\sum x_1^2 \cdot \sum x_2^2 - (\sum x_1 x_2)^2}$$

$$= \frac{-24 \times -27.3 - (-13.33) \times -50}{(7.3 \times -24) - (-13.33)^2}$$

$$= \frac{(655.2) - (666.5)}{-175.2 - (177.6889)}$$

$$= \frac{-11.3}{-352.8} = 0.03$$

$$= \underline{0.03} \quad \boxed{b_1 = 0.03}$$

(3)

$$\underline{b_2} := b_2 = \frac{(\sum x_1^2)(\sum x_2 y) - (\sum x_1 x_2)(\sum x_1 y)}{[(\sum x_1^2)(\sum x_2^2) - (\sum x_1 x_2)^2]}$$

$$= \frac{(7 \cdot 3 \times -50.) - [(-13.33)(-27.3)]}{-352.8}$$

$$= \frac{-365 - (363.09)}{-352.8}$$

$$= \frac{-728.09}{-352.8} = 2.063$$

$$\boxed{b_2 = 2.063}$$

$$b_0 = \cancel{\sum y} - b_1 \cancel{\sum y}$$

$$= \cancel{\sum y} - b_1 \cdot \cancel{\sum x_1} - b_2 \cdot \cancel{\sum x_2}$$

$$= 7 - (0.03 \times 2) - (2.063 \times 3.6)$$

$$= 7 - (0.06) - (7.4268)$$

$$= 7 - 7.4868$$

$$\boxed{b_0 = -0.4868}$$

$$\text{New prediction} \left\{ \hat{y} = -0.4868 + 0.03 x_1 + 2.063 x_2 \right.$$