Pattern Recognition and Machine learning

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Chapter 1 Introduction

Problem 1

Apply partial derivative to $E(\boldsymbol{\omega})$ with respect to ω_i and set it to zero.

$$\frac{\partial E(\boldsymbol{\omega})}{\partial \omega_i} = \sum_{n=1}^{N}(y - t_n)\frac{\partial y}{\partial \omega_i} = \sum_{n=1}^{N}(y - t_n)(x_n)^i = \sum_{n=1}^{N}(\sum_{j=0}^{M}\omega_j(x_n)^j - t_n)(x_n)^i = 0 \tag{1}$$

$$\sum_{j=0}^{M}\omega_j\sum_{n=1}^{N}(x_n)^{i+j} = \sum_{n=1}^{N}t_n(x_n)^i \tag{2}$$

Problem 2

Similar to Problem 1

$$\frac{\partial E(\boldsymbol{\omega})}{\partial \omega_i} = \sum_{n=1}^{N}(y - t_n)\frac{\partial y}{\partial \omega_i} + 2\lambda\omega_i = \sum_{n=1}^{N}(y - t_n)(x_n)^i + 2\omega_i = \sum_{n=1}^{N}(\sum_{j=0}^{M}\omega_j(x_n)^j - t_n)(x_n)^i + 2\lambda\omega_i = 0 \tag{3}$$

$$\sum_{j=0}^{M}\omega_j\sum_{n=1}^{N}(x_n)^{i+j} + 2\lambda\omega_i = \sum_{n=1}^{N}t_n(x_n)^i \tag{4}$$