ERRATA TO "LINEAR ALGEBRA DONE WRONG"

p. 30: the definition of a subspace should read "A *subspace* of a vector space V is a non-empty subset $V_0 \subset V$ of V..."—the word non-empty is inserted.

p. 31, problem 7.2: the last sentence of the problem should read: "Show that if X and Y are *subspaces* of V, then $X + Y$ is also a subspace."

p. 42: line 3 from below should read: "Make sure, by applying row operations of type 1 (row exchange), if necessary. . . "—not "type 2".

p. 48: There should be "row" instead of "column" in line 9 from below. This line should read: ". . . if and only if there is a pivot in every row in echelon form of the matrix."

p. 50, line 2: should be "columns" instead of "rows" here. This line shoul read: ". . . cannot exceed the number of columns, $n \leq m$."

p. 55: Subsection 5.1 should start before Proposition 5.4. The phrase "The following statement will play an important role later." should be the first sentence of this subsection.

p. 66, Sect. 7.4: in the second to last paragraph before the Remark, A and A_{e} are mixed up, and the indices in $\mathbf{v}_r, \dots, \mathbf{v}_n$ are wrong (it should be $\mathbf{v}_{r+1}, \dots, \mathbf{v}_n$). The correct paragraph should read as:

"To see that, let vectors $\mathbf{v}_{r+1}, \dots, \mathbf{v}_n$ complete the rows of A_{e} to a basis in $\mathbb{R}^n$. Then, if we add to a matrix A_{e} rows $\mathbf{v}_{r+1}^T, \dots, \mathbf{v}_n^T$, we get an invertible matrix. Let call this matrix $\widetilde{A}_{\text{e}}$, and let $\widetilde{A}$ be the matrix obtained from A by adding rows $\mathbf{v}_{r+1}^T, \dots, \mathbf{v}_n^T$. The matrix $\widetilde{A}_{\text{e}}$ can be obtained from $\widetilde{A}$ by row operations, so

$$\widetilde{A}_{\text{e}} = E\widetilde{A},$$

where E is the product of the corresponding elementary matrices. Then $\widetilde{A} = E^{-1}$ and $\widetilde{A}$ is invertible as a product of invertible matrices."

p. 68, problem 7.13: There should be question mark "?" (without quotes), not "/" at the end of the last sentence.

p. 86: there should be $\mathbf{v}_n$ instead of $\mathbf{e}_n$ on the last line.

p. 86, Problem 3.10: The last matrix there should be

$$\begin{pmatrix} A & \mathbf{0} \\ * & I \end{pmatrix}$$

p. 87, line 9: the line should read

". . . $D(\mathbf{e}_{j_1}.\mathbf{e}_{j_2}, \dots \mathbf{e}_{j_n})$ is zero, because there are two equal columns here." ("columns" instead of "rows")

p. 88: equation (4.2) should read

$$\det A = \sum_{\sigma\in\operatorname{Perm}(n)} a_{\sigma(1),1}a_{\sigma(2),2}\ldots a_{\sigma(n),n}\operatorname{sign}(\sigma), \tag{4.2}$$

(should be no commas between $a_{\sigma(k),k}$)

p. 95: In item c) of Problem 5.6 the formula should be "$A_n\cdot(x-c_0)(x-c_1)\ldots(x-c_{n-1})$", not "$A_n\cdot(x-c_0)(x-c_1)\ldots(x-c_n)$"

p. 126, Problem 2.3: In item a) the summation should be $\sum_{k=1}^{n}\ldots$, not $\sum_{k=1}^{\infty}\ldots$.

p. 129: The last line in the proof of Proposition 3.3 should read

$$= (\mathbf{v},\mathbf{v}_k) - \alpha_k(\mathbf{v}_k,\mathbf{v}_k) = (\mathbf{v},\mathbf{v}_k) - \frac{(\mathbf{v},\mathbf{v}_k)}{\|\mathbf{v}_k\|^2}\|\mathbf{v}_k\|^2 = 0.$$

not

$$= (\mathbf{v},\mathbf{v}_k) - \alpha_k(\mathbf{v}_k,\mathbf{v}_k) = \frac{(\mathbf{v},\mathbf{v}_k)}{\|\mathbf{v}_k\|^2}\|\mathbf{v}_k\|^2 = 0.$$

p. 142–143: Proof of Lemma 6.2 should read:

Proof. If $U^*U = I$, then by the definition of adjoint operator

$$(\mathbf{x},\mathbf{x}) = (U^*U\mathbf{x},\mathbf{x}) = (U\mathbf{x},U\mathbf{x}) \qquad \forall\mathbf{x}\in X.$$

Therefore $\|\mathbf{x}\| = \|U\mathbf{x}\|$, and so U is an isometry.

On the other hand, if U is an isometry, then by the definition of adjoint operator and by Theorem 6.1 we have for all $\mathbf{x}\in X$

$$(U^*U\mathbf{x},\mathbf{y}) = (U\mathbf{x},U\mathbf{y}) = (\mathbf{x},\mathbf{y}) \qquad \forall\mathbf{y}\in X,$$

and therefore by Corollary 1.5 $U^*U\mathbf{x} = \mathbf{x}$. Since it is true for all $\mathbf{x}\in X$, we have $U^*U = I$. □

p. 145: The second line of the proof of the proposition 6.5 should read "$UB\mathbf{x} = U(\lambda\mathbf{x}) = \lambda U\mathbf{x}$, i.e. $U\mathbf{x}$ is an eigenvector of A." ("$UB\mathbf{x}$ should be instead of $UA\mathbf{x}$)

p. 157: Conclusion of Theorem 1.1 should read

"In other words, any $n\times n$ matrix A can be represented as $A = UTU^*$, where U is a unitary, and T is an upper triangular matrix." ("$A = UTU^*$", not "$T = UTU^*$")

p. 164, line 2: Text in problem 2.6 should read "…has positive eigenvalues…", not "…has positive eigenvectors…"

p. 164, Problem 2.14: One "eigenvalues" should be deleted.

p. 171, problem 3.6: The part b) of the problem should read

b) " $\min_{\|\mathbf{x}\|=1}\|A\mathbf{x}\|$ and the vectors where the minimum is attained;"

(i.e. the condition should be $\|\mathbf{x}\| = 1$, not $\|\mathbf{x}\|\le 1$).

p. 173, line 12: it should be "$\mathbf{x} = (x_1, x_2, \ldots, x_n)^T$", not "$\mathbf{v} = (x_1, x_2, \ldots, x_n)^T$" there.

p. 174, formula (4.1): The formula and the text around it should read:

...Since for $\mathbf{x} = (x_1, x_2, \ldots, x_n)^T$

$$A\mathbf{x} = \sum_{k=1}^{r} s_k x_k \mathbf{e}_k, \tag{1}$$

we can conclude that

$$\|A\mathbf{x}\|^2 = \sum_{k=1}^{r} s_k^2 |x_k|^2 \le s_1^2 \sum_{k=1}^{r} |x_k|^2 = s_1^2 \cdot \|\mathbf{x}\|^2,$$

so $\|A\mathbf{x}\| \le s_1 \|\mathbf{x}\|$.

p. 175: The last displayed formula on this page should read

$$\|A\|_2^2 = \operatorname{trace}(A^*A) = \sum_{k=1}^{r} s_k^2.$$

(there should be $\|A\|_2^2$, not $\|A\|_2$).

p. 179: formula on line 10 from below should read

$$\mathbf{x} := \operatorname{Re}\mathbf{u} = (\mathbf{u} + \overline{\mathbf{u}})/2, \qquad \mathbf{y} = \operatorname{Im}\mathbf{u} = (\mathbf{u} - \overline{\mathbf{u}})/(2i),$$

not

$$\mathbf{x}_k := \operatorname{Re}\mathbf{u} = (\mathbf{u} + \overline{\mathbf{u}})/2, \qquad \mathbf{y} = \operatorname{Im}\mathbf{u} = (\mathbf{u} - \overline{\mathbf{u}})/(2i),$$

p. 183, Lemma 5.6: in the second line of the statement of the lemma it should be written "...rotations $R_1, R_2, \ldots, R_N$, $N \le n(n-1)/2$...", not "...rotations $R_1, R_2, \ldots, R_n$, $n \le n(n-1)/2$..."