Corrections and comments for: *Linear Algebra in Action*, **2nd edition.**

May 4, 2018

p.221, line 1 of Section 10.4: $\begin{bmatrix} a, & b_j \end{bmatrix}^T$ to $\begin{bmatrix} a_j & b_j \end{bmatrix}^T$

p.233, line 3 of Exercise 10.27 should read:

$$\max\{|\mathrm{trace}\,(UAVB)| : U, V \in \mathbb{C}^{n\times n} \quad \text{and} \quad U^H U = V^H V = I_n\} = \sum_{j=1}^{n} \alpha_j \beta_j.$$

p.233, (1) of Theorem 10.17: $\leq \mathrm{rank}\, A.$ to $= 1, \ldots, n.$

p.235, line 1 of proof of Lemma 10.19: $(I_p - AA^H)^{1/2}$ to $D_{A^H} = (I_p - AA^H)^{1/2}.$

p.255, At the end of the warning (after the sentence However, A is clearly not Hermitian.) add: But, if $A \in \mathbb{R}^{n\times n}$, then

$$\langle A\mathbf{x}, \mathbf{x}\rangle \geq 0 \quad \text{for every } \mathbf{x} \in \mathbb{C}^n \iff \langle A\mathbf{x}, \mathbf{x}\rangle \geq 0 \quad \text{for every } \mathbf{x} \in \mathbb{R}^n \text{ and } A = A^T.$$

p.258, line 4 of Lemma 12.6: positive definite and to positive definite, X is invertible and

p.289, line 2 above **5.**: $(\gamma^2 I_q - A^H A)^{1/2}$ to $(\gamma^2 I_p - AA^H)^{1/2}$ (This change should be implemented twice.)

Also, to verify Step 4, it is helpful to note that if $\mathrm{rank}\,(\gamma^2 I_q - A^H A) = r$, with $1 \leq r < q$, then there exists a $q \times q$ unitary matrix $V = \begin{bmatrix} V_1 & V_2 \end{bmatrix}$ such that $V_1 \in \mathbb{C}^{q\times r}$, S is invertible, $(\gamma^2 I_q - A^H A) = V_1 S V_1^H$ and (because of (12.87)) $CV_2 = 0$.

p.324, Theorem 14.10: The bound in (4) may be obtained by strengthening the bound in (3) to:

$$\|J_{\mathbf{f}}(\mathbf{x}) - J_{\mathbf{f}}(\mathbf{x} + s(\mathbf{b} - \mathbf{x}))\| \leq \alpha s \|\mathbf{b} - \mathbf{x}\| \quad \text{for } 0 \leq s \leq 1$$

with α as in the present proof of (3).

p.325, line 3 of the proof: c_j to c_{ij}

p.326, line 4 up: $\left\| \begin{bmatrix} 2 & 2 \\ 2 & 0 \end{bmatrix} (\mathbf{x} - \mathbf{y}) \right\|$ to $\left\| \begin{bmatrix} 2 & 2 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} x_1 - y_1 & 0 \\ 0 & x_2 - y_2 \end{bmatrix} \right\|$

p.331, line 2 up: r_{A+B} to $r_\sigma(A+B)$

p.335, line 1 of Exercise 14.23: a_{J+1} to a_{j+1}

p.393, in Figure 1: The exterior curve should have been labelled Γ.

p.448, to get a better feel for the tail end of the proof of Theorem 19.9, it may be helpful to note that if $A = BC$, then $\operatorname{rank} A \le \operatorname{rank} B$. However, if CC^H is invertible, then $B = AC^H(CC^H)^{-1}$ and hence $\operatorname{rank} B \le \operatorname{rank} A$.

p.471, line 1, unitary to invertible

p.471, line 6: $Q = UCV^H$ to $Q = UCV^{-1}$

p.485, in the setting of Theorem 20.18 it is useful to note that if $(A.\mathbf{b})$ is controllable and $A = UJU^{-1}$ with J in Jordan form, then

$$\operatorname{rank} \begin{bmatrix} \lambda I_n - A & \mathbf{b} \end{bmatrix} = \operatorname{rank} \begin{bmatrix} \lambda I_n - J & U^{-1}\mathbf{b} \end{bmatrix} = n \quad \text{for every } \lambda \in \mathbb{C}.$$

Therefore, the geometric multiplicity of each eigenvalue of A is equal to one.

p.511, in (22.6) delete: on Q

p.543, line 14 up: $\mathbf{u}\mathbf{w}^T = \mathbf{y}\mathbf{v}^T$ to $\mathbf{w}^T\mathbf{u} = \mathbf{v}^T\mathbf{y}$.

p.550, line 1: unitary to Hermitian