Lab 2 – RLS

Regularized Least Squares

$$\min_{w \in \mathbb{R}^D} \frac{1}{n} \sum_{i=1}^{n} (y_i - w^\top x_i))^2 + \lambda w^\top w, \quad \lambda \geq 0.$$

$$f(x) = x^\top w, \ \forall x \in \mathbb{R}^D$$

$$(X_n^\top X_n + \lambda n I)w = X_n^\top Y_n.$$

Regularized Least Squares

$$(X_n^\top X_n + \lambda n I) w = X_n^\top Y_n.$$

A $\qquad\qquad b$

$$Aw = b$$

RLS training

def regularizedLSTrain(Xtr, Ytr, reg_par)

$$(X_n^\top X_n + \lambda n I)w = X_n^\top Y_n.$$

Return ...?

The regularization parameter controls the invertibility of the matrix

RLS test

def regularizedLSTest(w, Xtest)

$$f(x) = \boxed{x^\top w} \quad \forall x \in \mathbb{R}^D$$

Return ...?   **Ypred**

Your objectives today

- Implement and use RLS for regression

- Playing with data noise and different values of the regularization parameterfundamentals

- Apply K-Fold Cross Validation for selecting the best value for the regularization parameter