Non Linear Regression

Impact of outliers:

$$L(w) = \frac{1}{2} \sum_{i=1}^{N} (y_i - w^T x_i)^2$$

$$L(w) = \frac{1}{2} \sum_{i=1}^{N} | y_i - w^T x_i |$$

Absolute error

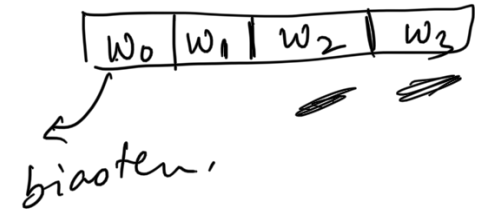
Robust linear model (RLM)

Polynomial basis expansion

$$x \longrightarrow x, x^2, x^3, \cdots, x^D$$

Regularization - Controlling the complexity of a model

$\bar{x} \longrightarrow x \quad x^2 \quad x^3$



$x^* \longrightarrow x^*, x^{*2}, x^{*3}$

$w_0 + w^T x^* \longrightarrow y^*$

$$J(w) = \frac{1}{2}(y - Xw)^T(y - Xw)$$

$$\tilde{J}(w) = J(w) + \lambda \|w\|_2^2$$

Ridge regression

$$\|w\|_p = \left(\sum_{i=1}^{D} w_i^p\right)^{1/p}$$

$$\|w\|_2 = \left(\sum_{i=1}^{D} w_i^2\right)^{1/2}$$

$$\|w\|_2^2 = \sum_{i=1}^{D} w_i^2$$