SUSTech

MACHINE-LEARNING

Fall 2020

Homework 5

Liu Yuxi 2020 年 11 月 5 日

5.1. Consider a regression problem involving multiple target variables in which it is assumed that the distribution of the targets, conditioned on the input vector x, is a Gaussian of the form

$$p(t|x, w) = \mathcal{N}(t|y(x, w), \Sigma)$$

where $y(x, w)$ is the output of a neural network with input vector x and wight vector w, and Σ is the covariance of the assumed Gaussian noise on the targets.

(a) Given a set of independent observations of x and t, write down the error function that must be minimized in order to find the maximum likelihood solution for w, if we assume that Σ is fixed and known.

(b) Now assume that Σ is also to be determined from the data, and write down an expression for the maximum likelihood solution for Σ.

5.2. The error function for binary classification problems was derived for a network having a logistic-sigmoid output activation function, so that $0 <= y(x, w) <= 1$