

List of Errata for Principles of Signal Detection and Parameter Estimation

Chapter 1

1. On page 1, lines 12 and 13, the hyphenated word the-ses should be replaced by these (no s, no hyphenation).
2. On page 4, line 3, replace give by given.
3. On page 4, line 9, a period is missing after observations.

Chapter 2

1. On page 18, line 11, replace \mathbf{Y}_1 by \mathcal{Y}_1 .
2. On page 26, 9 lines from the bottom, replace auxiliary statistic by ancillary statistic.
3. On page 29, line 1 just below Fig. 2.1, replace South-West by South-East.
4. On page 35, equation (2.67) should be $P_D = \dots$. The change replaces P_F by P_D .
5. On page 53, the summation on the last line of equation (2.130) should be $\sum_{i=0}^{M-1}$ (sum with respect to i instead of j).
6. On page 69, 4th line of Problem 2.13, hypothesis H_2 should be:

$$\mathbf{Y} = \mathbf{s}_2 + \mathbf{V} ,$$

i.e. replace \mathbf{s}_3 by \mathbf{s}_2 .

Chapter 3

1. On page 81, 5 lines from the bottom, a closing parenthesis is missing in $\min(I_0(\gamma), I_1(\gamma))$.
2. On page 93, equation (3.77) should be

$$\delta_{Bn}(\mathbf{y}_1, \dots, \mathbf{y}_n) = \begin{cases} 1 & \text{for } L_n(\mathbf{y}_1, \dots, \mathbf{y}_n) \geq B \\ 0 & \text{for } L_n(\mathbf{y}_1, \dots, \mathbf{y}_n) \leq A , \end{cases}$$

i.e., exchange A and B on the right hand side of the equation.

Chapter 4

1. On page 117, in the line above (4.12), the first term of the integrand should be $C(\mathbf{x}, \hat{\mathbf{X}}(\mathbf{y}))$ (a closing parenthesis was missing).
2. On page 119, line 2 should be:

$$C(\mathbf{x}, \hat{\mathbf{x}}) = \|\mathbf{x} - \hat{\mathbf{x}}\|_1,$$

i.e., a hat is missing on top of the second \mathbf{x} on the right hand side of the equation.

3. On page 119, equation (4.25), integrations should be over dx_i , not $d\mathbf{y}$.
4. On page 119, in the first line after equation (4.25), the estimate should be $\hat{\mathbf{X}}_{\text{MAE}}(\mathbf{y})$ (a hat was missing on top of \mathbf{X}).
5. On page 120, in the equation 8 lines from the bottom, the second equality should be

$$\cdots = \mathbf{m}_{\mathbf{X}} + \mathbf{K}_{\mathbf{X}\mathbf{Y}}\mathbf{K}_{\mathbf{Y}}^{-1}(\mathbf{Y} - \mathbf{m}_{\mathbf{Y}})$$

The change is that the minus sign after $\mathbf{m}_{\mathbf{X}}$ should be replaced by a plus sign.

6. On page 123, in equation (4.38), the right hand side should be $\mathbf{0}$ (the zero should be in bold face).
7. On page 124, in equation (4.41) and the equation above it, the right hand side should be $\mathbf{0}$ (the zero should be in bold face).
8. In equation (4.46), one term is missing. The equation should be:

$$\begin{aligned} \mathbf{K}_{\mathbf{X}} &= \mathbf{K}_E + E[(\mathbf{X} - E[\mathbf{X}|\mathbf{Y}])\mathbf{\Delta}^T(\mathbf{Y})] \\ &\quad + E[\mathbf{\Delta}(\mathbf{Y})(\mathbf{X} - E[\mathbf{X}|\mathbf{Y}])^T] + \mathbf{K}_{\mathbf{\Delta}}. \end{aligned}$$

Accordingly, the sentence five lines below equation (4.46) should be:

Since the error $\mathbf{X} - E[\mathbf{X}|\mathbf{Y}]$ is uncorrelated with $\mathbf{\Delta}(\mathbf{Y})$, the second and third terms on the right hand side of (4.46) are zero, which gives...

9. In the equation appearing on the second line of p. 129, replace $(\mathbf{Y} - \mathbf{m}_{\mathbf{y}})^T$ by $(\mathbf{Y} - \mathbf{m}_{\mathbf{Y}})^T$, i.e. the \mathbf{Y} subscript of \mathbf{m} should be in capital bold font instead of lower case bold font.
10. Equation (4.77) on p. 131 should be

$$\mathbf{G} = \mathbf{K}_{\text{LLS}}\mathbf{H}^T\mathbf{R}^{-1},$$

i.e., \mathbf{R} should be replaced by \mathbf{R}^{-1} .

11. On page 135, Case 3, a closing parenthesis is missing on the right hand side of the first line of the first equation, which should be

$$L(\mathbf{y}, m, v) \triangleq \ln(f_{\mathbf{Y}}(\mathbf{y}|m, v))$$

12. On page 137, line 11, replace "auxiliary statistic" by "ancillary statistic".
13. On page 137, 5 lines from the bottom, the equation should be

$$b(\mathbf{S}, \mathbf{x}) = \exp(\mathbf{x}^T \mathbf{S} - t(\mathbf{x}))$$

The change is that $v(\mathbf{x})$ should be replaced by $t(\mathbf{x})$ to maintain consistency with the exponential canonical form (4.80).

14. On line 6 of page 139, replace "where $\mathbf{O}^T \dots$ " by "where $\mathbf{0}^T \dots$ ". The change consists of replacing a bold face capital O by a bold face capital zero.
15. On page 143, in the equation 10 lines from the bottom, a hat is missing on top of θ_{ML} , which should be replaced by $\hat{\theta}_{\text{ML}}$.
16. On the last line of page 150, replace "... at the most ..." by "... at most ..." i.e., delete "the".
17. On page 166, 2 lines from the bottom, replace "auxiliary statistic" by "ancillary statistic".

Chapter 5

1. On page 177, on the right hand side of equation (5.21), replace \mathcal{A} by A , i.e. the A should be capital italic, not capital calligraphic.
2. On page 187, in the equations on line 3 and on line 7, the product should be from $k = 1$ to $N - 2$ (instead of $N - 1$).
3. On page 187, 6 lines from the bottom, exchange H_0 and H_1 , so that the sentence concludes with "... there exists a UMPI test for testing $H_1 : A > 0$ against $H_0 : A \leq 0$."
4. On page 192, the right hand side of the first line of equation (5.56) should be $P[R \geq \eta | A]$ and on the second line, the integral should be \int_{η}^{∞} , i.e. the limits of integration should be η and ∞ .

Chapter 7

1. On page 304, equation (7.76), the element in the third row and second column of matrix $\mathbf{C}(t)$ should be $K(t + 1, t)$ (a "1" is missing).
2. On page 318, on the fourth line of Problem 7.4, replace "... and since $X(0) = -X(T), \dots$ " by "... and since $K(0) = -K(T), \dots$ "

Chapter 8

1. In Problem 8.1 on page 362, the probability of a correct decision should be

$$P[C] = (1 - Q(d/2))^2$$

with $d = (2E)^{1/2}/\sigma$. Since the symbol energy $E = 2E_b$, where E_b denotes the bit energy, the probability of a correct decision can also be expressed as

$$P[C] = (1 - Q(E_b^{1/2}/\sigma))^2 .$$

Chapter 9

1. In the second line of equation (9.9) there should not be an extra "dt" in $\cos(2(\omega_c t + \psi(t)))$.
2. In the second line of equation (9.10) there should not be an extra "dt" in $\cos(2(\omega_c t + \psi(t)))$.
3. On page 375, in the equation two lines below (9.20), the integrand should be

$$\exp(z \cos(\theta - \phi)) .$$

A closing parenthesis is missing.

4. The second line of equation (9.120) on page 394 contains two typographical errors: the exponent of $(1 - Q(z))$ should be $N - 1$ instead of N . Also an unnecessary closing parenthesis should be removed in the $(2\pi)^{1/2}$ denominator term.
5. On page 396, the left hand side of equation (9.134) should be

$$\nabla_{\mathbf{x}} \ln L(Y(\cdot)|\mathbf{x}) = \dots$$

A ln was missing.

6. On page 406, equation (9.174), the exponential term should be

$$\exp(j(\omega_0 t + \theta)) .$$

The $\psi(t - d)$ term in the exponent should be removed.

7. On page 411, equation (9.201), the exponential term should be

$$\exp(-j\nu\bar{d}) .$$

The extra t factor in the exponent should be removed.

8. On page 411, equation (9.204) should be:

$$\begin{aligned} h(t, \omega_0) &= \Re\{\tilde{s}^*(T-t) \exp(j(\omega_c + \omega_0)t)\} \\ &= c(T-t) \cos((\omega_c + \omega_0)t - \psi(T-t)). \end{aligned}$$

The changes consist of inserting a closing bracket } at the end of the first line, and replacing $c(t-t)$ by $c(T-t)$ after the equality sign on the second line.

9. On page 413, the first line of equation (9.208) should be

$$\langle \tilde{s}_1, \tilde{s}_2 \rangle = \int_{-\infty}^{\infty} \tilde{s}(t-d_1) \tilde{s}^*(t-d_2) \exp(j(\omega_1 - \omega_2)t) dt$$

The change consists of inserting dt at the end of the equation.

10. On page 424, the first sentence of Problem 9.5 should be:

Consider the CT version of Problem 5.9.

11. On page 424, 10th line of Problem 9.5, replace "intefering" by "interfering" (an 'r' is missing).

Chapter 11

1. On page 503, the first line of equation (11.84) should be:

$$Q(\boldsymbol{\theta}, \boldsymbol{\theta}^k) = -\frac{1}{2} \text{tr} \left\{ \mathbf{Q}^{-1} [\boldsymbol{\Phi}_k - \mathbf{A} \boldsymbol{\Psi}_k - \boldsymbol{\Psi}_k^T \mathbf{A}^T + \mathbf{A} \boldsymbol{\Theta}_k \mathbf{A}^T] \right\}$$

The change consists of replacing $\boldsymbol{\Omega}_k$ by $\boldsymbol{\Theta}_k$ in the last term of this equation.

2. On page 505, replace lines 15 and 16 by:

Then by taking the conditional expectation with respect to \mathbf{Y} on both sides of (11.93) and using the repeated conditioning identity (11.90), ...

The change consists of inserting "conditional" in front of expectation on line 15, and replacing (11.89) by (11.90) on line 16.

3. On page 508, the first subequation of equation (11.108) should be

$$\hat{X}_k(t) = a_{sk}(t) \hat{X}_k(t+1) + P_{ck}(t) \hat{X}_{fk}(t) / P_{fk}(t)$$

The change consists of exchanging $P_{ck}(t)$ and $P_{fk}(t)$ in the last term of the equation.

4. On page 509, line 8, ψ_k is defined as

$$\psi_k = \sum_{t=1}^T \hat{X}_k(t) \hat{X}_k(t-1) + P_k(t, t-1)$$

A subscript k was omitted in $\hat{X}(t-1)$.

5. On page 512, the left hand side of equation (11.115) should be

$$2 \ln L_G(\mathbf{Y}) = \dots$$

The Latex source code for this equation contained a minor error.

6. On page 516, line 3 of Problem 11.1 should be:

$$H_1 : Y(t) = Z(t) + V(t)$$

In other words, replace H_0 by H_1 .

7. On page 518, the equation on the second line from the bottom should be

$$q = (1 - a^2)P.$$

8. In the first line of page 521, replace $1 < \ell < N/2$ by $1 \leq \ell < N/2$.

9. On page 521, the equation appearing on the 6th line from the bottom should be

$$m_\ell^k = \frac{P_\ell^k}{v} [\hat{Y}_1(e^{j\omega_\ell}) + A_k e^{j\omega_\ell D_k} \hat{Y}_2(e^{j\omega_\ell})]$$

Compared to the original equation, this requires replacing the opening parenthesis (on the right hand side of the equation by a square bracket [, inserting a hat on top of Y_2 , and inserting a closing bracket].

Chapter 12

1. The left hand side of equation (12.174) on page 577 should be

$$\sum_{k=0}^L h_k D(t-k) = \dots$$

Instead of starting from $k = 1$, the summation should start from $k = 0$.

Chapter 13

1. On page 600, equation (13.13) should be

$$\nabla_\phi J_t^u(\hat{\phi}(b(\ell, t+1), t)) = 0$$

The change consists of inserting one additional closing parenthesis in term on the left hand side of the equation.

2. On page 601, the first line of equation (13.35) should be

$$\nabla_{\phi} J_{t+1}^u(\hat{\phi}(b(\ell, t+1), t)) = \nabla_{\phi} c_t^u(\hat{\phi}(b(\ell, t+1), t))$$

Closing parentheses need to be inserted both on the left and right hand side of the equation.

3. On page 601, the first line of equation (13.36) should be

$$\hat{\phi}(\ell, t+1) = \hat{\phi}(b(\ell, t+1), t) - \frac{\mu}{2} \nabla_{\phi} J_{t+1}^u(\hat{\phi}(b(\ell, t+1), t))$$

The change consists of inserting a closing parenthesis in the last term.

4. On page 601, in equation (13.38) the summation should be

$$\sum_{s=1}^t$$

The summation should start from $s = 1$ instead of $s = 0$.

5. On the last line of page 628, replace "with variance v " by "with intensity v ".