

Homework 6

Due May 05, 2018 by 11:59am

Instructions: This homework is not graded. The purpose of this homework assignment is to help you train for the midterm exam.

“Reading” Assignment

Review mathematical derivations from Week 1-4 classes. Do not passively read the handouts.

Do it yourself, without notes

Exercise 1

In this exercise, you will compute the gradients of several loss functions. Notation: for a pair of example-label (x, y) , the prediction is $x^T \beta$.

- $\ell(y, x^T \beta) = |y - x^T \beta|^3$
- $\ell(y, x^T \beta) = yx^T \beta - \exp(x^T \beta)$
- $\ell(y, x^T \beta) = (\max(0, 1 - yx^T \beta))^8$

Exercise 2

Consider the design matrix $X \in \mathbb{R}^{n \times d}$ collecting all the input examples x_1, \dots, x_n and the label matrix $Y \in \mathbb{R}^{n \times 1}$ collecting all the output labels y_1, \dots, y_n . Compute the derivative of F with respect to β

$$\min_{\beta \in \mathbb{R}^d} F(\beta) = \frac{1}{n} \sum_{i=1}^n \ell(y_i, x_i^T \beta) + \lambda \|\beta\|_2^2.$$

and represent it in matrix-vector form. You may define functions that act on matrices or vectors element-wise.

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