

16/3/24

Loss Function or cost function



D.P.
one



entire data

Gradient Techniques

① mean square Error

$$\frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2$$

⇒ also called variance.

Error = $(y - \hat{y})$

Square Error = $(y - \hat{y})^2$

mean sq = $\frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2$

note! - most of the time we will use this method because after squaring we can easily find out the error.

Knowing our destination is completing half the journey.

07

MAY'23

SUNDAY

19th Week • 127-238

SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

09.00

10.00

11.00

12.00

13.00

14.00

15.00

16.00

17.00

18.00

② Mean Absolute Error

⇒ MAD

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

③ Root Mean Square Error

⇒ $\sqrt{\text{var}}$ = std dev

$$\frac{1}{n} \sum_{i=1}^n \sqrt{(y - \hat{y})^2}$$

Optimization / convergence algom - slope
c - intercept

gradient descent

$$m_{\text{new}} = m_{\text{old}} - \eta \frac{\partial \text{loss}}{\partial m} \rightarrow \text{derivative}$$

learning rate

$$c_{\text{new}} = c_{\text{old}} - \eta \frac{\partial \text{loss}}{\partial c}$$

Use caseLet $x = 1, 2, 3$ $y = mx$ Let $n = 1$ $m = 0.5$ $m = 0$ $x_1 = 1$ $x_1 = 1$ $x_1 = 0$ $\hat{y} = 1 \times 1 = 1$ $\hat{y} = 0.5 \times 1 = 0.5$ $\hat{y} = 0$ $x_2 = 2$ $x_2 = 2$ $x_2 = 0$ $\hat{y} = 1 \times 2 = 2$ $\hat{y} = 0.5 \times 2 = 1$ $\hat{y} = 0$ $x_3 = 3$ $x_3 = 3$ $x_3 = 0$ $\hat{y} = 1 \times 3 = 3$ $\hat{y} = 0.5 \times 3 = 1.5$ $\hat{y} = 0$

Try to leave everything a little better than you found it.

$$\text{Cost fun} = \frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2$$

here $n=3$ (mp, 1, 2, 3)

for $m=1$

$$= \frac{1}{3} [(1-1)^2 + (2-2)^2 + (3-3)^2]$$

$$= 0$$

for $m=0.5$

$$= \frac{1}{2} [(-0.5)^2 + (2-1)^2 + (2-1.5)^2]$$

$$= 1.16$$

for $m=0$

$$= \frac{1}{3} [(1-0)^2 + (2-0)^2 + (3-0)^2]$$

$$= \frac{1}{3} [1 + 4 + 9]$$

$$= 4.6$$

So we will select $m=1$ & C value $= 0$.

So it is our optimized parameter

→ it gives us no loss. so this m & C value we will select.

Ridge Regression & Lasso Regression

$$\text{Cost fun} = \frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2 + \beta(m)^2 \quad (\text{Ridge})$$

$$= \frac{1}{n} \sum_{i=1}^n (y - \hat{y})^2 + \beta(m) \quad (\text{Lasso})$$

β = hyperparameter