

## Errata Sheet (15 February 2010)

- p. xx: The entry for  $\{g_{j,l}\}$  should say ‘with  $\{g_{1,l}\} = \{g_l\}$ ’ rather than ‘with  $\{g_{1,l}\} = \{g_j\}$ ’. The entries for  $\{\tilde{g}_{j,l}\}$ ,  $\{h_{j,l}\}$  and  $\{\tilde{h}_{j,l}\}$  need similar corrections also (spotted by Phil Reiss).
- p. 2: In the third displayed equation, ‘ $< 1 - \epsilon$ ’ should be ‘ $> 1 - \epsilon$ ’ (spotted by Nathaniel Derby).
- p. 11:  $W(\lambda, t)$  should be  $W(\lambda, u)$  in Equation (11a).
- p. 25: In the first line, ‘the convolution of  $\{a_t^*\}$ ’ should be replaced by ‘the time reverse of the convolution of  $\{a_t^*\}$ ’ (spotted by Himadri Ghosh).
- p. 46: In the first and second lines above Exercise [46a], there are two instances where  $\mathcal{O}_{j,\bullet}$  should be  $\mathcal{O}_{j\bullet}$  (i.e., no comma in the subscript).
- p. 51: In the last sentence, ‘Plots (b) and (c) of Figures 50 and 51’ should be ‘The second and third columns of Figures 50 and 51’ (spotted by Michael Keim).
- p. 55: In the last sentence of Exercise [3.4],  $F_k$  should be  $|F_k|^2$  (spotted by Zhao Xuelin).
- p. 55: The first equation in Exercise [3.5] should read  $P_{\mathcal{F}}(f_k) = \|\mathcal{D}_{\mathcal{F},k}\|^2/N$  (i.e., the right-hand side needs to be divided by  $N$ ).
- p. 55: In the second line of Exercise [3.8],  $a_{t,k}$  should be  $a_{k,t}$  (spotted by Zhao Xuelin).
- p. 59: In the second line of the fourth paragraph, ‘ $t = 1$  and  $2$ ’ should be ‘ $t = 0$  and  $1$ ’ (spotted by Zhao Xuelin).
- p. 72: Immediately below Equation (72), ‘As discussed in Section 2.5’ should be ‘As discussed in Section 2.6’ (spotted by William Hamilton).
- p. 78: In the second line after Exercise [78], the paragraph indentation before ‘can be expressed as’ should be eliminated.
- p. 84: The last sentence of the first paragraph should be replaced by the following (spotted by Eric Aldrich):
- Hence the coefficients at frequencies  $f_k \in [-1/4, 1/4]$  in the Fourier representation for  $\{X_t\}$  map onto the coefficients at  $f'_k \in [-1/2, 1/2]$  in the approximate Fourier representation for  $\{V_{1,t}\}$ .
- p. 85: The last two sentences in the first paragraph should be replaced by the following (spotted by Eric Aldrich):
- Note that  $\mathcal{X}_{k+\frac{N}{2}}$  and  $\mathcal{X}'_k$  correspond to each other;  $\mathcal{X}_{k+\frac{N}{2}}$  corresponds to frequency  $f_{k+\frac{N}{2}} = \frac{k}{N} + \frac{1}{2}$ ; and  $\mathcal{X}'_k$ , to  $f'_k = k/N' = 2k/N = 2f_k$ . As  $k$  ranges from 0 to  $N'/2$ ,  $f'_k$  ranges over the interval  $[0, 1/2]$ , while  $f_{k+\frac{N}{2}}$  ranges from  $\frac{1}{2}$  to  $\frac{N'}{2N} + \frac{1}{2} = \frac{3}{4}$ , i.e., over the interval  $[1/2, 3/4]$ . For a real-valued sequence, the Fourier coefficient at a frequency  $f_k$  in the interval  $[1/2, 3/4]$  is the complex conjugate of the coefficient associated with frequency  $1 - f_k$ , which is in the interval  $[1/4, 1/2]$ . This mapping from  $[1/2, 3/4]$  to  $[1/4, 1/2]$  is in reverse order; i.e., as we sweep from left to right in  $[1/2, 3/4]$ , we sweep from right to left in  $[1/4, 1/2]$ . Hence the complex conjugates  $\mathcal{X}_k^*$  of the coefficients at frequencies  $f_k \in [1/4, 1/2]$  in the Fourier representation for  $\{X_t\}$  map – *in reverse order* – onto  $\mathcal{X}'_k$  at frequencies  $f'_k \in [0, 1/2]$  in the approximate Fourier representation for  $\{W_{1,t}\}$ .
- p. 90: The upper limits for the summation in Equation (90a) and for the first summation in the large displayed equation below Equation (90b) should be  $2L - 2$  rather than

$2L - 1$  (spotted by Intae Kang).

- p. 108: In the first displayed equation, the lower limit in the summation should be  $l = -\infty$  rather than  $l = \infty$  (spotted by Bill Constantine).
- p. 116: In the first line following the last displayed equation,  $A_L(f)$  should be  $\mathcal{A}_L(f)$  (spotted by Zhao Xuelin).
- p. 118: In the line just after Exercise [118], for clarity, ‘the Daubechies wavelet and scaling filters’ should say ‘all wavelet and scaling filters’.
- p. 125: In the third sentence of Section 4.10, ‘11.38 second interval’ should be ‘11.37 second interval’.
- p. 125: In the last line, for clarity, ‘the broader peak that comes after a P wave is a T wave’ should say ‘the broader peak that comes after the P and R waves is a T wave’ (spotted by Eric Aldrich).
- p. 129: The second sentence of the last paragraph should say ‘on all four figures’ rather than ‘on all three figures’ (spotted by Zhao Xuelin).
- p. 143: The first displayed equation should read

$$\hat{\sigma}_X^2 = \frac{1}{N} \sum_{j=1}^{J_0} \|\mathbf{W}'_j\|^2 + \frac{1}{N} \|\mathbf{V}'_{J_0}\|^2 - \frac{N'}{N} \bar{X}^2.$$

Also, in the line following the displayed equation, ‘ $\frac{N'}{N^2} \|\mathbf{W}'_j\|^2$ ’ should be ‘ $\frac{1}{N} \|\mathbf{W}'_j\|^2$ ’ (spotted by Eric Aldrich).

- p. 147: The first line on this page should have ‘ $|\nu_1^{(H)}| = \frac{L}{3}$ .’ rather than ‘ $|\nu_1^{(H)}| = \frac{2L}{3} - 1$ .’ Due to this error, the last part of the first displayed equation on this page should say ‘ $1 - \frac{L}{3} \bmod N = N + 1 - \frac{L}{3}$ ’ rather than ‘ $2 - \frac{2L}{3} \bmod N = N + 2 - \frac{2L}{3}$ ,’ and the third displayed equation should say ‘ $2t + 1 - \frac{L}{3} \geq 0$ ; i.e.,  $t = \frac{L}{6} \equiv \gamma_1^{(H)}$ ’, rather than ‘ $2t + 2 - \frac{2L}{3} \geq 0$ ; i.e.,  $t = \frac{L}{3} - 1 \equiv \gamma_1^{(H)}$ ’ (spotted by Zhao Xuelin).
- p. 147: The third line following the fourth displayed equation should have ‘ $\gamma_1^{(H)} \leq \frac{L}{2} - 2 < L'_1$ ’ rather than ‘ $\gamma_1^{(H)} < \frac{L}{2} - 2 < L'_1$ ’ because in fact  $\gamma_1^{(H)} = \frac{L}{2} - 2$  for the C(6) and LA(8) filters (spotted by Zhao Xuelin).
- p. 157: In the second sentence of Exercise [4.13], the second occurrence of  $\mathcal{B}_4\mathcal{A}_3\mathcal{A}_2\mathcal{A}_1$  should be  $\mathcal{A}_4\mathcal{A}_3\mathcal{A}_2\mathcal{A}_1$  (spotted by Melissa Meyer).
- p. 168: In the third line above the last displayed equation,  $\{\tilde{h}_l\}$  should be  $\{\tilde{h}_l^\circ\}$ ; in the first line above this equation,  $\{\tilde{g}_l\}$  should be  $\{\tilde{g}_l^\circ\}$  (spotted by Intae Kang).
- p. 170: In the second line of the second paragraph, ‘Section 2.5’ should be ‘Section 2.6’.
- p. 171: In the line just below Equation (171b), the period just before the word ‘while’ should be a comma (spotted by Eric Aldrich).
- p. 180: The last sentence of the second paragraph should begin with ‘As is evident from Figure 161’ rather than ‘As is evident from Figure 181’ (spotted by Eric Aldrich).
- p. 189: In the first sentence following the first displayed equation, there are two instances of  $\mathbf{W}_j$  that should be  $\tilde{\mathbf{W}}_j$ .
- p. 196: To keep with the convention used in the book for numbering figures, the first line of the caption for the figure on this page should have ‘Figure 196’ rather than ‘Figure

197'. The same change should be made in the second line and the second to last line in the main text on this page.

- p. 199: To complete a correction noted for page 196, 'Figure 197' in the fourth and sixth lines of the first complete paragraph should be changed to 'Figure 196'.
- p. 204: In Exercise [5.4], the dummy index  $k$  should be changed to  $j$  throughout to be consistent with the indexing convention used elsewhere in the book.
- p. 205: In the first line of Exercise [5.5],  $X_t$  should be  $\{X_t\}$ .
- p. 214: The period at end of Equation (214a) should be a comma.
- p. 217: In the caption to Figure 217,  $|U_{j,n}|^2$  should be  $|U_{j,n}(\cdot)|^2$ .
- p. 219: In the next to the last sentence of the first paragraph, 'This southern hemisphere data' should be 'These southern hemisphere data'.
- p. 221: In the last sentence of the first paragraph, the clause 'while the sample means of  $\mathbf{W}_{4,n}$  for  $n > 0$  are all zero' should be deleted (it is in fact incorrect).
- p. 226: In the last line of item (b) just above item [3], the parenthetical phrase 'no marking is done' should be changed to 'no new marking is done' for clarity (spotted by Eric Aldrich).
- p. 231: The summations in the second displayed equation should be

$$\sum_{l=0}^{L-1} lg_l^2 \quad \text{and} \quad \sum_{l=0}^{L-1} lh_l^2 \quad \text{rather than} \quad \sum_{l=0}^{L-1} lg_l \quad \text{and} \quad \sum_{l=0}^{L-1} lh_l$$

(spotted by Sean Lastuka).

- p. 253: The last sentence of Exercise [6.6] is incorrect and should be replaced by the following:  
 Show that the sample mean of  $\mathbf{W}_{j,0}$  is equal to  $2^{j/2}\bar{X}$ . Is it necessarily true that the sample mean of  $\mathbf{W}_{j,n}$  for  $n > 0$  is zero?
- p. 255: In the last line, 'Carmon' should be 'Carmona'.
- p. 270: In the third sentence of the last paragraph, three instances of  $S(f)$  should be  $S_X(f)$ .
- p. 277: In Figure 277 the horizontal axes should be labeled with  $\nu$  and not  $\eta$  (three occurrences).
- p. 283: In the line just before the displayed equation at the bottom of the page, the condition ' $-\frac{1}{2} \leq \delta < \frac{1}{2}$ ' should read ' $-\frac{1}{2} < \delta < \frac{1}{2}$ '.
- p. 284: Just prior to Equation (284b), the phrase 'for an FD( $\delta$ ) process' should be changed to 'for any stationary FD( $\delta$ ) process such that  $\delta$  is not an integer'.
- p. 284: Just after Equation (284c), the following sentence should be added: 'This equation holds for all stationary FD processes (i.e., when  $\delta < \frac{1}{2}$ ).'
- p. 284: The phrase 'the remainder of the ACVS' following Equation (284c) should be changed to read 'the remainder of the ACVS for any stationary FD process'.
- p. 295: In the next to last line of the first paragraph, there is an extra comma that should be eliminated (spotted by Ian MacLeod).
- p. 302: On the extreme right-hand side of the fourth displayed equation,  $\tilde{V}_{1,t}$  should be  $\bar{V}_{1,t}$  (spotted by Katsuto Tanaka).
- p. 304: In the fifth line above Exercise [304],  $\{\bar{W}_{j,t}\}$  should be changed to  $\{\bar{W}_{1,t}\}$  (spotted by Eric Aldrich).

- p. 306: In the right-most of the three summations in Equation (306c), although it is in fact correct, ' $\widetilde{W}_{j,t}^2$ ' should be changed to ' $\overline{W}_{j,t}^2$ ' for clarity (spotted by Eric Aldrich).
- p. 314: In the line before the first displayed equation, 'proportional to the DFT' should be changed to 'proportional to the squared modulus of the DFT' (spotted by Eric Aldrich).
- p. 331: The horizontal axis for plot (d) of Figure 331 should be labeled  $\tau_j \Delta t$  rather than just  $\tau_j$  (spotted by Charles Cornish).
- p. 335: In the third line of the last paragraph, ' $L > 2d$  or  $\mu_Y = 0$ ' should be '(i)  $L > 2d$  or (ii)  $L = 2d$  and  $\mu_Y = 0$ '.
- p. 343: In the eighteenth line, the 't' in the phrase ' $\mathcal{H}_j(f)$  t for  $\{h_{j,l}\}$ ' should be deleted (spotted by Katsuto Tanaka).
- p. 349: In the third line of the caption to Figure 349, ' $\log_{10}(S_X(f))$ ' should be replaced by ' $10 \cdot \log_{10}(S_X(f))$ '.
- p. 353: In the next to last sentence in the parenthetical comment at the end of the first paragraph, ' $-1 < \phi < -1$ ' should be ' $-1 < \phi < 1$ '.
- p. 367: The next to last sentence should be replaced with the following:  
 Our second use for the PACS is to compute a sequence  $\{v_t\}$  relating the variances of  $e_t$  and  $e_0$ :

$$v_t = \text{var}\{e_0\} \prod_{n=1}^t (1 - \phi_{n,n}^2), \quad t = 0, \dots, N-1, \quad \text{where} \quad \text{var}\{e_0\} = \frac{\Gamma(1-2\delta)}{\Gamma^2(1-\delta)}$$

(see Equation (284c); here  $v_0 = \text{var}\{e_0\} = \text{var}\{X_t\}$ ).

- p. 368: The second displayed equation should read as follows:

$$l(\delta | \mathbf{X}) \equiv N \log(\hat{\sigma}_\varepsilon^2(\delta)) + N \log\left(\frac{\Gamma(1-2\delta)}{\Gamma^2(1-\delta)}\right) + \sum_{t=1}^{N-1} (N-t) \log(1 - \phi_{t,t}^2).$$

- p. 371: In the fifth line, the upper limit for the summation defining  $N'$  should be  $J_0$  so that we have  $N' \equiv \sum_{j=1}^{J_0} N'_j$ .
- p. 374: For consistency, all occurrences of  $J$  in Equation (374) should be replaced with  $J_0$ .
- p. 384: The caption to Table 384 should say 'atomic clock fractional frequency deviates' rather than 'atomic fractional frequency deviates'.
- p. 385: The eighth line of the next to last paragraph should have 'On the other hand' rather than 'On the hand'.
- p. 385: In the fourteenth line from the bottom line,  $\mathbf{V}_3$  should be  $\mathbf{V}_4$ .
- p. 386: In the twelfth line of the first paragraph of Section 9.8, the value reported for the exact MLE  $\hat{\sigma}_\varepsilon^2(\hat{\delta})$  should be 0.4230 rather than 0.4231 (this small change is due to the errors in the exact MLE procedure given on pages 367–8; note that the MLE  $\hat{\delta}$  for  $\delta$  did not change).
- p. 387: In the second line of the caption to Table 387, 'wavelet filter critical values' should be changed to 'wavelet filter with critical values'.
- p. 396: In the last row of Table 396, the left-hand entry (i.e., the one for the LA(8) DWT transform for the frequency domain signal) should be 22 rather than 21.

- p. 430: In the third line from the bottom, ‘ODWT-based’ should be ‘MODWT-based’.
- p. 442: The sentence immediately following Equation (442) should be modified to start as follows: ‘Computations indicate that, under the special case of the Haar DWT and  $M = N/2$ , in fact . . .’
- p. 456: In the statement of Exercise [10.2], the two occurrences of  $\mathbf{P}[\|\widehat{\mathbf{D}}^{(\text{ht})} - \mathbf{D}\|^2 < \alpha]$  should be replaced with  $\mathbf{P}[\frac{1}{N}\|\widehat{\mathbf{D}}^{(\text{ht})} - \mathbf{D}\|^2 < \alpha]$ .
- p. 456: In the second displayed equation in Exercise [10.4], the numerator ‘ $\delta^4 - 2\sigma_{n_l}^2 \delta^2$ ’ should be ‘ $\delta^4 + 2\sigma_{n_l}^2 \delta^2$ ’ (i.e., the minus sign should be replaced with a plus sign).
- p. 456: In the last sentence of Exercise [10.8], there is a gratuitous ‘ST’ that should be erased.
- p. 456: Exercise [10.9] does not currently say what values should be used for  $N$  (the sample size) and  $K$  (the number of sine tapers). To remove this ambiguity, the last part of the stated exercise should say ‘. . . for the case  $M = 2N = 1024 = 2^{10} = 2^J$  and  $K = 5$ .’ Other choices for  $N$  and  $K$  could certainly be entertained; however, it is required that  $2N \leq 1024$ , and, per the discussion in Section 10.7, we recommend  $5 \leq K \leq 10$  (the lower bound is needed to achieve approximate Gaussianity, but the upper bound is somewhat arbitrary and is dictated by the fact that picking  $K$  to be much larger than 10 could result in important sharp features in the SDF being smeared out).
- p. 459: In the first displayed equation,  $\gamma_{j,0}(\cdot)$  should be  $\gamma_{j,0}(t)$ .
- p. 474: The displayed equation just prior to Exercise [474a] should read

$$\int_{-\infty}^{\infty} \psi_{0,m}(t)\phi_{0,n}(t) dt = \sum_{l=-\infty}^{\infty} \bar{h}_l \bar{g}_{l+2m-2n} = 0;$$

i.e., there is a ‘2’ prior to the summation that needs to be deleted (spotted by Agnieszka Jach).

- p. 483: In the third line below Equation (483a), ‘when  $l$  is even’ should be ‘when  $k$  is even’, and, in the following line, ‘when  $l$  is odd’ should be ‘when  $k$  is odd’.
- p. 503: In the first displayed equation in the solution to Exercise [28a], two instances of ‘ $a_{2,t}$ ’ should be ‘ $a_{2,u}$ ’ (spotted by Nathaniel Derby).
- p. 511: In the first line following the last displayed equation in the solution to Exercise [58], the term just before the right parenthesis should be  $k$  rather than  $2^j k$  (spotted by Zhao Xuelin).
- p. 519: In the last line of the last displayed equation, ‘ $[2i \sin(3\pi f)]$ ’ should be ‘ $[-2i \sin(3\pi f)]$ ’ (spotted by Katsuto Tanaka).
- p. 522: The left-hand side of the last displayed equation in the answer to Exercise [114] should be  $\theta_j^{(H)}(f)$  rather than  $\theta_j^{(G)}$  (spotted by Zhao Xuelin).
- p. 525: In the answer to Exercise [167a], the right-hand side of the equation in the second line above the last displayed equation should read  $\frac{1}{2}(\|\mathbf{W}_1\|^2 + \|\mathbf{W}_{\mathcal{T},1}\|^2)$  rather than  $\frac{1}{2}\|(\mathbf{W}_1\|^2 + \|\mathbf{W}_{\mathcal{T},1}\|^2)$ ; i.e., the left parenthesis is misplaced (spotted by Nathaniel Derby).
- p. 526: The left-hand side of the next to last displayed equation should be  $g_l^\circ$  rather than  $g_{L-l-1}^\circ$  (spotted by Eric Aldrich).
- p. 526: In the last displayed equation, all instances of  $\tilde{h}$  and  $\tilde{g}$  should be  $\tilde{h}^\circ$  and  $\tilde{g}^\circ$  (spotted by Caleb Dougherty).

- p. 527: In the first displayed equation in the answer to Exercise [171a], the index ‘ $j$ ’ should be ‘ $l$ ’ in two instances; additionally, ‘ $\equiv$ ’ should be ‘ $=$ ’ in the expression for  $\tilde{V}_{1,t}$  (spotted by Agnieszka Jach).
- p. 527: In the answer to Exercise [171a], the last displayed equation should have just ‘ $\tilde{\mathcal{G}}(\frac{k}{N})$ ’ rather than ‘ $|\tilde{\mathcal{G}}(\frac{k}{N})$ ’; i.e., the vertical bar should be deleted (spotted by Nathaniel Derby).
- p. 528: In the first displayed equation in the solution to Exercise [172],  $\tilde{h}_j^\circ$  and  $\tilde{g}_j^\circ$  should be  $\tilde{h}_l^\circ$  and  $\tilde{g}_l^\circ$  (spotted by Zhao Xuelin).
- p. 528: In the last line of the last displayed equation in the solution to Exercise [175], there is a ‘hat’ above a plus sign that should be eliminated (spotted by Intae Kang).
- p. 529: In the solution to Exercise [214], for clarity, ‘Note first that’ should be expanded to ‘Note first that, starting from Equation (214a),’.
- p. 537: Three occurrences of  $A_{\tilde{W}_j}$  in the solution to Exercise [313a] should all be  $A_j$  (spotted by Intae Kang).
- p. 540: In the last line of the second displayed equation, the two occurrences of negative signs in front of  $a_1$  should be positive signs – the same is true for the negative sign in front of  $a_1$  in the third displayed equation (spotted by Katsuto Tanaka).
- p. 541: In the second displayed equation in the answer to Exercise [345], the ‘ $l$ ’ just to the left of the right brace should be ‘ $l'$ ’ (spotted by Nathaniel Derby).
- p. 541: In the next to last sentence in the answer to Exercise [345], the expression ‘ $l - l' =$ ’ should be ‘ $l - l' = m$ ’ (spotted by Katsuto Tanaka).
- p. 542: In the second line after the last displayed equation, the equation ‘ $\text{var}\{\overline{V}_{J,0}\}/N = \text{var}\{\overline{V}_{J,0}\}$ ’ should read ‘ $\text{var}\{V_{J,0}\}/N = \text{var}\{\overline{V}_{J,0}\}$ ’ (spotted by Katsuto Tanaka).
- p. 549: In the expression for  $v_{j,k}$  in the answer to Exercise [481], ‘ $\langle s_{j-1}(\cdot), \phi_{2,k}(\cdot) \rangle$ ’ should be ‘ $\langle s_{j-1}(\cdot), \phi_{j,k}(\cdot) \rangle$ ’, while ‘ $w_{1,m}$ ’ should be ‘ $w_{l,m}$ ’ (spotted by Agnieszka Jach).
- p. 557: The title of the journal in the entry for Jensen (1999b) should start with ‘Studies in’ rather than ‘Studies of’ (spotted by Zhao Xuelin).
- p. 562: The volume for Toussoun (1925) should be 9 rather than 18.
- p. 571: In the entry for ‘bias-variance’ in the index, 431 should be 430.
- p. 576: In the entry for ‘backward difference’ under ‘filter’, 107 should be 105.
- p. 585: The entry ‘reflecting boundary conditions’ should be ‘reflection boundary conditions’.