

# Errata for *Essentials of Pattern Recognition*

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## Abstract

This document collects errors found in the first edition of the book, which are organized by the chapters they belong to. I sincerely thank those readers who kindly pointed out these errors to me.

## 1 Chapter 2

- P21 (Section 2.1.7), in the second paragraph in this page, the statement “The rank of a square matrix  $X$  equals its number of nonzero eigenvalues” is not correct. The correct version is “The rank of a real symmetric square matrix  $X$  equals its number of nonzero eigenvalues”.

## 2 Chapter 5

- P109, in the line above Equation 5.24, “the original input  $\mathbf{x}$  is” is not correct. The correct version is “the original input  $\mathbf{x}_i$  is”. In addition, in Equation 5.24, the LHS “ $\mathbf{x} \approx$ ” is not correct. The correct version is “ $\mathbf{x}_i \approx$ ”.
- P120 (Exercise 5.2), in the second line of the Matlab code, “**rand**” is not correct. The correct version is “randn”.

## 3 Chapter 6

- P138, in the item (e) of Problem 6.4, “ $A = LR$ ” is wrong, the correct version is “ $A = LU$ ”.

## 4 Chapter 7

- P151, in the first unnumbered display equation, a subscript was missing ( $\mathbf{x}$  must be replaced by  $\mathbf{x}_i$ ). That is, the display equation

$$c = \min_{1 \leq i \leq n} y_i ((\mathbf{w}^*)^T \mathbf{x} + b^*).$$

is wrong, and the correct version is

$$c = \min_{1 \leq i \leq n} y_i ((\mathbf{w}^*)^T \mathbf{x}_i + b^*).$$

- P151, in the same spirit, in the second unnumbered display equation, a subscript was missing ( $\mathbf{x}$  must be replaced by  $\mathbf{x}_i$ ). That is, the display equation

$$\min_{1 \leq i \leq n} y_i \left( \left( \frac{1}{c} \mathbf{w}^* \right)^T \mathbf{x} + \frac{1}{c} b^* \right) = 1 > 0.$$

is wrong, and the correct version is

$$\min_{1 \leq i \leq n} y_i \left( \left( \frac{1}{c} \mathbf{w}^* \right)^T \mathbf{x}_i + \frac{1}{c} b^* \right) = 1 > 0.$$

- P152, continuing this thread, in Equation (7.14), a subscript was missing ( $\mathbf{x}$  must be replaced by  $\mathbf{x}_i$ ). That is, the equation

$$\max_{\mathbf{w}, b} \frac{\min_{1 \leq i \leq n} y_i(\mathbf{w}^T \mathbf{x} + b)}{\|\mathbf{w}\|} = \frac{1}{\|\mathbf{w}\|} \quad (7.14)$$

is wrong, and the correct version is

$$\max_{\mathbf{w}, b} \frac{\min_{1 \leq i \leq n} y_i(\mathbf{w}^T \mathbf{x}_i + b)}{\|\mathbf{w}\|} = \frac{1}{\|\mathbf{w}\|} \quad (7.14)$$

- P155, in line -6 (the 6th line counting backward from the bottom), “the margin of the training example  $\mathbf{x}_i$  must be 1” is wrong, the correct version is “the margin of the training example  $\mathbf{x}_i$  must be  $\frac{1}{\|\mathbf{w}\|}$ ”. Likewise, in line -2, “(all examples whose margin)  $y_i f(\mathbf{x}_i)$  is 1” is wrong, the correct version is “(all examples whose margin)  $y_i f(\mathbf{x}_i)$  is  $\frac{1}{\|\mathbf{w}\|}$ ”. Lastly, in the last line, “(and the) smallest margin of all training examples is 1” is wrong, the correct version is “(and all) training examples satisfy that  $y_i f(\mathbf{x}_i) \geq 1$ ”.
- P171, in the item (b) of Problem 7.5, in the equation at the end of this sub-problem, the term  $f'(\boldsymbol{\alpha})$  in the right hand side is wrong, the correct version is  $f'(\boldsymbol{\alpha})_i$ .

## 5 Chapter 8

- P194, in the code provided for Exercise 8.5(a), there is a typo in the comment: “probablity” should be corrected as “probability”.

## 6 Chapter 11

- P252, in the first paragraph of Section 11.1.4, the sentence “the lasso aims to learn regression parameters  $\boldsymbol{\beta}$  such that  $X\boldsymbol{\beta}$  approximates  $\mathbf{y}$ ” is not correct. The correct version is “aims to learn regression parameters  $\boldsymbol{\beta}$  such that  $X^T\boldsymbol{\beta}$  approximates  $\mathbf{y}$ ”.
- P253, in the first line in this page, the sentence “We can replace  $\mathbf{w}^T \mathbf{w} = \|\mathbf{w}\|^2$  by  $\|\mathbf{w}\|_1$ ” is not completely correct. The correct version is “We can replace  $\frac{1}{2}\mathbf{w}^T \mathbf{w} = \frac{1}{2}\|\mathbf{w}\|^2$  by  $\|\mathbf{w}\|_1$ ”.

## 7 Chapter 12

- P268, in the last paragraph in this page, in the second last line, “long-short term memory” is not correct. The correct version is “long short-term memory”.
- P283, in the second line of Algorithm 10, the sentence “For  $t = 2, 3, \dots, T - 2, T - 1$ ” is not correct. The correct version is “For  $t = 1, 2, \dots, T - 2, T - 1$ ”.

## 8 Chapter 13

- P306, in the third paragraph in Section 13.8.2, in the second line last, “previous state  $\mathbf{x}_{t-1}$ ” is not correct. The correct version is “previous state  $\mathbf{x}_{k-1}$ ”.

## 9 Bibliography

- P375, the reference “Strang, G. (2018), ..., 5th edn, ...” is not correct. The correct version is “Strang, G. (2006), ..., 4th edn, ...”.