Regularized Linear Regression and Bias v.s. Variance

- Regularized linear regression cost function

$$J(\theta) = \frac{1}{2m}\left(\sum_{i=1}^{m}\left(h_\theta\left(x^{(i)}\right) - y^{(i)}\right)^2\right) + \frac{\lambda}{2m}(\sum_{j=1}^{n}\theta_j^2)$$

- Regularized linear regression gradient

$$\frac{\partial J(\theta)}{\partial \theta_0} = \frac{1}{m}\sum_{i=1}^{m}(h_\theta\left(x^{(i)}\right) - y^{(i)})x_j^{(i)}\,, \;\; for\, j = 0$$

$$\frac{\partial J(\theta)}{\partial \theta_j} = \left(\frac{1}{m}\sum_{i=1}^{m}\left(h_\theta\left(x^{(i)} - y^{(i)}\right)x_j^{(i)}\right)\right) + \frac{\lambda}{m}\theta_j, \;\; for\, j \geq 1$$