Errata:
An Introduction to Optimization, Third Edition
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Typos and minor changes

- p. 26, Theorem 3.2: Add "real" before "symmetric."

- p. 63, line 10, displayed equation for $D^2 f$: In the denominator of the $(2, n)$ entry of the matrix, change x_1 to x_2; it should be $\partial^2 f/\partial x_n \partial x_2$.

- p. 63, Example 5.1: The function should be changed to

$$f(\boldsymbol{x}) = \begin{cases} x_1 x_2 (x_1^2 - x_2^2)/(x_1^2 + x_2^2) & \text{if } \boldsymbol{x} \neq \boldsymbol{0} \\ 0 & \text{if } \boldsymbol{x} = \boldsymbol{0} \end{cases}$$

  and the Hessian should be evaluated at $\boldsymbol{0} = [0, 0]^\top$. The intermediate steps will also change accordingly, but the final Hessian matrix on p. 65 is the same as before.

- p. 73, 8 lines from bottom: Add "$/\|\boldsymbol{x} - \boldsymbol{x}_0\|$" to the end of the line (should be $(\boldsymbol{x} - \boldsymbol{x}_0)^\top Df(\boldsymbol{z}(\alpha))^\top / \|\boldsymbol{x} - \boldsymbol{x}_0\|$).

- p. 74, line 2, displayed equation for $D^2 f$: In the denominator of the $(2, n)$ entry of the matrix, change x_1 to x_2; it should be $\partial^2 f/\partial x_n \partial x_2$.

- p. 86, first displayed equation: Exchange the numerator and denominator. The correct equation should read:

$$f(x) = \frac{1 + (2 - x)^2}{1 + x^2}.$$

- p. 86, second and third displayed equations: The correct equations should read:

$$\begin{aligned} f'(x) &= \frac{-2(2 - x)(1 + x^2) - 2x(1 + (2 - x)^2)}{(1 + x^2)^2} \\ &= \frac{4(x^2 - 2x - 1)}{(1 + x^2)^2}. \end{aligned}$$

- p. 94, exercises 6.11: Change the equation for $f(\boldsymbol{x})$ to $f(\boldsymbol{x}) = -3x_1$ (insert a negative sign). Also, change the equation for Ω to $\Omega = \{\boldsymbol{x} = [x_1, x_2]^\top : x_1 + x_2^2 \leq 2\}$ (reverse the inequality).

- p. 103, first line below Figure 7.3: Replace "function of ρ" by "equation" (to read "equation above").

- p. 104, first line of Iteration 2: add "so" after "and" (to read "and so f need only be").

- p. 162, 13 lines from bottom: Remove "the" before "Section 9.2".
- p. 138, Example 8.3: The values of γ_{2k} and γ_{2k+1} should be interchanged: $\gamma_{2k} = -1/2$ and $\gamma_{2k+1} = 1/2$.
- p. 207, Exercise 11.9: In the equation for $\boldsymbol{v}_1^\top$, change $\boldsymbol{v}$ on the right-hand side to $\boldsymbol{x}$.
- p. 223: Add p. 223 to a new index entries for "Woodbury."
- p. 224, Example 12.6, first three displayed equations: Add comma and spaces before $\boldsymbol{b}^{(0)}$, $\boldsymbol{b}^{(1)}$, and $\boldsymbol{b}^{(2)}$.
- p. 251, first two displayed equations in the middle of the page: Change $R(k)$ to $R(k)+1$.
- pp. 262–263, Example 13.3: To be consistent with the notation in Section 13.2, we should use indices d, i with $i = 1, 2, 3, 4$ (instead of $0, 1, 2, 3$). So, on p. 262, the vectors in the displayed equation should start with $\boldsymbol{x}_{d,1}$ (not $\boldsymbol{x}_{d,0}$). Similarly, we should start with $y_{d,1}$ (not $y_{d,0}$). On p. 263, change $(\boldsymbol{x}_{d,R(k)}, y_{d,R(k)})$ to $(\boldsymbol{x}_{d,R(k)+1}, y_{d,R(k)+1})$.
- p. 277, last line: Insert superscript "(0)" to $\boldsymbol{g}$, $\boldsymbol{x}_1$, and $\boldsymbol{x}_d$. The last equation should read: $\boldsymbol{g}^{(0)} = \arg\min_{\boldsymbol{x}\in\{\boldsymbol{x}_1^{(0)},\ldots,\boldsymbol{x}_d^{(0)}\}} f(\boldsymbol{x})$.
- p. 278, first two displayed equations: Swap the order of these two equations and replace $\boldsymbol{v}_i^{(k)}$ by $\boldsymbol{v}_i^{(k+1)}$ in the (new) second equation. They should read:
$$\begin{aligned}\boldsymbol{v}_i^{(k+1)} &= \omega\boldsymbol{v}_i^{(k)} + c_1\boldsymbol{r}_i^{(k)} \circ (\boldsymbol{p}_i^{(k)} - \boldsymbol{x}_i^{(k)}) + c_2\boldsymbol{s}_i^{(k)} \circ (\boldsymbol{g}^{(k)} - \boldsymbol{x}_i^{(k)}),\\ \boldsymbol{x}_i^{(k+1)} &= \boldsymbol{x}_i^{(k)} + \boldsymbol{v}_i^{(k+1)}.\end{aligned}$$
- p. 401, 8 lines from bottom: Insert "=" between "$\boldsymbol{e}$" and "$[1,\ldots,1]^\top$."
- p. 512, line 8: Change "$l(\boldsymbol{x},\boldsymbol{\mu})$" to "$l(\boldsymbol{x},\boldsymbol{\mu}) = f(\boldsymbol{x}) + \boldsymbol{\mu}^\top\boldsymbol{g}(\boldsymbol{x})$".
- p. 522, Lemma 22.2: Change $\boldsymbol{f}^*$ to $\boldsymbol{x}^*$.
- p. 522, displayed equation in middle of page: Change the sign in front of $D\boldsymbol{h}$ to "+" so that it reads
$$\boldsymbol{U}(\boldsymbol{w}) = \begin{bmatrix}\boldsymbol{x} - \alpha(\nabla f(\boldsymbol{x}) + D\boldsymbol{h}(\boldsymbol{x})^\top\boldsymbol{\lambda})\\ \boldsymbol{\lambda} + \alpha\boldsymbol{h}(\boldsymbol{x})\end{bmatrix}.$$
- p. 522, second to last displayed equation at bottom of page: Change the signs in front of $D\boldsymbol{h}$ so that it reads
$$D\boldsymbol{U}(\boldsymbol{w}) = \boldsymbol{I} + \alpha\begin{bmatrix}-\boldsymbol{L}(\boldsymbol{x},\boldsymbol{\lambda}) & -D\boldsymbol{h}(\boldsymbol{x})^\top\\ D\boldsymbol{h}(\boldsymbol{x}) & \boldsymbol{O}\end{bmatrix}.$$
- p. 523, third displayed equation: Change the signs in front of $D\boldsymbol{h}$ so that it reads
$$\boldsymbol{M} = \begin{bmatrix}-\boldsymbol{L}(\boldsymbol{x}^*,\boldsymbol{\lambda}^*) & -D\boldsymbol{h}(\boldsymbol{x}^*)^\top\\ D\boldsymbol{h}(\boldsymbol{x}^*) & \boldsymbol{O}\end{bmatrix},$$
- p. 524, Lemma 22.3: Change $\boldsymbol{f}^*$ to $\boldsymbol{x}^*$.

- p. 525, displayed equation in middle of page: Change the sign in front of $D\boldsymbol{g}$ to "+" so that it reads

$$\boldsymbol{U}(\boldsymbol{w}) = \begin{bmatrix} \boldsymbol{x} - \alpha(\nabla f(\boldsymbol{x}) + D\boldsymbol{g}(\boldsymbol{x})^\top \boldsymbol{\mu}) \\ \boldsymbol{\mu} + \alpha \boldsymbol{g}(\boldsymbol{x}) \end{bmatrix}.$$

- p. 525, displayed equation at bottom of page: Change the signs in front of $D\boldsymbol{g}$ so that it reads

$$D\boldsymbol{U}(\boldsymbol{w}) = \boldsymbol{I} + \alpha \begin{bmatrix} -\boldsymbol{L}(\boldsymbol{x}, \boldsymbol{\mu}) & -D\boldsymbol{g}(\boldsymbol{x})^\top \\ D\boldsymbol{g}(\boldsymbol{x}) & \boldsymbol{O} \end{bmatrix}.$$

- p. 526, displayed equations for $\boldsymbol{U}_A$ and $D\boldsymbol{U}_A$ at middle of page: Change the signs in front of $D\boldsymbol{g}_A$ so that they read

$$\boldsymbol{U}_A(\boldsymbol{w}_A) = \begin{bmatrix} \boldsymbol{x} - \alpha(\nabla f(\boldsymbol{x}) + D\boldsymbol{g}_A(\boldsymbol{x})^\top \boldsymbol{\mu}_A) \\ \boldsymbol{\mu}_A + \alpha \boldsymbol{g}_A(\boldsymbol{x}) \end{bmatrix},$$

  and

$$D\boldsymbol{U}_A(\boldsymbol{w}_A) = \boldsymbol{I} + \alpha \begin{bmatrix} -\boldsymbol{L}(\boldsymbol{x}, \boldsymbol{\mu}_A) & -D\boldsymbol{g}_A(\boldsymbol{x})^\top \\ D\boldsymbol{g}_A(\boldsymbol{x}) & \boldsymbol{O} \end{bmatrix}.$$

- pp. 575–576: Add p. 512 to the index entries for "Function, Lagrangian" and "Lagrangian function."

- p. 584: Add p. 223 to a new index entry for "Woodbury."