التاريخ: / /   الموضوع: multilinear regrission

$$f[x,\phi] = \phi_0 + \phi_1 x^{(1)} + \phi_2 x^{(2)}$$ vector notation

$$f[\vec{x},\vec{\phi}] = \langle \phi_0, \phi_1, \phi_2 \rangle \cdot \langle 1, x^{(1)}, x^{(2)} \rangle$$

$$\underset{1\times 3}{\begin{bmatrix} \phi_0 & \phi_1 & \phi_2 \end{bmatrix}} \underset{3\times 1}{\begin{bmatrix} 1 \\ x^{(1)} \\ x^{(2)} \end{bmatrix}}$$

for n data

$$\underset{1\times n}{\begin{bmatrix} f_1 & f_2 & f_3 & \cdots & f_n \end{bmatrix}} = \underset{1\times 3}{\begin{bmatrix} \phi_0 & \phi_1 & \phi_2 \end{bmatrix}} \underset{3\times n}{\begin{bmatrix} 1 & \cdots & 1 \\ x_1^{(1)} & \cdots & x_n^{(1)} \\ x_1^{(2)} & \cdots & x_n^{(2)} \end{bmatrix}}$$

$$L[\phi] = \sum_{i=1}^{n} l_i \Rightarrow (f_i - y_i)^2 = (\phi_0 + \phi_1 x_i^{(1)} + \phi_2 x_i^{(2)})^2$$

$$\frac{\partial l_i}{\partial \phi_0} = 2(f_i - y_i) \quad \frac{\partial l_i}{\partial \phi_1} = 2x_i^{(1)}(f_i - y_i) \quad \frac{\partial l_i}{\partial \phi_2} = 2x_i^{(2)}(f_i - y_i)$$

$$\nabla L[\phi] = \sum_{i=1}^{n} \nabla l_i \qquad \nabla l_i = 2(f_i - y_i)\langle 1, x_i^{(1)}, x_i^{(2)} \rangle$$