Graded Assignment 1

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10-10-'17

2. Minimize $\frac{\partial J(\theta)}{\partial \theta_1}$ by setting it equal to 0.

We know that:

$$h_\theta(x^{(i)}) = \theta_0 + x_1\theta_1$$

$$J(\theta_1) = \frac{1}{2m}\sum_{i=0}^{m}(h_\theta(x^{(i)}) - y^{(i)})^2$$

$$\frac{\partial J(\theta)}{\partial \theta_1} = \frac{1}{m}\sum_{i=0}^{m}(h_\theta(x^{(i)}) - y^{(i)})\,x_1^{(i)}$$

now set $\frac{\partial J(\theta)}{\partial \theta_1} = 0$

so

$$\frac{1}{m}\sum_{i=0}^{m}(h_\theta(x^{(i)}) - y^{(i)})\,x_1^{(i)} = 0$$

As θ is the only parameter of J (so the only variable), m and $x_1^{(i)}$ are constants. So we can leave them out.

$$\sum_{i=0}^{m}(h_\theta(x^{(i)}) - y^{(i)}) = 0$$

$$\sum_{i=0}^{m} h_\theta(x^{(i)}) - \sum_{i=0}^{m} y^{(i)} = 0$$

$$\sum_{i=0}^{m} h_\theta(x^{(i)}) = \sum_{i=0}^{m} y^{(i)}$$

Because we are interested at θ_1 we can write

$\sum_{i=0}^{m} h_\theta(x^{(i)})$ as $\theta_0 + x_1\theta_1$ because $m=1$

so

$$\theta_0 + x_1\theta_1 = \sum_{i=0}^{m} y^{(i)}$$

$$\theta_1 = \frac{\sum_{i=0}^{m}(y^{(i)}) - \theta_0}{x_1}$$