

*Linear Algebra, Data Science, and Machine Learning*

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Errata

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- Page 141: Equation with  $R \circ S$  on left hand side:

Change  $\mathbf{u}_j \mathbf{u}_j^T$  to  $\mathbf{u}_i \mathbf{u}_i^T$ .

- Page 188: Proof of Theorem 6.9:

Change  $b = \mathbf{y}^T \mathbf{f}$  to  $b = -\mathbf{y}^T \mathbf{f}$ .

- Page 205, Exercise 4.8:

Change  $A$  to  $H$  twice:

$$\mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k (H \mathbf{x}_k - \mathbf{b}) \quad \text{and} \quad \mathbf{r}_k = H \mathbf{x}_k - \mathbf{b}.$$

- Page 213:

Change  $x$  to  $\mathbf{x}$  on the line immediately below Eq. (6.79).

- Page 214: Definition 6.32:

Change the definition to read “is the  $n \times n$  self-adjoint matrix defined by the inequality”.

- Page 225: Equation 6.109:

Change  $\mu^2$  to  $\mu$ .

- Page 275: Equation 7.62:

Change the equation to read

$$\min_{\substack{\mathbf{w} \in \mathbb{R}^n \\ b \in \mathbb{R}}} \left\{ \|\mathbf{w}\|^2 \mid y_i(\mathbf{x}_i \cdot \mathbf{w} - b) \geq 1, \quad i = 1, \dots, m \right\}.$$

- Page 275: Equation 7.63:

Change the equation to read

$$\min_{\mathbf{w}, b} \left\{ \|\mathbf{w}\|^2 \mid \mathbf{z} \cdot \mathbf{w} - b \geq 1, \quad \mathbf{z} \cdot \mathbf{w} + b \geq 1 \right\}.$$

- Page 306: Theorem 7.22:

The assumptions on convexity/concavity of  $F$  should be switched, and  $D$  must be nonempty. Also, while the result in Fan [72] holds for nonconvex sets  $D$ , Fan has a more general notion of convex/concave functions than we have given in the book, so to be more clear we also assume  $D$  is convex. The correct statement of the theorem should read:

**Theorem 7.22:** Let  $D \subset \mathbb{R}^m$  be convex, compact, i.e., closed and bounded, and nonempty. Let  $F: D \times \mathbb{R}^n \rightarrow \mathbb{R}$  be continuous, and suppose that  $F(\mathbf{x}, \mathbf{y})$  is convex as a function of  $\mathbf{y}$  for each fixed  $\mathbf{x} \in D$ , while  $F(\mathbf{x}, \mathbf{y})$  is concave, i.e.,  $-F(\mathbf{x}, \mathbf{y})$  is convex, as a function of  $\mathbf{x}$  for each fixed  $\mathbf{y} \in \mathbb{R}^n$ . Then,

$$\min_{\mathbf{y} \in \mathbb{R}^n} \max_{\mathbf{x} \in D} F(\mathbf{x}, \mathbf{y}) = \max_{\mathbf{x} \in D} \min_{\mathbf{y} \in \mathbb{R}^n} F(\mathbf{x}, \mathbf{y}).$$

As a side note, Theorem 7.22 is one place in the book where the minimum is really an infimum.

- Page 307: Equation (7.112):

Change  $\sum_{i=1}^n$  to  $\sum_{i=1}^m$ .

- Page 307: Remark 7.23:

Replace “exactly those” with “a subset of the”.

- Page 309:

Change  $\sum_{i=1}^n$  to  $\sum_{i=1}^m$ .

- Page 319: Section 8.8.1. Kernel Principal Component Analysis

Throughout this section there should be a standing assumption that  $d \geq m$  (i.e., the feature dimension is at least as large as the number of data points).

- Page 320: Theorem 8.4:

The formula for  $\mathbf{q}_i$  should read  $\mathbf{q}_i = \lambda_i^{-1/2} Z^T \mathbf{p}_i$ .

- Page 333: Equation (8.33):

Change  $Q$  to  $Q^T$ .

- Page 333: Equation (8.34):

Change  $Q_k$  to  $Q_k^T$ .

- Page 346, Exercise 4.1:

Delete “How does the accuracy change with the number of principal components used?”

- Page 541, Eq. (10.94):

Remove extra left parenthesis, so equation should read

$$\Phi(\mathbf{x}) = \prod_{i=1}^n \theta(x_i) = \prod_{i=1}^n (1 - |x_i|)_+.$$

- Page 543, line -6:

Remove first “the” in “...it is the only the lower intrinsic...”

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