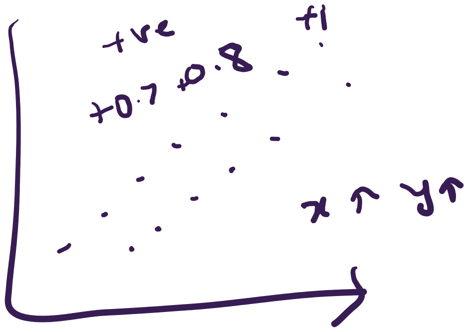


x ↑ y ↓ y ↑

≈ 0

corr ≈ 0

$$corr = \frac{cov}{\sigma_x \sigma_y} = \Sigma$$

$$cov = \frac{\Sigma (x_i - \bar{x}) \cdot (y_i - \bar{y})}{N}$$

$$\sigma_x = \sqrt{\frac{\Sigma (x - \bar{x})^2}{N}}$$

$$corr = \frac{\Sigma (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\Sigma (x - \bar{x})^2} \sqrt{\Sigma (y_i - \bar{y})^2}}$$

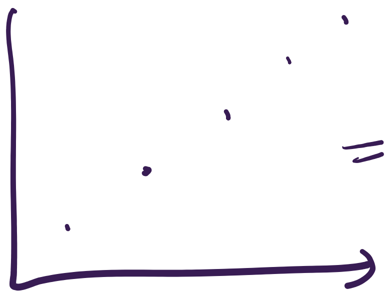
cov & corr

↓ ↓

scale variant   Invariant

$x = y$

x	y
2	2
4	4
6	6
8	8



$= +1$

$y = mx + c \rightarrow$ simple

$y = m_1x_1 + m_2x_2 + \dots + m_N x_N + c$

PL	SL

Hgt	wt

$wt = m \times Hgt + c$

Gradient Descent

$f(x) = x^2$

$x^n \rightarrow n.x^{n-1}$

$$\frac{\partial f(x)}{\partial x} = 2x^{2-1} = 2x$$

$$f(x) = 4x^2y + 5x + \underset{\rightarrow 0}{100}$$

$$= 8xy + 5 + 0$$

$$= 8xy + 5 + 0$$

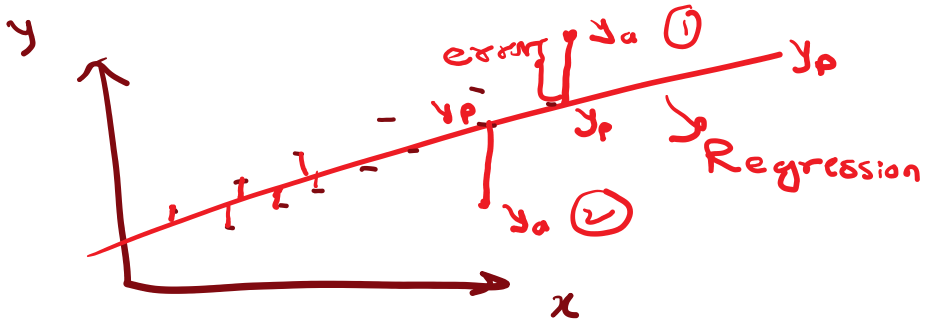
$$f(x) = 7x^4y^2 + 9y + 20x + 40$$

$$\frac{\partial f(x)}{\partial x} = 28x^3y^2 + 0 + 20 + 0$$

$$f(x) = (4x^3 + y^2)^3$$

$$\frac{\partial f(x)}{\partial x} = 3.(4x^3 + y^2)^2.(12x^2 + 0)$$

$$= 36x^2 \times (4x^3 + y^2)^2$$



① error $= (y_a - y_p)$

$= 20 - 15 = +5$

② $E = 10 - 15 = -5$

$\varepsilon = +5 - 5 = 0$

$$\Sigma(y_a - y_p)^2$$

$-5^2 = 25$

$+5^2 = 25$

① Error $= y_a - y_p$

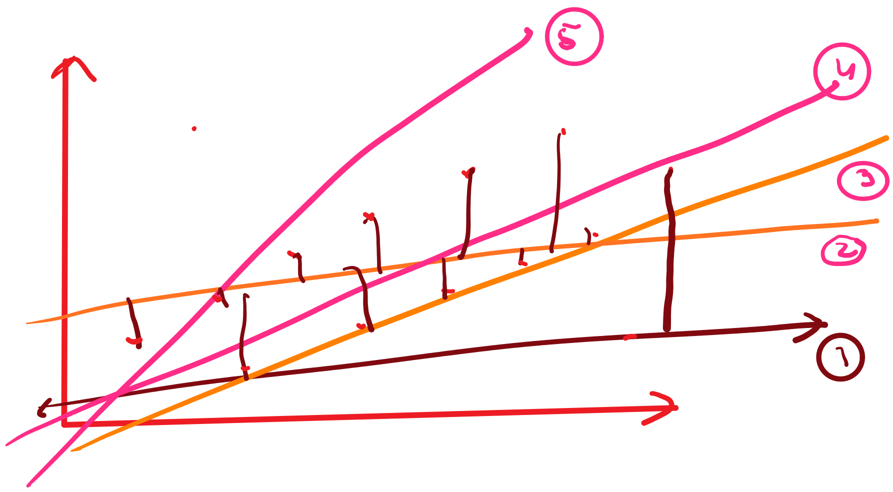
② SSE $= \Sigma(y_a - y_p)^2$

Sum of Squared Error

③ MSE $= \dfrac{\Sigma(y_a - y_p)^2}{N}$

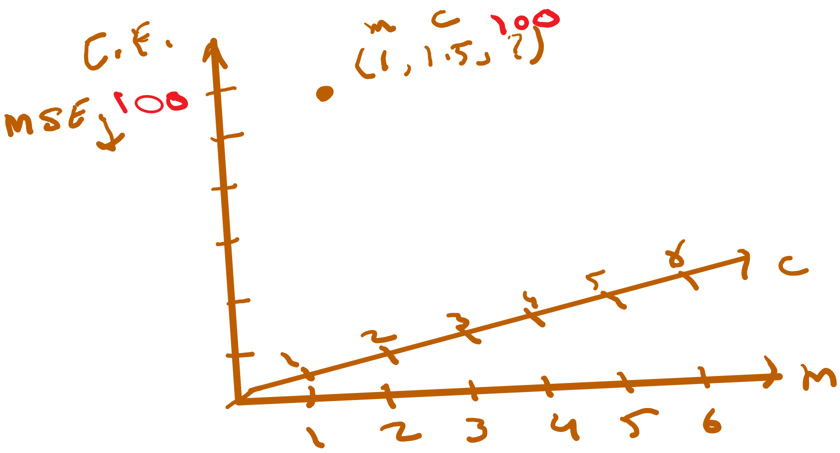
Cost Function

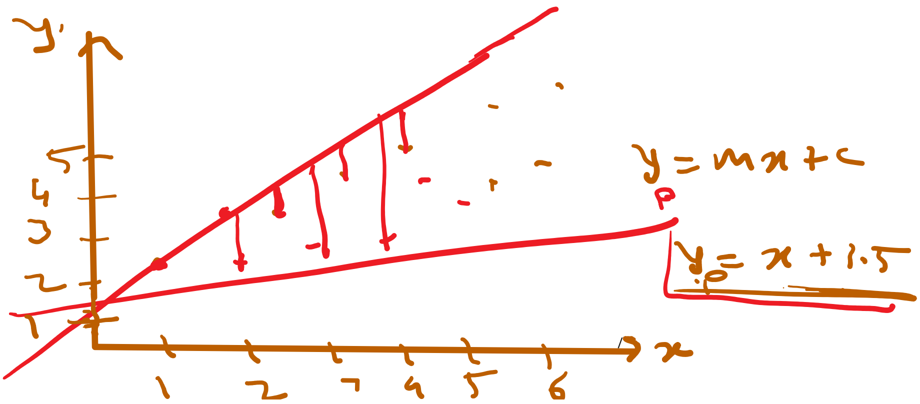
Loss Function

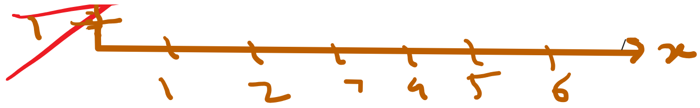


	MSE
1	100
2	150
3	120
4	$\boxed{80}$
5	110

$\rightarrow$ Min MSE







$$y = x + 1.5$$

$$x = 1,\ y = 2.5$$

$$x = 2,\ y = 3.5$$

$$MSE = 100$$

$$M_{new} = M_{old} - L\frac{\partial CF}{\partial m}$$

$$C_{new} = C_{old} - L\frac{\partial CF}{\partial c}$$

$$\frac{\partial CF}{\partial m} = \frac{\partial}{\partial m}\ \Sigma\ \frac{(y_a - y_p)^2}{N}$$

$$= \frac{1}{N}\ \frac{\Sigma}{\partial m}\ [y_a - (mx + c)]^2$$

$$= \frac{1}{N}\ 2 \cdot [y_a - (mx+c)] \cdot (-x)$$

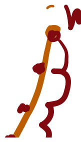
$$\boxed{\frac{\partial CF}{\partial m} = \Sigma \frac{-2x}{N}\ [y_a - y_p]}$$

$$\frac{\partial CF}{\partial c} = \frac{\partial}{\partial c}\ \frac{\Sigma (y_a - y_p)^2}{N}$$

$$= \frac{\partial}{\partial c}\ \Sigma\ \frac{(y_a - (mx+c))^2}{N}$$

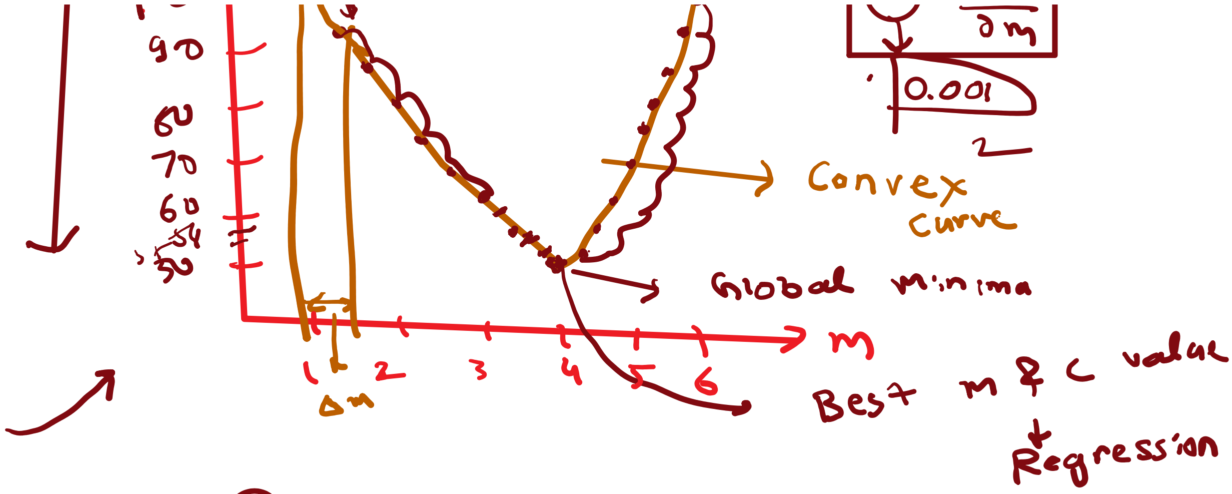
$$= \frac{1}{N} \cdot 2(y_a - (mx+c)) \cdot (-1)$$

$$\boxed{\frac{\partial CF}{\partial c} = \frac{-2}{N}\ (y_a - y_p)}$$



$$m = 1 - \boxed{L \cdot \frac{\partial CF}{\partial m}}$$

$L \to 0.001$



① $m_2 = 1 - 0.001 \times (-2w)$

$= (1 - (-0.2))$

$= 1 + 0.2 = 1.2$

$c_2 = 1.8$ $\quad y = 1.2x + 1.8$

MSE = 90

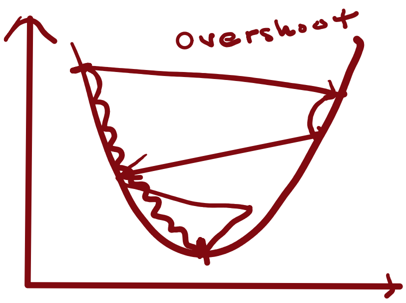
$m_1 = 6$

$m_2 = 5.5$

$m_3 = 5.3$

$m_4 = 5.0$

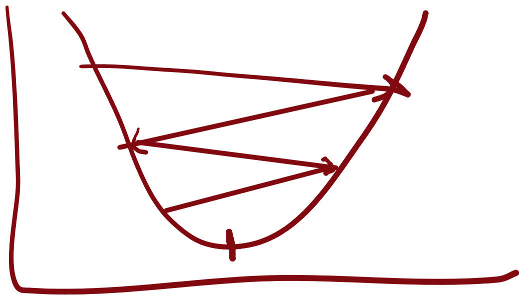
$m_5 = 4$

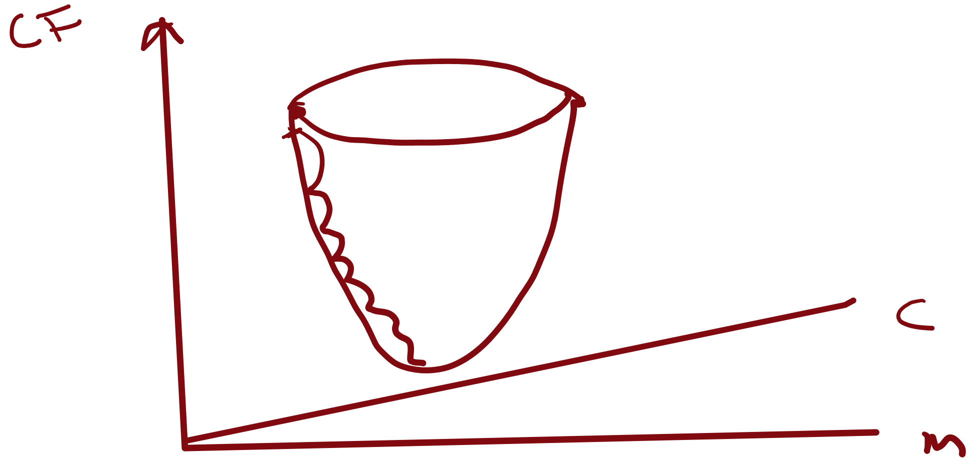


$m_1 = 1$

$m_2 = 1 - (2) \times (-20)$

$= 1 + 40 = 41$





Line	m	c	MSE(CF)
1	1	1	1000
2	1.5	1.2	800
3	2	3	600
4	3	5	400
5	4	6	300 → BFL

B. → best m

→ Best c