Gradient descent for linear regression

repeat until convergence {

$$\theta_0 := \theta_0 - \frac{\alpha}{m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)})$$

$$\theta_1 := \theta_1 - \frac{\alpha}{m}\sum_{i=1}^{m}((h_\theta(x^{(i)}) - y^{(i)})\, x^{(i)})$$

(Update θ_0 & θ_1 simultaneously)

$h_\theta(x) = \theta_0 = 0,\ \theta_1 = 1$ → $\theta_0 + \theta_1 x^{(i)} \equiv x^{(i)}$

$$J(\theta_0, \theta_1) = \frac{1}{2m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)})^2$$

$x^{(i)} - y^{(i)}$

x	y
3	2
1	2
0	1
4	3

$$J(0,1) = ? = \frac{1}{8}(1 + 1 + 1 + 1)$$

$$= \frac{1}{2}\begin{bmatrix}1 & 2 & 4\\ 5 & 3 & 2\end{bmatrix} + 2$$

$h_\theta(6) = \theta_0 + \theta_1 x$

$$\begin{matrix}2\\3\\\frac{7}{2}\end{matrix} - \begin{matrix}6\\3\\0\end{matrix}\begin{bmatrix}-4\\0\\7/2\end{bmatrix} = -2 + \frac{1}{2}\times\frac{3}{6}\begin{bmatrix}2 & 2 & 2\\ 2 & 2 & 2\end{bmatrix} = 1$$

$2(4-4)$

$-2(4-4)$

$+2($

$$\begin{matrix}11\\16\end{matrix}\quad\begin{matrix}16\\2\end{matrix}\quad\begin{bmatrix}3\\12\\6\end{bmatrix} - \begin{bmatrix}0\\0\\5\end{bmatrix} - \begin{bmatrix}1\\0\\2\\\frac{2}{3}\end{bmatrix}$$

$$\begin{bmatrix}2\\12\\\frac{31}{3}\end{bmatrix} \quad \begin{bmatrix}3\\12\\11\end{bmatrix} \quad \begin{bmatrix}1\\0\\2/3\end{bmatrix}$$