



Machine Learning

Linear Regression with multiple variables

Gradient descent for multiple variables

Hypothesis: $h_{\theta}(x) = \theta^T x = \theta_0 x_0 + \theta_1 x_1 + \theta_2 x_2 + \dots + \theta_n x_n$

Handwritten notes: $x_0 = 1$ (green arrow pointing to x_0)

Parameters: $\theta_0, \theta_1, \dots, \theta_n$

Handwritten notes: θ (green underline), $n+1$ -dimensional vector (green text)

Cost function:

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

Handwritten notes: $J(\theta)$ (green text below the parameters)

Gradient descent:

Repeat {

$\rightarrow \theta_j := \theta_j - \alpha \left[\frac{\partial}{\partial \theta_j} J(\theta_0, \dots, \theta_n) \right]$

Handwritten notes: $J(\theta)$ (green text next to the derivative), \uparrow (green arrow pointing to α)

(simultaneously update for every $j = 0, \dots, n$)

so substituer!!!

Gradient Descent

Previously ($n=1$):

Repeat {

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

derivada parcial

$$\frac{\partial}{\partial \theta_0} J(\theta)$$

$$\theta_1 := \theta_1 - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_1^{(i)}$$

(simultaneously update θ_0, θ_1)

}

varias variaveis
New algorithm ($n \geq 1$):

Repeat {

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

(simultaneously update θ_j for $j = 0, \dots, n$)

}

$$\theta_0 := \theta_0 - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_0^{(i)}$$

$$\theta_1 := \theta_1 - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_1^{(i)}$$

$$\theta_2 := \theta_2 - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_2^{(i)}$$

...

$$\frac{\partial}{\partial \theta_j} J(\theta)$$

$$x_0^{(i)} = 1$$