Fundamentals of Mathematical Statistics — Errata

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May 6, 2024

Abstract

This note identifies typographical and other errors in my book on *Fundamentals of Mathematical Statistics,* CRC Press, April 2023. I am grateful to teachers and students at the University of Copenhagen for spotting most of these.

Errors identified after 2024

p9 line 4 $f_x(\theta)$ should be $f_\theta(x)$.

p16 Example 1.27 The parameters (α, β) should vary in $\mathbb{R}^2_+$.

p31 Proof of Proposition 2.10 First line in displayed formula should read

$$\varphi_Y(u) = \mathbf{E}(e^{i\langle u,Y\rangle_W}) = e^{i\langle u,a\rangle_W}\mathbf{E}(e^{i\langle u,BX\rangle_W}) = e^{i\langle u,a\rangle_W}\mathbf{E}(e^{i\langle B^*u,X\rangle_V})$$

(a subscript was missing for an inner product).

p31 Theorem 2.11 could be formulated better as: Let $(V, \langle\cdot,\cdot\rangle)$ be a Euclidean space, $\xi \in V$, and $\Sigma \in \mathcal{L}(V, V)$ a positive semidefinite and self-adjoint linear map. Then there is a random variable X with $X \sim \mathcal{N}_V(\xi, \Sigma)$ if and only if there is a linear map $A \in \mathcal{L}(V, V)$ with $AA^* = \Sigma$. Then X has the same distribution as $Y = \xi + AZ$ where $Z \sim \mathcal{N}_V(0, I)$ and I is the identity map on V.

p36 Lemma 2.22 There are too many commas in the inner products here. It should read: $(V, \langle\cdot,\cdot\rangle)$, $(W_1, \langle\cdot,\cdot\rangle_1)$, and $(W_2, \langle\cdot,\cdot\rangle_2)$.

p46 line -8 $\mathbf{V} \setminus \{0\} \times \mathbb{R}$ should be $V \setminus \{0\} \times \mathbb{R}$ (no bold faced V)

Errors in the first printing

p5 Example 1.9 The Cauchy density should be

$$f_{\alpha,\beta}(x) = \frac{1}{\pi}\frac{\beta}{((x-\alpha)^2 + \beta^2)}, \quad x \in \mathbb{R}$$

p15 middle It would be more correct to write the Fisher information as

$$i(\theta) = \mathbf{V}_\theta\{S(X,\theta)^\top\} = \mathbf{E}_\theta\{I(X,\theta)\}$$

since $S(X,\theta)$ is defined as an $1 \times k$ matrix rather than a vector in $\mathbb{R}^k$.

p17 middle Similarly, as on p15, the correct expression for the Fisher information should be

$$i(\alpha,\beta) = \mathbf{E}_{\alpha,\beta}\{I(X,\alpha,\beta)\} = \mathbf{V}_{\alpha,\beta}\{S(X,\alpha,\beta)^\top\} = \mathbf{V}_{\alpha,\beta}\{(\log X, X/\beta^2)^\top\}$$

p46 Exercise 2.7 c) "is of" should be "of"

p50 Example 3.5 The expression for the rewritten density should be

$$f_\theta(x) = \frac{e^{\theta_1 x + \theta_2(-x^2/2)}}{c(\theta)}.$$

p55 Theorem 3.11 The n-fold direct product $\mathcal{P}^{\otimes n}$ is also minimally represented.

p57 line -9 should read:

Now, since Θ was an open and convex subset of V, $\tilde{\Theta}$ is an open and convex subset of L...

p57 line -6 should read:

and thus, if $\langle \lambda, \tilde{t}(x)\rangle$ is a.e. constant with respect to $\tilde{\mu}$, then also $\langle \lambda, t(x)\rangle$ is a.e. ...

p57 last line should read:

but then the representation would not be regular since $\tilde{\Theta}$ is not an open subset of V.

p64 Example 3.27, line -10 $B = \mathbb{R}^m$ should be $B = \phi^{-1}(\Theta)$

p65 line 12 should read

$$\ell_x(\theta) = \theta^\top x - \frac{1}{2}\|\theta\|^2.$$

p65 (3.10) should read

$$\ell_x(\theta) = \phi(\beta)^\top x.$$

p66 line -10 'for alle β' should read 'for all β

p70 Exercise 3.6, line 4 λx should be βx

p70 Exercise 3.8 Poisson's should be Poisson

p71 Exercise 3.10 Lebesque should be Lebesgue

p75 line -8 should read:

$$\mathbf{B}(\hat{\theta}_n) = \frac{n\theta}{n+1} - \theta = -\frac{\theta}{n+1}$$

p77 Theorem 4.4 $\hat{\lambda} = t(x)$ should be $\hat{\lambda} = t(X)$

p88 Example 4.16 The moment functions are

$$m_1(\xi) = \xi, \quad m_2(\xi) = P_\xi(X > 0) = \Phi(\xi), \quad m_3(\xi) = 3\xi + \xi^3$$

p104 Theorem 5.6 The asymptotic covariance should read:

$$\Sigma(\theta)/n = Dm(\theta)^{-1}\mathbf{V}_\theta(t(X))Dm(\theta)^{-\top}/n.$$

p104 Example 4.7 last line on page should read:

$$m_1(\xi) = \xi, \quad m_2(\xi) = P_\xi(X > 0) = \Phi(\xi), \quad m_3(\xi) = 3\xi + \xi^3$$

p107 Corollary 5.12 Last line would be clearer as:

where $A = \sqrt{ni(\hat{\theta}_n)}$ is the unique positive definite matrix A satisfying $A^2 = ni(\hat{\theta}_n)$.

p111 last line before proof delete 'obtain a'

p132 Exercise 5.9 c) Compare the asymptotic distribution of $\hat{\lambda}_n$ and $\tilde{\lambda}_n$.

p169 First displayed formula should read:

$$\hat{p}_N = p_{\mathrm{MC}}(d(x)) = \frac{1}{N}\sum_{i=1}^{N} \mathbf{1}_{(d(x),\infty)}(d(X_i^*)) = \frac{1}{N}\sum_{i=1}^{N} Y_i$$

p177 Exercise 7.7 e) Derive the quadratic score test statistic for H_1 under the assumption of H_0.

p195 line -3 "the the" should be "the"

p201 line -8 "Pearson's ^{2} evaluates" should be "Pearson's χ^2 statistic evaluates"

p229, line -6 $\mu(d(x)$ should be $\mu(dx)$