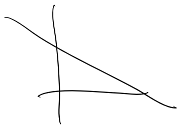
Linear Regression:

$y = mx + c$
$\downarrow$ slope $\downarrow$ intercept



$y = ax + bz + c$

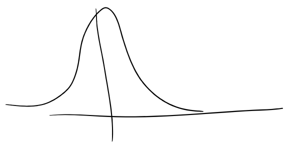
n^{th} dimension
line eq^n $(n-1)$ dimensions.

eq^n of st. line in
3dim = 1, → 2 dim.

$y = ax + bz + c$

(100%) Dataset? $m \times n$

(70-80%) → Training set
(20-10%) → Testing set
(10-10%) → validation



$y = mx + c$

$y = \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \cdots + \theta_{n-1} x_{n-1} + c$

$y = \theta_0 x_0 + \theta_1 x_1 + \theta_2 x_2 + \cdots + \theta_{n-1} x_{n-1}$ $(x_0 = 1)$
Let $(\theta_0 = c)$

$\boxed{y = \sum_{i=0}^{n-1} \theta_i x_i}$ hypothesis func. of linear regression

(θ_0 : intercept
x_0 : 1)

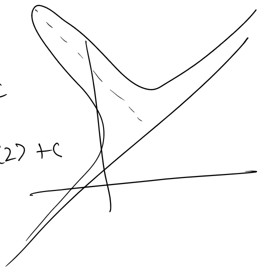
Loss used in this case:

$$\boxed{L2 \text{ loss} : J = \min \frac{1}{2} \sum_{i=0}^{n} (h(x_i) - y_i)^2}$$

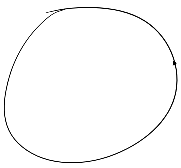
99

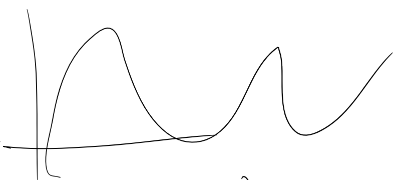
$y = mx + c$

$y = m(2) + c$



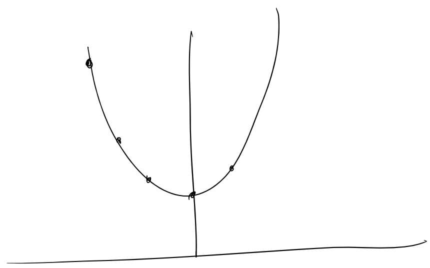
Gradient Descent:





$\frac{dy}{dx}$ = slope

gradient $\frac{\partial y}{\partial x}$



$y = ax + bz + c$ $\quad \frac{\partial y}{\partial x}, \frac{\partial y}{\partial z}$

$y = 4x + 2$

$y = 2x + 1$

$$\frac{\partial J}{\partial \theta_i}$$

$$\boxed{\theta_j = \theta_j - \alpha \frac{\partial J}{\partial \theta_j}}$$

α: Learning rate (α : 0.001, 0.003)
Hyper parameter

$\frac{\partial J}{\partial \theta_j}$: $\quad J = \min \frac{1}{2} \sum_{i=0}^{n-1} (h(x_i) - y_i)^2$

$h(x_i) = \sum_{i=0}^{n-1} \theta_i x_i$

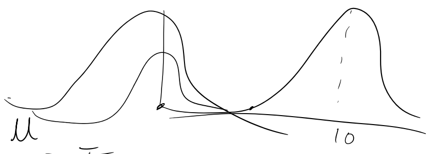
$$\frac{\partial J}{\partial \theta_j} = \frac{1}{\cancel{2}} \cdot \cancel{2} (h(x_i) - y_i) \cdot \frac{\partial}{\partial \theta_j} (h(x_i) - y_i)$$

mx3

$\cancel{y} = a\cancel{x} + b\cancel{z} + c$

set

ML



$\frac{X - \mu}{\sigma}$ =

$\partial \theta_j \quad 4 \quad \partial \theta_j$

$(h(x_i) - y_i) \cdot \frac{\partial}{\partial \theta_j} \left(\sum_i \theta_i x_i - y_i \right)$

$$\boxed{\frac{\partial J}{\partial \theta_j} = (h(x_i) - y_i) \cdot (x_j)}$$