KOCAELİ ÜNİVERSİTESİ
Bilgisayar Mühendisliğinde Matematik Uygulamaları

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Problem Tanımı:

0.1

Logistic Regression const function

$$J(\theta) = (-1/m)\sum_{i=1}^{m} \left[(y^i)log(h_\theta(x^i)) + (1-y^i)log(1-h_\theta(x^i))\right]$$

$$\partial(J\theta)/\partial(\theta_j) = (-1/m)\sum_{i=1}^{m} \left[((y^i)(\partial/\partial(\theta_j))(h_\theta(x^i))/(h_\theta(x^i)) + ((1-y^i)(\partial/\partial(\theta_j))(1-h_\theta(x^i))/(1-h_\theta(x^i))\right]$$

$$= (-1/m)\sum_{i=1}^{m} \left[((y^i)(\partial/\partial(\theta_j))\sigma(\theta^T(x^i)))/(h_\theta(x^i)) + ((1-y^i)(\partial/\partial(\theta_j))(1-\sigma(\theta^T(x^i))))/(1-(h_\theta(x^i)))\right]$$

$$= (-1/m)\sum_{i=1}^{m} \left[(y^i(\sigma(\theta^T(x^i)))(1-(\sigma(\theta^T(x^i)))(\partial/\partial(\theta_j))\sigma(\theta^T(x^i)))/(h_\theta(x^i)))\right]$$

$$\left[-(1-y^i)(\sigma(\theta^T(x^i)))(1-(\sigma(\theta^T(x^i)))(\partial/\partial(\theta_j))\sigma(\theta^T(x^i)))/(1-h_\theta(x^i)))(\theta^T(x^i)))/(1-h_\theta(x^i))\right]$$

$$= (-1/m)\sum_{i=1}^{m} \left[(y^i h_\theta(x^i)(1-h_\theta(x^i))))\partial/\partial(\theta_j))(\theta^T(x^i)))/(h_\theta(x^i))\right]$$

$$-((1-y^i)h_\theta(x^i)(1-h_\theta(x^i))(\partial/\partial(\theta_j))(\theta^T(x^i)))/(1-h_\theta(x^i)))$$

$$= (-1/m)\sum_{i=1}^{m} \left[(y^i(1-h_\theta(x^i))x_j^i) - ((1-y^i)h_\theta(x^i)x_j^i)\right]$$

$$= (-1/m)\sum_{i=1}^{m} \left[x_j^i(y^i(1-h_\theta(x^i)) - (1-y^i)h_\theta(x^i))\right]$$

$$= (-1/m)\sum_{i=1}^{m} \left[x_j^i((y^i) - (y^i)h_\theta(x^i) - h_\theta(x^i) + y^i h_\theta(x^i))\right]$$

$$= (1/m)\sum_{i=1}^{m}(\mathrm{h}_\theta(x^i) - y^i)x_j^i$$

0.2

Çıkarımda kullandığım eşitlikler

1-) $\mathrm{h}_\theta(x) = \sigma(\theta^T(x^i))$

$2-)\partial/\partial(x)\sigma((x)) = \partial/\partial(x)(1/(1+e^{(}-x)) = \sigma((x))(1-\sigma((x)))$

$3-)\partial/\partial(\theta^T)(\theta^T(x^i)) = x_j^i$