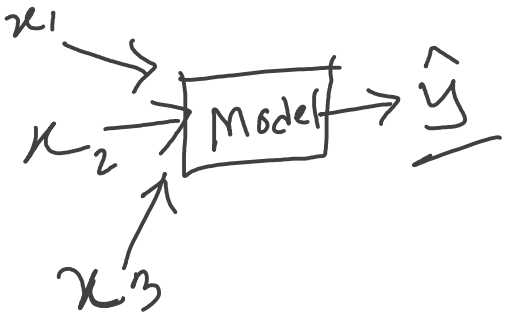
Linear Regression

Thursday, April 25, 2024 9:47 PM

Linear Regression



dependent

independent

$h_\theta(x) = \theta_0 + \theta_1 x$

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$y = mx + c$

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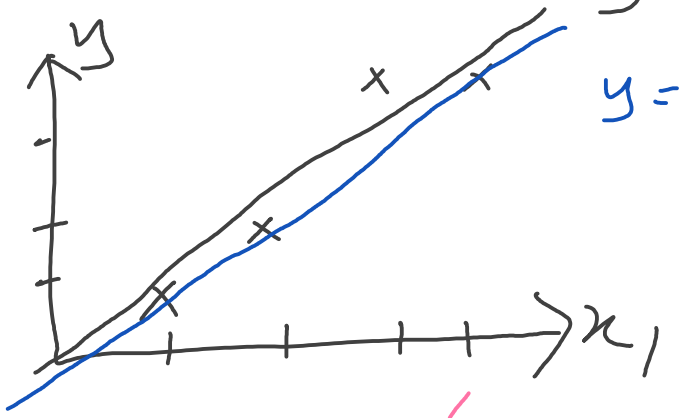
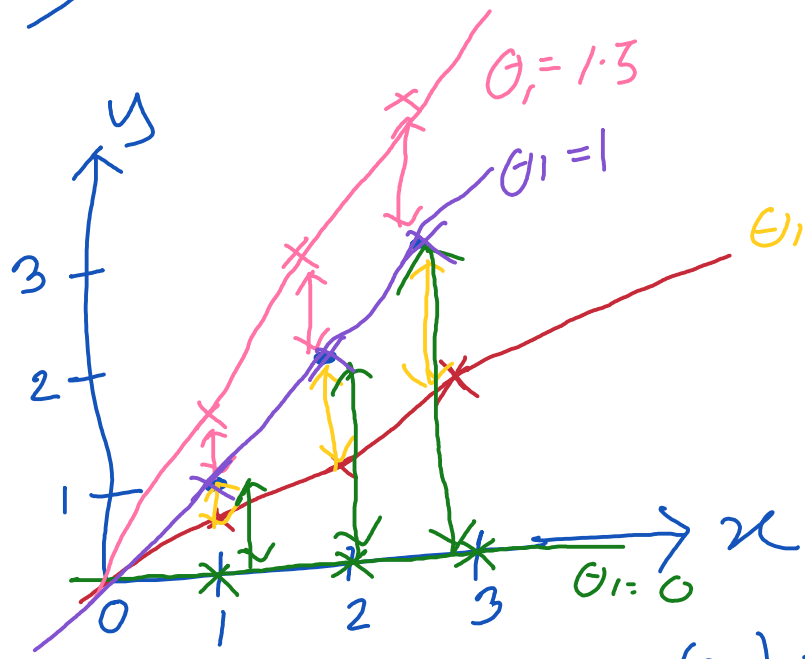


$\theta_0 = 0$

$\theta_1 = [0, 0.5, 1, 1.5]$ Data



x	y
1	
2	
3	

$|\hat{y} -$

Lets say, $\theta_0 = 0$; $h_\theta(x) = \theta_0 + \theta_1 x$

$y = \theta_1 x$

$J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=}^{m}$

If $\theta_1 = 0.5$;

$x = 1$; $y = 0.5 \times 1$

MSE

$= 0.5$

$x = 2 ; \; y = 0.5 \times 2$
$= 1$

$x = 3 ; \; y = 0.5 \times 3$
$= 1.5$

$J(\theta_1) = \frac{1}{2\times 3}[(0.5-1)$

≈ 0.58

if $\theta_1 = 0$;

$x = 1 ; \; y = 0 \times x = 0$

$x = 2 ; \; y = 0$

$x = 3 ; \; y = 0$

$J(\theta_1) = \frac{1}{2\times 3}[(0-1)^2 +$

≈ 2.3

if $\theta_1 = 1.5$

$x = 1 ; \; y = 1.5 \times x$
$= 1.5$

$x = 2 ; \; y = 1.5 \times 2 = 3$

$x = 3 ; \; y = 1.5 \times 3 = 4.5$

$J(\theta_1) = \frac{1}{2\times 3}[(1.5-1)$

$\approx$ ~~1.2~~ 0.58

if $\theta_1 = 1$;

$x = 1 ; \; y = 1 \times 1 = 1$

$x = 2 ; \; y = 1 \times 2 = 2$

$x = 3 ; \; y = 1 \times 3 = 3$

$J(\theta_1) = \frac{1}{2\times 3}[(1-1)^2 +$

$= 0$

Test set

x	y
4	4
	5
5	

$y = \theta_0 + \theta_1 x$

$y = 0 + 1(x)$ LR

4 → [m] → 5, 4 // 100%

5

Convergence Algorithm

Optimize θ_0 / θ_1

$J(\theta_j) =$

$\theta_0 = 0$ ↑ Loss

$\theta_1 = 0$

$\frac{\partial}{\partial \theta_j} =$

Repeat until convergence {

$$\theta_j = \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta_j)$$

θ_j: old value; α: learning rate; $J(\theta_j)$: loss/cost

}

Gradient Descent

$\theta_j = \theta_j - \alpha \times$ float

$= 0 + n$ $0.5 - n$

α

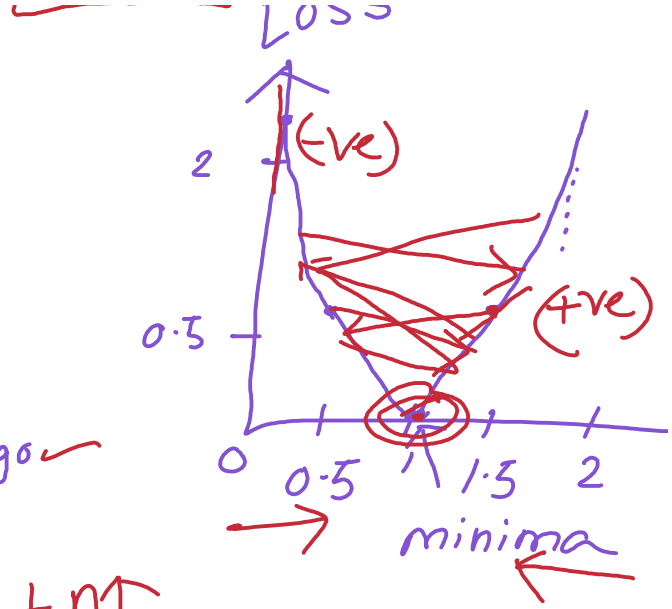
Step-1 : predict

$\theta_0 = 0$

$\theta_1 = 1$

Step2 : Loss

Step 3 : Convergence Algo



0.5 + ∆