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Linear Regression

Task 01:

Given,

Weight	price
2	35
4	60
5	20
3	50
6	50
5	55
7	60

let,

x	y	xy	x^2
2	35	70	4
4	60	240	16
5	20	100	25
3	50	150	9
6	50	300	36
5	55	275	25
7	60	420	49

$\therefore \bar{x} = 32/7 = 4.571$

$\bar{y} = 330/7 = 47.142$

$\overline{xy} = 1555/7 = 222.142$

$(\bar{x})^2 = (4.571)^2 = 20.894$

$\overline{(x^2)} = 164/7 = 23.428$

$\therefore Y = MX + C$ where

$= 2.626 \times 6 + 35.138$

$= 50.894$

$M = \dfrac{\bar{x}.\bar{y} - \overline{xy}}{(\bar{x})^2 - \overline{(x^2)}}$

$= 2.626$

$C = \bar{y} - M\bar{x}$

$= 35.138$

$x = 6$

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Task 02:

Predicted price (Y),

$Y = 2.626 \times 2 + 35.138 = 40.39$

$Y = 2.626 \times 4 + 35.138 = 45.642$

$Y = 2.626 \times 5 + 35.138 = 48.268$

$Y = 2.626 \times 3 + 35.138 = 43.016$

$Y = 2.626 \times 6 + 35.138 = 50.894$

$Y = 2.626 \times 5 + 35.138 = 48.268$

$Y = 2.626 \times 7 + 35.138 = 53.52$

∴ Residual,

$R_1 = 35 - 40.39 = -5.39$

$R_2 = 60 - 45.642 = 14.358$

$R_3 = 20 - 48.268 = -28.268$

$R_4 = 50 - 43.016 = 6.984$

$R_5 = 50 - 50.894 = -0.894$

$R_6 = 55 - 48.268 = 6.732$

$R_7 = 60 - 53.52 = 6.48$

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Task 03:

Mean Absolute Error:

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i|$$

$$= \frac{1}{7} \times (5.39 + 14.358 + 28.268 + 6.984 + 0.894 + 6.732 + 6.48)$$

$$= \frac{1}{7} \times 69.106 = 9.88$$

Mean Squared Error,

$$MSE = \frac{1}{n}\sum(y_i - \hat{y}_i)^2$$

$$= \frac{1}{7} \times \{(-5.39)^2 + (14.358)^2 + (28.268)^2 + (6.984)^2 + (-0.894)^2 + (6.732)^2 + (6.48)^2\}$$

$$= \frac{1}{7} \times 11.71.169$$

$$= 167.309$$