Homework 1

Shao-Ting Chiu (UIN:433002162)

9/16/22

Homework Description

Problems (from Chapter 2 in the book): 2.1 , 2.3 (a,b), 2.4, 2.7, 2.9, 2.17 (a,b)

Note: the book is available electronically on the Evans library website.

- Deadline: `Sept. 26th, 11:59 pm`

Problem 2.1

Suppose that X is a discrete feature vector, with distribution concentrated over a countable set $D = \{x^1, x^2, ...\}$ in R^d. Derive the discrete versions of (2.3), (2.4), (2.8), (2.9), (2.11), (2.30), (2.34), and (2.36)

Hint: Note that if X has a discrete distribution, then integration becomes summation, $P(X = x_k)$, for $x_k \in D$, play the role of $p(x)$, and $P(X = x_k|Y = y)$, for $x_k \in D$, play the role of $p(x|Y = y)$, for $y = 0, 1$.

Problem 2.3

This problem seeks to characterize the case $\epsilon^* = 0$.

(a)

Prove the "Zero-One Law" for perfect discrimination:

$$\epsilon^* = 0 \Leftrightarrow \eta(X) = 0 \text{ or } 1 \quad \text{with probability 1.} \tag{1}$$

(b)

Show that

$$\epsilon^*$$

Problem 2.4

Problem 2.7

Problem 2.9

Problem 2.17

(a)

(b)

References