Applied Linear Algebra, Second Edition

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Corrections to First Printing (2018)

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⋆⋆⋆ Page *xx* ⋆⋆⋆

Add the following paragraph after the last paragraph:

We would also like to thank Alexander Voronov for sending us suggestions and corrections to the printed text and solutions manuals.

⋆⋆⋆ Page 153 ⋆⋆⋆ Exercise 3.3.44:

Move Exercise 3.3.44 to the exercise set in following subsection since matrix norms are not introduced until there.

⋆⋆⋆ Page 159 ⋆⋆⋆ Equation (3.57):

Change $K = \begin{pmatrix} c^2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$ to $K = \begin{pmatrix} c^2 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$

⋆⋆⋆ Page 284 ⋆⋆⋆ Exercise 5.5.71 (d):

Change "Answer part (d) . . . " to "Answer part (c) . . . "

⋆⋆⋆ Page 308 ⋆⋆⋆ Exercise 6.1.8 (b):

Change "Answer Exercise 6.1.8 when . . . " to "Answer part (a) when . . . "

⋆⋆⋆ Page 310 ⋆⋆⋆ Exercise 6.1.16:

Change "Describe the mass–spring chains that gives rise to . . . " to
"Describe mass–spring chains that give rise to . . . "

⋆⋆⋆ Page 431 ⋆⋆⋆ Exercise 8.4.1:

Change $W \subset \mathbb{R}^2$ to $W \subset \mathbb{R}^3$

⋆⋆⋆ Page 453 ⋆⋆⋆ Exercise 8.6.26 (c):

Change $\begin{pmatrix} 0 & -1 & 1 \\ 1 & 1 & -1 \\ 3 & 3 & -4 \end{pmatrix}$ to $\begin{pmatrix} 0 & -1 & 1 \\ 1 & 1 & -1 \\ -3 & 3 & -4 \end{pmatrix}$

⋆⋆⋆ Page 453 ⋆⋆⋆ Exercise 8.6.27:

Insert period after "impractical"

⋆⋆⋆ Page 473 ⋆⋆⋆ Exercise 8.8.1 (e):

Change , ., to , .2,: $.9, -.4, -.8, .2, 1., -1.6, -1.2, -.7$

$\star\star\star$ Page 474 $\star\star\star$ Exercise 8.8.12:

Change $\operatorname{dist}(\mathbf{x}, L) = \sum_{i=1}^{m} \operatorname{dist}(\mathbf{x}_i, L)$ to $\sum_{i=1}^{m} \operatorname{dist}(\mathbf{x}_i, L)^2$

$\star\star\star$ Page 549 $\star\star\star$ Exercise 9.6.19 (e):

Change "… the solution ot the linear …" to "… the solution to the linear …"

$\star\star\star$ Page 553 $\star\star\star$ line before Example 9.56:

Change "… can be found [**18**, **88**]." to "… can be found in [**18**, **88**]."

$\star\star\star$ Page 554 $\star\star\star$ Exercise 9.7.1 (a):

Change "… coefficients $c_{j,k}$." to
"… coefficients c_0 and $c_{j,k}$ for $j = 0, \ldots, 3$ and $k = 0, \ldots, 2^j - 1$."

$\star\star\star$ Page 563 $\star\star\star$ Exercise 9.7.22:

Change $i \geq p$ to $i \geq 3$. Also change "Daubechies scaling equation" to
"Daubechies dilation equation".

$\star\star\star$ Page 558 $\star\star\star$ Replace the final paragraph by the following::

Before explaining how to solve the Daubechies dilation equation, let us complete our discussion of orthogonality. It is easy to see that, by translation invariance of the inner product integral, since $\varphi(x)$ and $\varphi(x-m)$ are orthogonal whenever $m \neq 0$, so are $\varphi(x-k)$ and $\varphi(x-l)$ for all $k \neq l$. Next we seek to establish orthogonality of $\varphi(x-m)$ and $w(x)$. Combining the dilation equation (9.138) and the definition (9.142) of w, and then using (9.147, 148), produces

$$\begin{aligned}
\langle\, w(x)\,, \varphi(x-m)\,\rangle &= \left\langle\; \sum_{j=0}^{p} (-1)^j c_{p-j}\, \varphi(2\,x - j)\,,\; \sum_{k=0}^{p} c_k\, \varphi(2\,x - 2\,m - k) \right\rangle \\
&= \sum_{j,k=0}^{p} (-1)^j\, c_{p-j}\, c_k \,\langle\, \varphi(2\,x-j)\,, \varphi(2\,x - 2\,m - k)\,\rangle \\
&= \sum_{j,k=0}^{p} (-1)^j\, c_{p-j}\, c_k \,\langle\, \varphi(x)\,, \varphi(x + j - 2\,m - k)\,\rangle = \frac{1}{2} \sum_{k} (-1)^k\, c_{p-2m-k}\, c_k\, \|\,\varphi\,\|^2,
\end{aligned}$$

where the sum is over all $0 \leq k \leq p$ such that $0 \leq 2\,m + k \leq p$. Now, if $p = 2q+1$ is odd, then each term in the final summation appears twice, with opposite signs, and hence the result is always zero — no matter what the coefficients $c_0, \ldots, c_p$ are! On the other hand, if $p = 2\,q$ is even, then orthogonality requires all $c_0 = \cdots = c_p = 0$, and hence $\varphi(x) \equiv 0$ is completely trivial and not of interest. Indeed, the particular cases $m = \pm\, q$ require $c_0 = c_p = 0$; with this, setting $m = \pm\,(q-1)$ requires $c_1 = c_{p-1} = 0$, and so on. Thus, to ensure orthogonality of the wavelet basis, the dilation equation (9.138) necessarily has an even number of terms, meaning that p must be an odd integer, as it is in the Haar and Daubechies versions (but not for the hat function). The proof of orthogonality of the translates $w(x-m)$ of the mother wavelet, along with all her wavelet descendants $w(2^j\, x - k)$, relies on a similar argument, and the details are left as Exercise 9.7.17.