VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

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V.E.S.
Since 1962

Department of Artificial Intelligence and Data Science

Subject: DAV **Class:** D11AD **Semester:** VI

Roll No.: 26	Name: Dyotak Kachare		
Exp No.: 3	Title: Multiple Linear Regression.		
DOP:		DOS:	
GRADE		LAB OUTCOME:	SIGNATURE:

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DAV Experiment - 3

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Multiple linear ~~se~~ regression in python

Theory

- Multiple linear regression is used to estimate the relationship between two or more independent variables and one dependent variable.

	X_1	X_2	Y	X_1Y	X_2Y	X_1X_2	X_1^2	X_2^2
Σ								

- $\Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n}$ $\quad$ $\Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n}$

$$\Sigma x_1 y = \Sigma X_1 Y - \frac{\Sigma X_1 \Sigma Y}{n} \qquad \Sigma x_2 y = \Sigma X_2 Y - \frac{\Sigma X_2 \Sigma Y}{n}$$

$$\Sigma x_1 x_2 = \Sigma X_1 \Sigma X_2 - \frac{\Sigma x_1 \Sigma x_2}{n}$$

$$b_1 = \frac{\Sigma x_2^2 \, \Sigma x_1 y - \Sigma x_1 x_2 \, \Sigma x_2 y}{\Sigma x_1^2 \Sigma x_2^2 - (\Sigma x_1 x_2)^2}$$

$$b_2 = \frac{\Sigma x_1^2 \Sigma x_2 y - \Sigma x_1 x_2 \, \Sigma x_1 y}{\Sigma x_1^2 \Sigma x_2^2 - (\Sigma x_1 x_2)^2}$$

$$b_0 = \overline{Y} - b_1 \overline{X_1} - b_2 \overline{X_2}$$

$$\boxed{y = b_0 + b_1 x_1 + b_2 x_2}$$

Q)

X_1	X_2	Y	X_1Y	X_2Y	X_1X_2	X_1^2	X_2^2
1	4	9.29	9.29	37.16	4	1	16
2	12	12.17	25.34	152.04	24	4	144
3	16	12.42	37.26	198.72	48	9	256
4	8	0.38	1.52	3.04	32	16	64
5	32	20.77	103.85	664.64	160	25	1024
6	24	9.52	57.12	228.48	144	36	576
7	20	2.38	16.66	47.6	140	49	400
8	28	7.46	59.68	208.88	224	64	784
36	144	74.89	310.72	1540.5	776	204	3264

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$$\Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n}$$

$$= 204 - \frac{36^2}{8}$$

$$= 42$$

$$\Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n}$$

$$= 3264 - \frac{(144)^2}{8}$$

$$= 672$$

$$\Sigma x_1 y = \Sigma X_1 Y - \frac{\Sigma X_1 \Sigma Y}{n}$$

$$= 310.72 - \frac{36\,(74.89)}{8}$$

$$= -26.28$$

$$\Sigma x_2 y = \Sigma X_2 Y - \frac{\Sigma X_2 \Sigma Y}{n}$$

$$= 1540.5 - \frac{144\,(74.89)}{8}$$

$$= 192.48$$

$$\Sigma x_1 x_2 = \Sigma X_1 X_2 - \frac{\Sigma X_1 \Sigma X_2}{n}$$

$$= 776 - \frac{36\,(144)}{8}$$

$$= 128$$

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$$b_1 = \frac{\Sigma x_2^2 \, \Sigma x_1 y - \Sigma x_1 x_2 \, \Sigma x_2 y}{\Sigma x_1^2 \, \Sigma x_2^2 - (\Sigma x_1 x_2)^2}$$

$$= \frac{672(-26.28) - 128(192.48)}{42(672) - 128^2}$$

$$= -3.572$$

$$b_2 = \frac{\Sigma x_1^2 \, \Sigma x_2 y - \Sigma x_1 x_2 \, \Sigma x_1 y}{\Sigma x_1^2 \, \Sigma x_2^2 - (\Sigma x_1 x_2)^2}$$

$$= \frac{42(192.48) - 128(-26.28)}{42(672) - 128^2}$$

$$= 0.966$$

$$b_0 = \overline{Y} - b_1 \overline{X_1} - b_2 \overline{X_2}$$

$$= \frac{74.89 - (-3.572)36 - 0.966(144)}{8}$$

$$= 8.047$$

$$\boxed{y = 8.047 - 3.572 x_1 + 0.966 x_2}$$

<u>Conclusion</u>

Thus we have succesfully implemented Multi-linear regression