04.08.22

Linear Regression

x	1	2	3	4	5
y	2	5	3	8	7

Sol :-

x	y	xy	x^2
1	2	2	1
2	5	10	4
3	3	9	9
4	8	32	16
5	7	35	25

Find the value of m and C ?

$$m = \frac{n\Sigma xy - \Sigma y \Sigma x}{n\Sigma x^2 - (\Sigma x)^2}$$

$$= \frac{[(5\times 88) - (15\times 25)]}{(5\times 55) - (15)^2}$$

$$m = \frac{440 - 375}{275 - 225}$$

$$m = \frac{65}{50} = \frac{13}{10}$$

$$m = 1.3$$

$$C = (\Sigma y - m \Sigma x)/n$$

$$= (25 - 1.3\times 15)/5$$

$$= (25 - 19.5)/5$$

$$= 5.5/5$$

$$C = 1.1$$

So, $y = 1.3x + 1.1$

↓

Independent variable for prediction.

q.8. vn

Logistic Regression

hours study	Pass(1) / Fail(0)
29	0
15	0
33	1
28	1
39	1

Q.1 Calculate the probability of pass for the student who studied 33 hours.

Q.2 at least how many hours student should study that makes he will pass the course with prob of more than 95%.

assume the model for ODDS of passing the course is given,

$$\log(\text{odds}) = -64 + 2 * \text{hrs.}$$

↓ independent variable

Sol / Sigmoid fn:

$$S(x) = \frac{1}{1+e^{-x}}.$$

Q.1 → $\log(\text{odds}) = z$

$$= -64 + 2 * \text{hrs.}$$

$$p = \frac{1}{1+e^{-z}}$$

[we can write in form of probability]

$$z = -64 + 2 * 33$$

$$= -64 + 66 = 2$$

Replace value of z

$$p = \frac{1}{1+e^{-2}}$$

$$= 0.88$$

* So, if Student Studied 33 hrs, then there is 88% chance that Student will pass.

Q.2 Sol:-

$$p = \frac{1}{1+e^{-z}} = 0.95 \quad \text{(given)}$$

$$0.95 * (1+e^{-z}) = 1$$

$$0.95 * e^{-z} = 1 - 0.95$$

$$e^{-z} = \frac{0.05}{0.95} = 0.0526$$

* Student should study atleast 33.47 hrs. to get 95% prob.

we need to calculate no of hrs.

So,

$$\log(e^{-z}) = \log(0.0526)$$

we know, $\log(e^x) = x$.

So,

$$-z = \log(0.0526) = -2.94$$

$$z = 2.94$$

$$\log(\text{odds}) = z$$

$$= -64 + 2 * \text{hrs}.$$

$$2.94 = -64 + 2 \times \text{hr}.$$

$$\therefore 2 \times \text{hrs} = 2.94 + 64$$

$$= 66.94$$

$$\text{hrs} = 33.47 \text{ hrs}$$

Polynomial Regression

07.08.23

a.1

x	y
3	2.5
2	3.2
1	3.5

Quadratic polynomial Regression model

$$y = a_0 + a_1 x + a_2 x^2$$

Values of a_0, a_1, a_2 are calculated using the following equations.

$$\Sigma y_i = n a_0 + a_1 (\Sigma x_i) + a_2 (\Sigma x_i^2)$$

$$\Sigma y_i x_i = a_0 (\Sigma x_i) + a_1 (\Sigma x_i^2) + a_2 (\Sigma x^3)$$

$$\Sigma y_i x_i^2 = a_0 (\Sigma x^2) + a_1 (\Sigma x^3) + a_2 (\Sigma x^4)$$

P.T.O

x	y	x^2	x^3	x^4	xy	x^2y
3	2.5	9	27	81	7.5	22.5
2	3.2	4	8	16	6.4	12.8
1	3.5	1	1	1	3.5	3.5
Σ 6	9.2	14	36	98	17.4	38.8

So,

$9.2 = 3a_0 + a_1 6 + a_2 14$

$17.4 = a_0 6 + a_1 14 + a_2 36$

$38.8 = a_0 14 + a_1 36 + a_2 98$

Find a_0, a_1, and a_2.