Homework 3

Regression, Gaussian Processes, and Boosting

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Problem 1: Gaussian Processes

(a)

(b)

(c)

(d)

(e)

(f)

Problem 2: Regression

2.1 Why Lasso Works

1. Write $J_\lambda(\beta)$ in the form $J_\lambda(\beta) = g(y) + \sum_1^d f(X_i, y, \beta_i, \lambda)$, $\lambda > 0$:

   $J_\lambda(\beta) = \frac{1}{2} \|y - X\beta\|^2 + \lambda \|\beta\|$

   $= \frac{1}{2}(y - X\beta)^T(y - X\beta) + \lambda \|\beta\|$

   $= \frac{1}{2}[\|y\|^2 - 2y^T X\beta + (X\beta)^T X\beta] + \lambda \|\beta\|$

   $= \frac{1}{2}[\|y\|^2 - 2y^T X\beta + \beta^T X^T X\beta] + \lambda \|\beta\|$

   $= \frac{1}{2}[\|y\|^2 - 2y^T X\beta + \beta^T \beta] + \lambda \|\beta\|$ $(X^T X = I)$

   $= \frac{1}{2} \|y\|^2 - y^T X\beta + \frac{1}{2} \|\beta\|^2 + \lambda \|\beta\|$

2.

3.

4.

5.

2.2 Bayesian regression and Gaussian process

1. (a)

   (b)

2.

3.

4.