Non Linear Regression

Impact of outliers:

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

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

Absolute error

Robust linear model (RLM)

Polynomial basis expansion

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

Regularization - Controlling the complexity of a model

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

w_0	w_1	w_2	w_3

bias term.

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

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

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

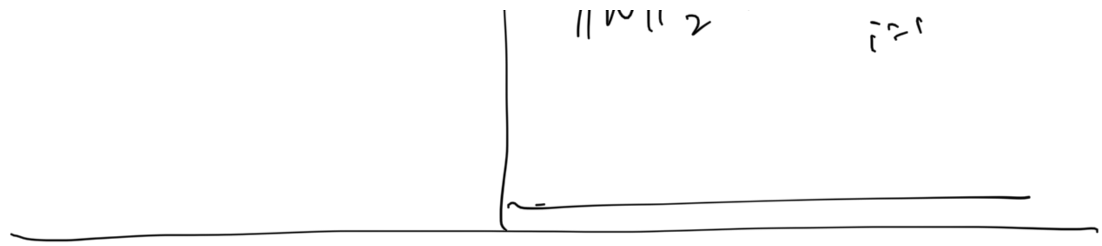
$$\tilde{J}(w) = J(w) + \lambda \|w\|_2^2$$

Ridge regression

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

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

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



Friday Mar 5

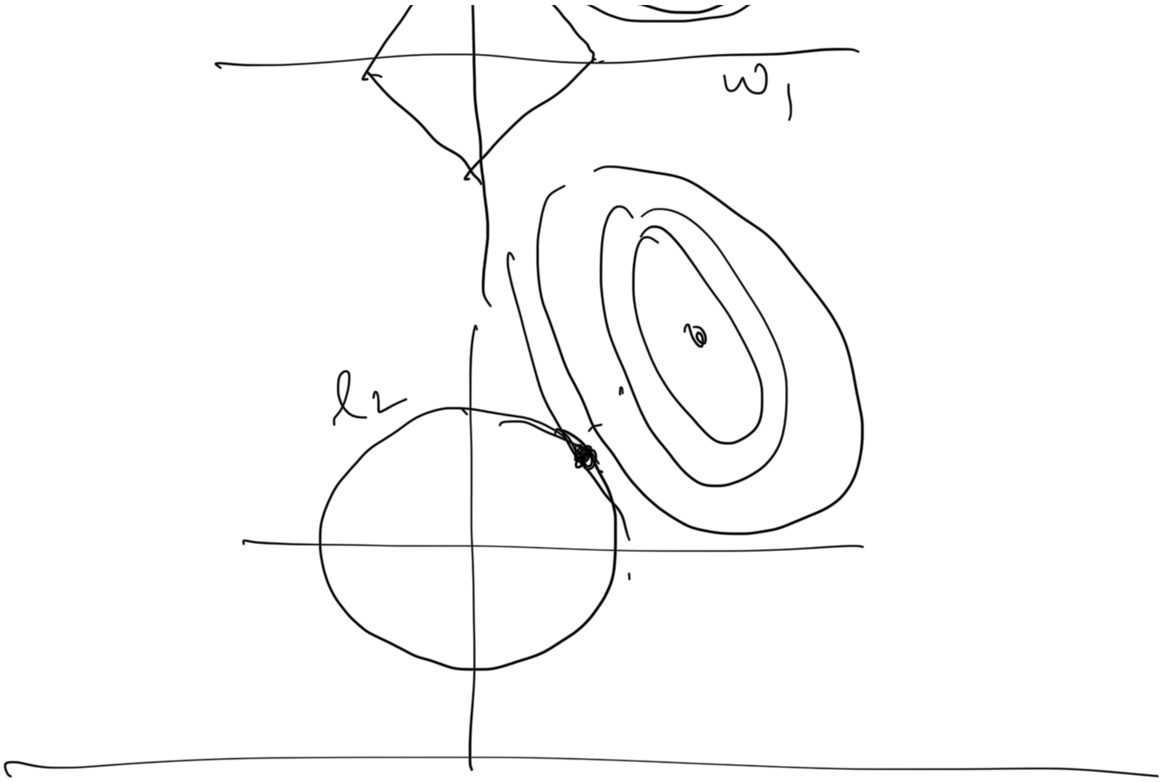
"Correlation does not mean causation"

Ridge regression:

$$\frac{1}{2}(y - Xw)^T(y - Xw) + \frac{1}{2}\lambda \|w\|^2$$

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

s.t. $\|w\|^2 \le t$



$$X_i = 1, x_i, x_i^2, x_i^3, x_i^4, x_i^5$$

$$\bar{x}_i = [\ \text{———}\ ]$$