

Exercises for Lecture 4

1. Linear regression in 1D

Consider the linear regression problem in 1D

$$y = \beta_0 + \beta_1 x$$

with the sum-of-squares error function

$$E(\beta_0, \beta_1) = \frac{1}{2} \sum_{n=1}^N (y_n - (\beta_0 + \beta_1 x_n))^2.$$

Given N training samples of $\{x, y\}_{n=1}^N$, show that the parameters that minimize the above error function are given by

$$\beta_1 = \frac{\sum_n (x_n - \bar{x})(y_n - \bar{y})}{\sum_n (x_n - \bar{x})^2},$$
$$\beta_0 = \bar{y} - \beta_1 \bar{x}$$

where $\bar{x} = \frac{1}{N} \sum_n x_n$ and $\bar{y} = \frac{1}{N} \sum_n y_n$.

2. Linear regression lab

Do the lab in Section 3.6 of ISLR.