Foundations of ML & AI

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Exercise Set No 2

Exercice 1 (Comparison of the three penalties)
Consider the following toy problem :

$Y \sim \mathcal{N}_1(\beta^*, 1)$ where β is a real-valued parameter ($d = 1$).

1. Find the three estimators when minimizing the following three functions :

$$\text{(i)}\frac{1}{2}(Y-\beta)^2 + \lambda,\ \text{(ii)}\frac{1}{2}(Y-\beta)^2 + \lambda|\beta|,\ \text{(iii)}\frac{1}{2}(Y-\beta)^2 + \lambda\beta^2$$

2. Show a plot of the estimators as functions of the unconstrained LSE and explain the use of the following terminology for the penalized procedures : hard thresholding, soft thresholding, shrinkage.