→ Linear Regression with Multiple Variables

- Gradient Descent for Multiple Regression

• Parameters : $w_1, \dots, w_n \longrightarrow \vec{w} = [w_1, \dots, w_n]$

$b \qquad\qquad b$

• Model : $f_{\vec{w},b}(\vec{x}) = w_1 x_1 + \cdots + w_n x_n \longrightarrow f_{\vec{w},b}(\vec{x}) = \vec{w} \cdot \vec{x} + b$

} Vector notation

• Cost Function : $J(w_1, \dots, w_n, b) \longrightarrow J(\vec{w}, b)$

• Gradient Descent : repeat {

$$w_j = w_j - \alpha \frac{\partial}{\partial w_j} J(w_1, \dots, w_n, b) \longrightarrow w_j = w_j - \alpha \frac{\partial}{\partial w_j} J(\vec{w}, b)$$

$$b = b - \alpha \frac{\partial}{\partial b} J(w_1, \dots, w_n, b) \qquad b = b - \alpha \frac{\partial}{\partial b} J(\vec{w}, b)$$

}

repeat {

→ Gradient Descent ←

→ One feature

repeat {

$$w = w - \alpha \frac{1}{m} \sum_{i=1}^{m} [f_{w,b}(x^{(i)}) - y^{(i)}] x^{(i)}$$

$$b = b - \alpha \frac{1}{m} \sum_{i=1}^{m} [f_{w,b}(x^{(i)}) - y^{(i)}]$$

}

→ Multiple features n features ($n \geq 2$)

repeat {

$$w_1 = w_1 - \alpha \frac{1}{m} \sum_{i=1}^{m} [f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)}] x_1^{(i)}$$

$$\vdots$$

$$w_n = w_n - \alpha \frac{1}{m} \sum_{i=1}^{m} [f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)}] x_n^{(i)}$$

$$b = b - \alpha \frac{1}{m} \sum_{i=1}^{m} [f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)}]$$

}