

Fifth printing

Chapter 2

page 22 Eq. 5: Change “ $P(\text{error}, x)$ ” to “ $p(\text{error}, x)$ ”

page 27 *line -1* above Sect. 2.3.1: Change “gets smaller, as it should.” to “gets larger, as it should.” [Figure 2.3 is altered to have $\theta_b < \theta_a$.]

page 34 Eq. 44: Change “ $\Phi\Lambda^{-1/2}$ ” to “ $\Phi\Lambda^{-1/2}\Phi^t$ ”

page 47 Equation 75: The Σ_1 and Σ_2 are interchanged. (This error also appears in Keinosuke Fukunaga, **Introduction to Statistical Pattern Recognition** (2nd ed.) Academic Press 1990, Eq. 3.150, page 98.) Equation 75 should read:

$$k(\beta) = \frac{\beta(1-\beta)}{2}(\boldsymbol{\mu}_1 - \boldsymbol{\mu}_2)^t [(1-\beta)\boldsymbol{\Sigma}_1 + \beta\boldsymbol{\Sigma}_2]^{-1} (\boldsymbol{\mu}_1 - \boldsymbol{\mu}_2) + \frac{1}{2} \ln \frac{(1-\beta)\boldsymbol{\Sigma}_1 + \beta\boldsymbol{\Sigma}_2}{|\boldsymbol{\Sigma}_1|^{1-\beta} |\boldsymbol{\Sigma}_2|^\beta}.$$

page 47 *third line after Eq. 75*: Change “that minimizes $e^{-k(\beta)}$ ” to “that minimizes $P^\beta(\omega_1)P^{1-\beta}(\omega_2)e^{-k(\beta)}$ ”

page 48 Example 2, *line +3*: Change “4.11,” to “4.11157,”

page 48 Example 2, *line +4*: Change “0.016382.” to “0.008191.”

page 48 Example 2, second paragraph: Change “A tighter bound” to “A slightly tighter bound”

page 48 Example 2, second paragraph, *line +2*: Change “0.016380” to “0.008190.”

page 59 *top equation*: Change

$$\begin{aligned} &= 0.25 \times 0.6 \times 0.4 \times 0.5 \times 0.4 \\ &= 0.012. \end{aligned}$$

to

$$\begin{aligned} &= 0.25 \times 0.6 \times 0.6 \times 0.5 \times 0.4 \\ &= 0.018. \end{aligned}$$

page 61 *third line after Eq. 101*: Change “ $\alpha 0.066$ ” to “ $\alpha 0.042$ ”

page 61 *fourth line after Eq. 101*: Change “ $P(x_1|c_1, b_2) = 0.63$ and $P(x_2|c_1, b_2) = 0.37$ ” to “ $P(x_1|c_1, b_2) = 0.73$ and $P(x_2|c_1, b_2) = 0.27$ ”

page 61 Eq. 102: Replace equation by “ $P(\mathbf{a}, \mathbf{b}|\mathbf{x}) = P(\mathbf{a}|\mathbf{x})P(\mathbf{b}|\mathbf{x})$ ”

page 71 Problem 20, part (c), *line +2*: Change “standard deviation σ^2 ” to “standard deviation σ ”

page 71 Problem 21, *line +2*: Change “standard deviation σ^2 ” to “standard deviation σ ”

Chapter 3

page 87 line -5: Change “ $l(\boldsymbol{\theta})p(\boldsymbol{\theta})$ ” to “ $l(\boldsymbol{\theta}) + \ln p(\boldsymbol{\theta})$ ”

page 97 line +3: Change “Problem 17” to “Problem 18”

page 102 line 5: Change “invarinace” to “invariance”

page 102 first line after Eq. 54: Change “paramter” to “parameter”

page 104 Eq. 62: Change “ $= \frac{P(\mathcal{D}|\mathbf{s},\boldsymbol{\theta})}{\sum_{\mathcal{D} \in \mathcal{D}} P(\mathcal{D}|\mathbf{s},\boldsymbol{\theta})}$ ” to “ $= \frac{P(\mathcal{D},\mathbf{s}|\boldsymbol{\theta})}{\sum_{\mathcal{D} \in \mathcal{D}} P(\mathcal{D},\mathbf{s}|\boldsymbol{\theta})}$ ”

page 107 First unnumbered equation: Change “ $\mathbf{c}(\mathbf{x})$ ” to “ $\mathbf{c}(\mathbf{x}_k)$ ”

page 107 2 lines above Eq. 71: Change “Problem 30” to “Problem 31”

page 111 line -6: Change “its determinant is an $O(d^2)$ ” to “its determinant is an $O(d^3)$ ”

page 111 Eq. 74: Change the annotations above the equation from “ $O(dn)$ $O(nd^2)$ $O(1)$ $O(d^2n)$ $O(n)$ ” to “ $O(dn)$ $O(nd^3)$ $O(1)$ $O(d^3)$ $O(n)$ ”

page 126 first line of the equation at the middle of the page: Change “ $|\boldsymbol{\theta}^0; \mathcal{D}_g]$ ” to “ $[\mathcal{D}_g; \boldsymbol{\theta}^0]$ ”

page 127 lines -2- -1: Change “ $x_{41} = 2$, so that $\mathbf{x}_4 = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ ” to “ $x_{41} = 1$, so that $\mathbf{x}_4 = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ ”

page 138 Algorithm 5, line 5: Change “ $\hat{a}_{ij}(z-1)$ ” to “ $\hat{a}_{ij}(z)$ ”

page 138 Algorithm 5, line 6: Change “ $\hat{b}_{ij}(z-1)$ ” to “ $\hat{b}_{ij}(z)$ ”

Chapter 4

page 173 Algorithm 1, line 5: Change “ $\mathbf{x} \in \omega_i$ ” to “ $\mathbf{x}_j \in \omega_i$ ”

page 173 line after Eq. 28: Change “each output unit” to “each category unit”

page 173 two lines above Eq. 29: Change “activation function function” to “activation function”

page 185 line 1: Change “ $O(dn^2)$ ” to “ $O(dn)$ ”

page 192 line -7: Change “is that that in the extreme cases the” to “is that in the extreme cases when the”

page 194 3 lines above numbered list: Change “we should deman” to “we should demand”

page 194 one line above numbered list: Change “Cox-Jaynes axioms):” to “Cox-Jaynes axioms), which includes:”

page 196 Algorithm 4, line 4: Change the small element below from “ $\mathbf{x} \notin \omega_i$ ” to “ $\mathbf{x}' \notin \omega_k$ ”

page 196 *Algorithm 4, line 5*: Replace equation portion by “ $\lambda_j \leftarrow \min[\max[D(\hat{\mathbf{x}}, \mathbf{x}'), \epsilon], \lambda_m]$ ”

page 200 *line -8*: Change “Jayne” to “Jaynes”

page 213 Replace reference [23] with: “Edwin T. Jaynes and G. Larry Bretthorst, *Probability Theory: The Logic of Science*, Cambridge U. Press, 2003.”

Chapter 5

page 218 Figure 5.3, bottom sub-figure: The pink “ambiguous” region should not include the three small triangles $\Delta H_{14}H_{23}H_{24}$, $\Delta H_{24}H_{13}H_{34}$, $\Delta H_{34}H_{12}H_{23}$ nor the quadrilateral $\square H_{14}H_{34}H_{24}H_{12}$.

page 221 *line +8*: Change “Figure 5.6 shows” to “Figure 5.5 shows”

page 221 *line -11*: Change “ $O(\hat{d}^k)$ ” to “ $O(d^k)$ ”

page 229 Caption to Figure 5.12, *line +4*: Change “this sequence is $\mathbf{y}_2, \mathbf{y}_3, \mathbf{y}_1, \mathbf{y}_3$ ” to “this sequence is $\mathbf{y}_1 + \mathbf{y}_2 + \mathbf{y}_3, \mathbf{y}_2, \mathbf{y}_3, \mathbf{y}_1, \mathbf{y}_3$ ”

page 252 *second unnumbered equation below Eq. 84, middle*: Change “ $-\eta \mathbf{e}^t(k) \mathbf{e}^{+t}(k)$ ” to “ $-\eta \mathbf{e}^t(k) \mathbf{e}^+(k)$ ”

page 266 *line +3*: Change “that $\mathbf{y} \in \mathcal{Y}_1$ ” to “that $\mathbf{y}_k \in \mathcal{Y}_1$ ”

page 266 Eq. 113: Change “ $\hat{\mathbf{a}}_i^t \mathbf{y}_k$ ” to “ $\hat{\mathbf{a}}_1^t \mathbf{y}_k$ ”

page 266 *9 lines above Sect. 5.12.2*: Change “we construct $(c-1)c\hat{d}$ -dimensional” to “we construct $(c-1)c\hat{d}$ -dimensional” (that is, add a space)

page 266 *8 lines above Sect. 5.12.2*: Change “into $c\hat{d}$ -dimensional” to “int $c\hat{d}$ -dimensional” (that is, add a space)

page 271 Problem 2, *line +1*: Change “ $\mathbf{w}^t \mathbf{x}$ ” to “ $\mathbf{w}_i^t \mathbf{x}$ ”

page 272 Problem 7, *line +3*: Change “may not be linearly” to “may not be totally linearly”

Chapter 6

page 340 Problem 26, equation: Change “ $-b$ net” to “ $-2b$ net” in three places

Chapter 8

page 396 *2 lines above Sect. 8.3*: Change “knowledge if of greatest” to “knowledge is of greatest”

page 413 8.5, lines 3 – 4: Change “nucleic acids” to “bases”

page 416 Algorithm 2, lines 9–12: These lines are indented too far to the right. They should be moved the same distance to the left so the **if** of line 9 is directly under the **while** of line 7, and lines 10–12 are indented slightly farther to the right.

page 424 line -7, right-hand side of equation: Change “ $\alpha x \beta$ ” to “ $\alpha \gamma \beta$ ”

page 242 line -5: Change “ x is an intermediate or terminal symbol” to “ γ is a string made up of intermediate or terminal symbols”

page 424 line -4: Change “as x in” to “as γ in”

page 425 top equation: Change “ x ” to “ γ ”

page 245 line +1 Change “and x an intermediate or terminal symbol” to “and γ is a string made up of intermediate or terminal symbols”

page 425 line +3: Change “rewriting of I by x .” to “rewriting of I by γ .”

Chapter 9

page 461 Equation 6, in the lower limit on the summation: Change “ $r-2$ ” to “ $r = 2$ ”

page 468 two lines above Eq. 16: Change “error rate $\Pr[g(\mathbf{x}; \mathcal{D})] = y$ ” to “error rate $\Pr[g(\mathbf{x}; \mathcal{D})] \neq y$ ”

page 468 Eq. 16, lhs: Change “ $\Pr[g(\mathbf{x}; \mathcal{D})] = y$ ” to “ $\Pr[g(\mathbf{x}; \mathcal{D})] \neq y$ ”

page 468 Eq. 17, lhs: Change “ $\Pr[g(\mathbf{x})] = y$ ” to “ $\Pr[g(\mathbf{x})] \neq y$ ”

page 468 Eq. 17, rhs: Change “ $\Pr[y_B(\mathbf{x}) = y]$ ” to “ $\Pr[y_B(\mathbf{x}) \neq y]$ ”

page 469 Eq. 21: Change “ $e^{-1/2u^2}$ ” to “ $e^{-u^2/2}$ ”

page 472 Eq. 26: Change “ $\text{Var}[\hat{\mu}]$ ” to “ $\text{Var}[\mu_{(\cdot)}]$ ”

page 472 Eq. 26: Change “ $\frac{n-1}{n}$ ” to “ $\frac{1}{n(n-1)}$ ”

page 487 Eq. 41: Change “ $p(\boldsymbol{\theta}|\mathcal{D}, h_i)$ ” to “ $p(\boldsymbol{\theta}|h_i)$ ”

page 487 two lines after Eq. 41: Change “ $P(\boldsymbol{\theta}|\mathcal{D}, h_i)$ ” to “ $p(\boldsymbol{\theta}|h_i)$ ”

page 507 Problem 39 part 2, last line: Change “full circle” to “full circular disk”

Chapter 10

page 529 Eq. 32, left-hand side: Change “ $\boldsymbol{\mu}_j$ ” to “ $\boldsymbol{\mu}_i$ ”

page 529 line -1: Change “as given by Eq. 17.” to “that is, each point belongs in only one cluster.”

page 541 two lines after Eq. 52: Change “Tanimoto coefficient or *Tanimoto distance*” to “Jaccard coefficient or *Jaccard distance*”

page 541 In margin: Change “TANIMOTO DISTANCE” to “JACCARD DISTANCE”

page 545 line -6: Change “Furthermore, \mathbf{S}_B ” to “Furthermore, \mathbf{S}_W ”

page 549 Eq. 75, middle line, rhs, subscript on the summation: Change “ $\mathbf{x} \in \mathcal{D}_i$ ” to “ $\mathbf{x} \in \mathcal{D}_j$ ”

- page 552** *Algorithm 4, line 5*: Change “ $c = \hat{c}$ ” to “ $\hat{c} = c$ ”
- page 553** *one line above The Nearest-Neighbor Algorithm*: Change “ $O(cn^2d)$ ” to “ $O(n^2(c + d))$ ”
- page 556** *Algorithm 5, line 5*: Change “ $c = \hat{c}$ ” to “ $\hat{c} = c$ ”
- page 557** *line 14 of Sect. 10.10*: Change “decrease rapidly until $\hat{c} = c$ ” to Change “decrease rapidly until $c = \hat{c}$ ”
- page 559** *last three lines*: Change “For reasons that will become clear, each d -dimensional pattern is augmented (with $x_0 = 1$) and normalized” to “Each d -dimensional pattern is augmented (with $x_0 = 1$) and, for reasons that will become clear, normalized”
- page 571** *line -1*: Change “Jacobean” to “Jacobian”
- page 577** *Chaption Figure 10.28, line -3*: Change “sensed point, thought” to “sensed point, though”
- page 577** *Eq. 113*: Change “ ϕ_i ” to “ $(\phi_i - \mathbf{w}_{ki}(t))$ ”
- page 591** *Problem 38: line +2-3*: Change “between to clusters” to “between two clusters”

Appendix

- page 624** *Equation 98*: Change “ $n\Gamma(n - 1)$ ” to “ $(n - 1)\Gamma(n - 1)$ ”

Index

- page 645** *column 2*, insert an entry for: “Jaccard coefficient, 541”
- page 648** *column 1*, entry for metric, Tanimoto: delete reference to page “541”