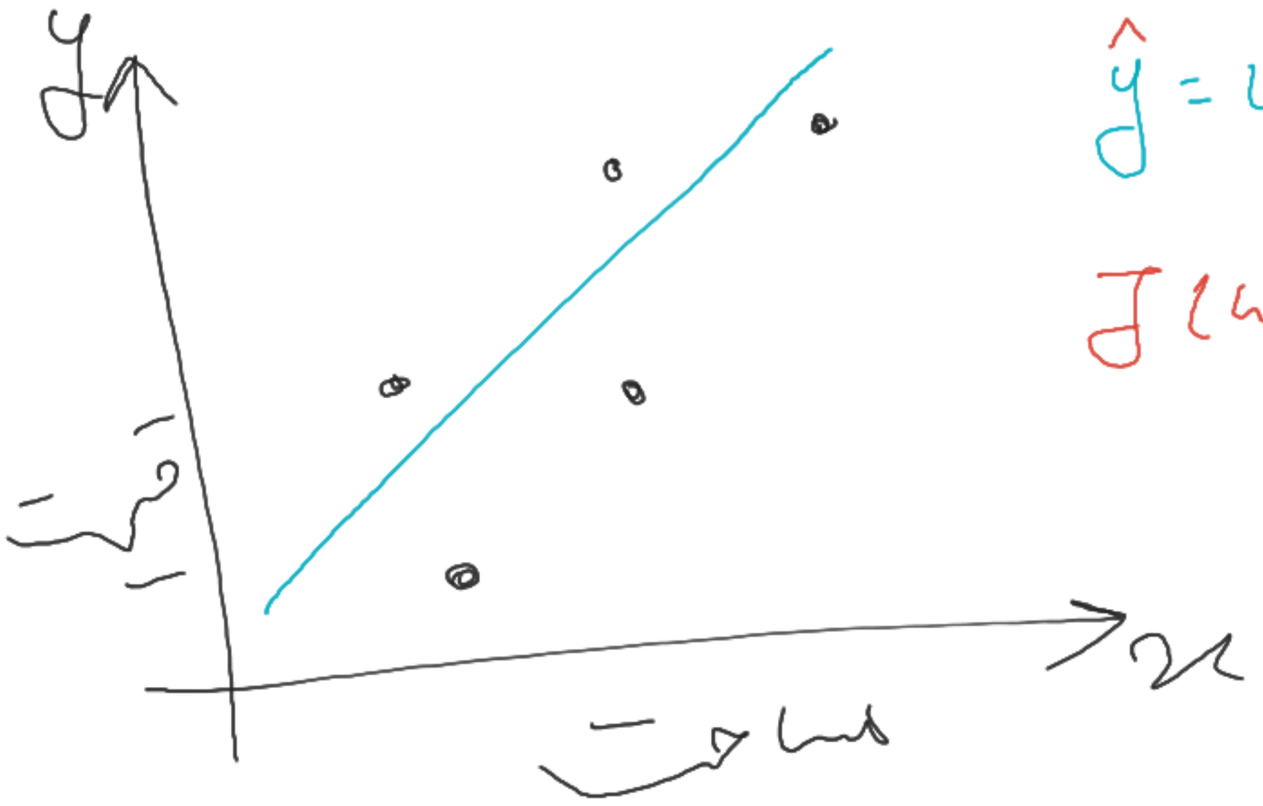
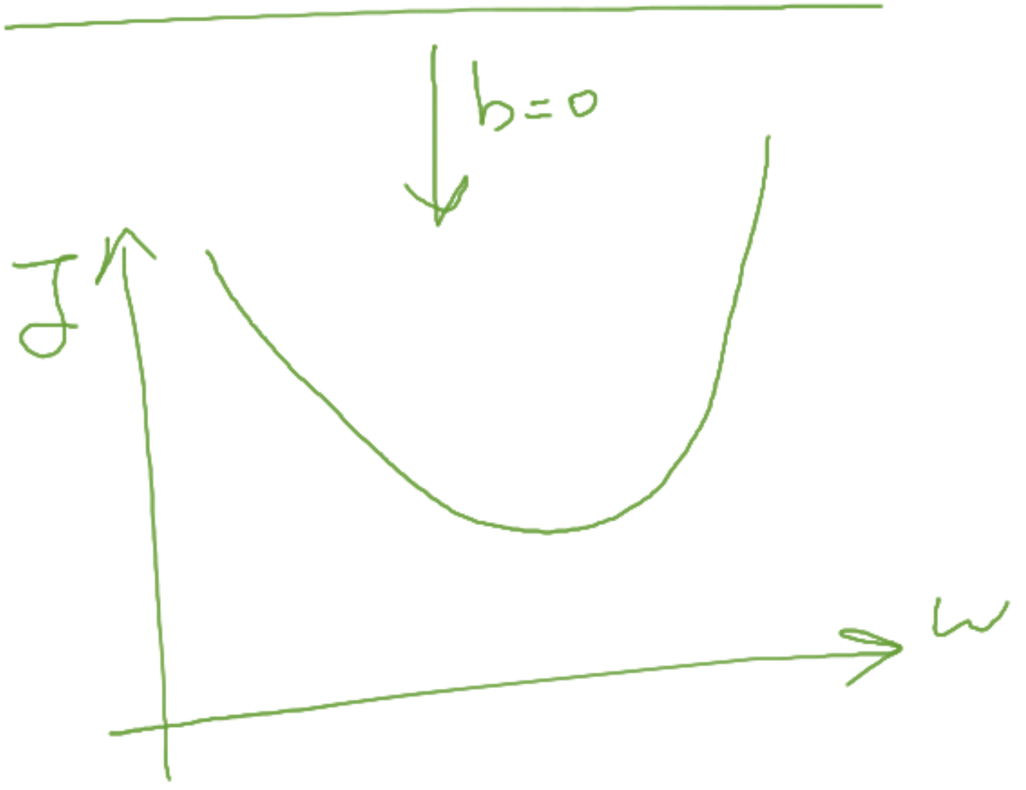
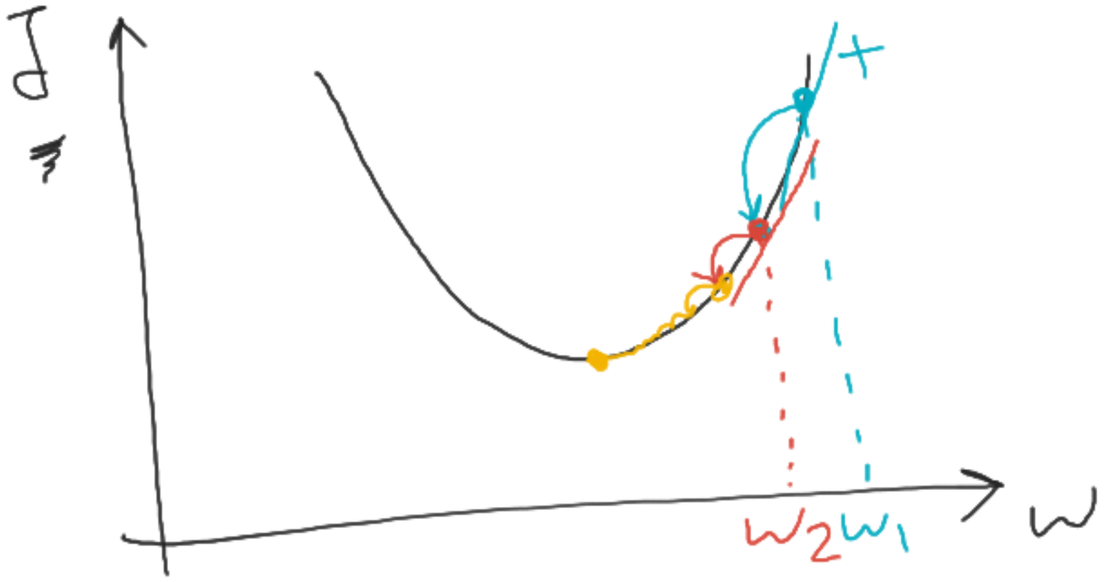


$$\hat{y} = wx + b$$

$$J(w,b) = \frac{1}{2m} \sum_{i=1}^{m} (\hat{y} - y)^2$$





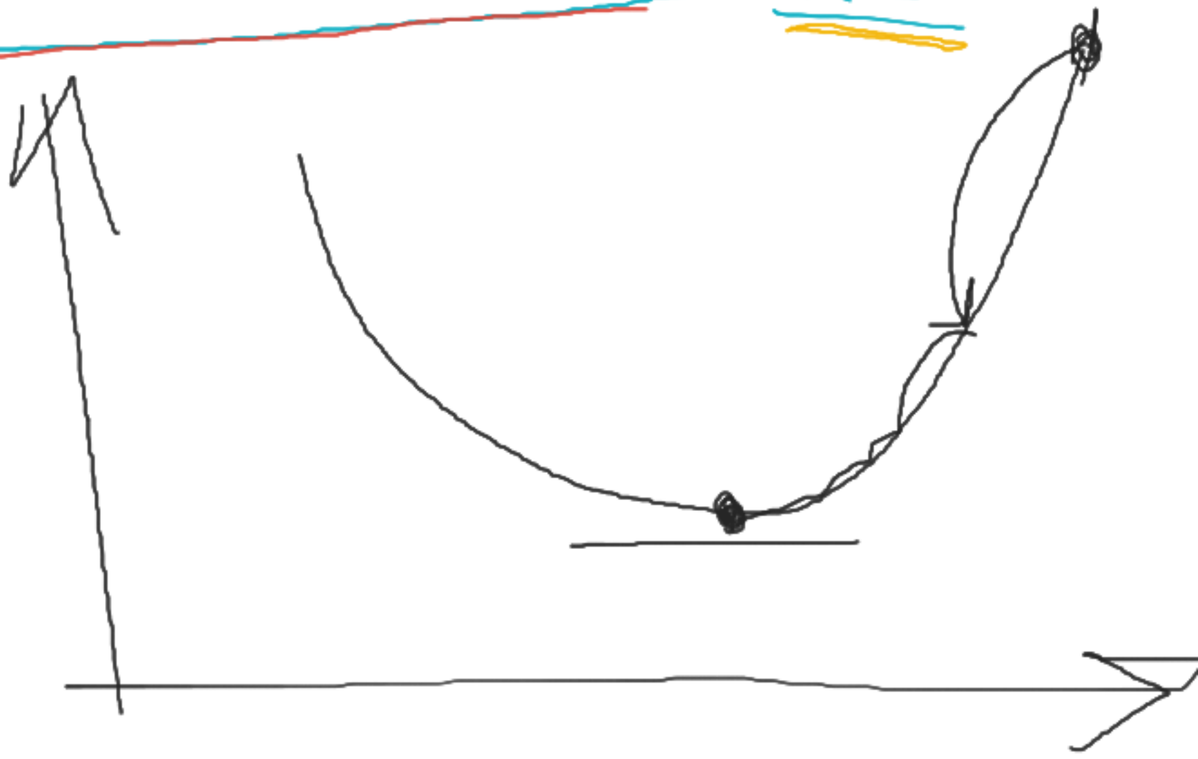
$\rightarrow w, b \Rightarrow \hat{y} = wx + b$

new old
$w = w - \alpha \frac{\partial}{\partial w}$

$\alpha = 1$

$w_2 = w_1 - \frac{\partial}{\partial w} \Rightarrow w_2$

$w_3 = w_2 - \frac{\partial}{\partial w} \Rightarrow w_3$



$\hat{y} = wx + b$

$u^n \longrightarrow n u^{n-1} u'$

$$J(w,b) = \frac{1}{2m} \sum (\hat{y} - y)^2 \longrightarrow J(w,b) = \frac{1}{2m} \sum \underbrace{(wx + b - y)^2}_{u^2}$$

$$\begin{cases} w^{new} = w^{old} - \alpha \dfrac{\partial J}{\partial w} \longrightarrow \dfrac{\partial J}{\partial w} = \dfrac{1}{m} \sum (\hat{y} - y) x \\ b^{new} = b^{old} - \alpha \dfrac{\partial J}{\partial b} \longrightarrow \dfrac{\partial J}{\partial b} = \dfrac{1}{m} \sum (\hat{y} - y) \end{cases}$$

$$w^{new} = w^{old} - \alpha \frac{1}{m} \sum (\hat{y} - y) x$$

x_0	مساحت	قیمت
1	200	400
1	250	430
	⋮	⋮
	x	y

چند دیگر

x_0	مساحت	تعداد اتاق	قیمت
1	200	2	410
1	250	3	450
	⋮		
	x_1	x_2	y

$y = wx + b \Rightarrow wx + \underbrace{b}_{w_0}\underbrace{1}$

$y = w_1 x_1 + w_2 x_2 + w_0 x_0$

$y = \underbrace{w_0}_{b}\underbrace{x_0}_{1} + w_1 x_1 + w_2 x_2 + \cdots + w_n x_n$

$$Y = WX$$

$$Y = W X$$

اولیه	چند دیتایی (n)
$W = [w_0 , w_1]$	$W = [w_0 , w_1 , \cdots , w_n]$
$X = [1 \quad x_1]$ ابعاد	$X = [x_0 \quad x_1 \quad \cdots \quad x_n]$

قیمت	محله	تعداد اتاق	متراژ

$$w^{new} = w^{old} - \alpha \frac{\partial J}{\partial w}$$

$$\begin{cases} w_1^{new} = w_1^{old} - \alpha \dfrac{\partial J}{\partial w_1} \\ \vdots \\ w_n^{new} = w_n^{old} - \alpha \dfrac{\partial J}{\partial w_n} \end{cases}$$

$$w^{new} = w^{old} - \alpha \frac{\partial J}{\partial w}$$

$$\frac{\partial J}{\partial w} = \frac{1}{m} \sum_{i=1}^{m} (\hat{y}_i - y_i) x_i$$

$$\frac{\partial J}{\partial w} = \frac{1}{m} \, dot[(\hat{y} - y) X]$$

$$\frac{\partial J}{\partial w} = \frac{1}{m} (\hat{y} - y) \cdot X$$

$$X = \begin{bmatrix} 1 & 1 & 2 & 3 \\ 1 & 4 & 5 & 6 \end{bmatrix} \quad \begin{matrix} i=1 \rightarrow \\ i=2 \rightarrow \end{matrix}$$

$$y = [y_1 \quad y_2]$$

$$\hat{y} = [\hat{y}_1 \quad \hat{y}_2]$$

$$[\hat{y}_1 - y_1 \quad \hat{y}_2 - y_2] \cdot \begin{bmatrix} 1 & 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = [\hat{y}_1 - y_1 + \hat{y}_2 - y_2 \quad \hat{y}_1 - y_1 + 4(\hat{y}_2 - y_2)$$

$$i=1 \rightarrow [(\hat{y}_1 - y_1)[1 \; 1 \; 2 \; 3]$$

$$i=2 \rightarrow [(\hat{y}_2 - y_2)[1 \; 4 \; 5 \; 6]$$

$$[\hat{y}_1 - y_1 \; \cdots] + [\hat{y}_2 - y_2 \; \cdots] = [\hat{y}_1 - y_1 + \hat{y}_2 - y_2 \; \cdots]_{2 \times 4}$$