PRACTICAL OPTIMIZATION:
Algorithms and Engineering Applications
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Errata Corrections for Printing #1
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NOTE:

We would greatly appreciate to be notified of any typographical errors in the textbook and the solutions of the end-of-chapter problems found at this website. Comments and suggestions for the next edition are especially welcome.

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Chapter 1

- Page 18, line 7 – Change "Aninterior" to "An interior".
- Page 25, Prob. 1.3 – Change

$$c_2(\mathbf{x}) = -x_2 - \tfrac{7}{5}x_1 + \tfrac{77}{5} \geq 0$$

to

$$c_2(\mathbf{x}) = x_2 + \tfrac{7}{5}x_1 - \tfrac{77}{5} \geq 0$$

- Page 26, Prob. 1.6 – Change

$$a_1(\mathbf{x}) = 2x_1 + 3x_2 + x_3 = 30$$

to

$$a_1(\mathbf{x}) = 2x_1 + 3x_2 + x_3 - 30 = 0$$

Chapter 2

- Page 36, Theorem 2.2(b)(ii) – Change $\mathbf{H}(\mathbf{x})^*$ to $\mathbf{H}(\mathbf{x}^*)$.
- Page 43, line -1[1] – Change $\mathbf{d}\hat{\mathbf{H}}\mathbf{d}$ to $\mathbf{d}^T\hat{\mathbf{H}}\mathbf{d}$.
- Page 59, Theorem 2.16 – Change $\mathbf{g}(x^*)$ to $\mathbf{g}(\mathbf{x}^*)$.
- Page 62, Prob. 2.10 – Change the second component of vector $\mathbf{x}_a$ from -11.3479 to -1.3479 as follows:

$$\mathbf{x}_a = [0.6959 \ \ -1.3479]^T$$

Chapter 4

- Page 94, line 3 – Change $F_n = 1.44$ to $F_n = 144$.
- Page 115, footnote – Change "Here and and" to "Here and in".

Chapter 5

- Page 121, line 1 – change "δ must" to "δ must be"
- Page 141, Prob. 5.2(a) – Change "$\mathbf{x}_{k+1}$" to "$\mathbf{x}_k$".

Chapter 6

- Page 163, Algorithm 6.4 – lines 3 and 5 of Step 3, change x_{k0} to $\mathbf{x}_{kn}$.

[1] Count from the bottom of the page for negative lines.

- Page 167, Algorithm 6.5 – lines 3 and 5 of Step 3, change x_{k0} to $\mathbf{x}_{kn}$.

Chapter 7

- Page 190, line −3 – Change $\mathbf{U}$ to $\mathbf{V}$.
- Page 192, line 8 – The formula for $\mathbf{P}_{k+1}$ should read as follows:

$$\mathbf{P}_{k+1} = \mathbf{P}_k + \frac{\boldsymbol{\gamma}_k \boldsymbol{\gamma}_k^T}{\boldsymbol{\gamma}_k^T \boldsymbol{\delta}_k} - \frac{\mathbf{P}_k \boldsymbol{\delta}_k \boldsymbol{\delta}_k^T \mathbf{P}_k}{\boldsymbol{\delta}_k^T \mathbf{P}_k \boldsymbol{\delta}_k}$$

- Page 196 – Delete definite article "The" at the end of Step 6 in Algorithm 7.3 and insert it at the start of the first paragraph after the algorithm, i.e., that paragraph should start with "The computational ...".
- Page 201, Prob. 7.14 – Change Prob. 7.6 to Prob. 7.7.

Chapter 8

- Page 206, Algorithm 8.1, Step 3 – Change $\widehat{E}(\breve{\mathbf{x}})$ to $\widehat{E}(\breve{\mathbf{x}}_k)$.
- Page 215, Algorithm 8.3, Step 3 – Change $\widehat{E}(\breve{\mathbf{x}})$ to $\widehat{E}(\breve{\mathbf{x}}_k)$.
- Page 218, Eq. (8.28d) – Replace $M(\mathbf{x}, \omega_i)$ by $-M(\mathbf{x}, \omega_i)$, i.e., Eq. (8.28d) should read as follows:

$$\frac{\partial e_i(\mathbf{x})}{\partial \mathbf{b}} = -\frac{M(\mathbf{x},\, \omega_i)\{[1 + \mathbf{b}^T \hat{\mathbf{c}}(\omega_i)]\hat{\mathbf{c}}(\omega_i) + [\mathbf{b}^T \hat{\mathbf{s}}(\omega_i)]\hat{\mathbf{s}}(\omega_i)\}}{[1 + \mathbf{b}^T \hat{\mathbf{c}}(\omega_i)]^2 + [\mathbf{b}^T \hat{\mathbf{s}}(\omega_i)]^2} \qquad (8.28d)$$

Chapter 10

- Page 287, lines 10–11 should read as follows:

  since $a_i(\mathbf{x}^*) = 0$. It follows that $a_i(\mathbf{x}^* + \mathbf{s}) = 0$ is equivalent to
- Page 287, line 13 – Change "if it is" to "if and only if it is".
- Page 301, line −11 – Change

$$3 - x_1 - x_2 = 0$$

  to

$$3 - x_1 - 2x_2 = 0$$

  Page 301, line −9 – Change

$$\mathbf{x}^* = \begin{bmatrix} \frac{14}{3} \\ -\frac{5}{3} \end{bmatrix} \quad \text{and} \quad \mu_2^* = \frac{14}{3}$$

  to

$$\mathbf{x}^* = \begin{bmatrix} 5 \\ -1 \end{bmatrix} \quad \text{and} \quad \mu_2^* = 4$$

- Page 304, Eq. (10.92) – Change $\nabla_x^2(\mathbf{x}_2^*,\ \boldsymbol{\lambda}_2^*)$ to $\nabla_x^2 L(\mathbf{x}_2^*,\ \boldsymbol{\lambda}_2^*)$.
- Page 309, Eq. (10.107b) – Change

$$a_i^T(\mathbf{x}) = \mathbf{a}_i^T \mathbf{x} - b_i$$

  to

$$a_i^T(\mathbf{x}) = \mathbf{a}_i^T \mathbf{x} - b_i = 0$$

- Page 314, Prob. 10.8 – Change "where $c > 0$ is a constant" to "where $c > 0$ is a constant such that $400/c > 61$".

- Page 315 – Prob. 10.10(b) should read as follows:

  Which condition on $\mathbf{M}$ will ensure that $\mathbf{Ax} \geq \mathbf{b}$ implies $\mathbf{MAx} \geq \mathbf{Mb}$?

Chapter 12

- Page 403, Prob. 12.2 – Change "Consider the problem Eq. (12.1)" to "Consider the problem in Eq. (12.1)".
- Page 405 – Eq. (P12.4) in Prob. 12.15 should read as follows:

$$\mathbf{d} = -\frac{1}{\tau}\mathbf{X}\bar{\mathbf{P}}\mathbf{X}\mathbf{c} + \mathbf{X}\bar{\mathbf{P}}\mathbf{e} \qquad (P12.4)$$

- Page 406, Prob. 12.22 – The last two lines should read as follows:

  using a primal-dual algorithm and then taking the negative of the optimal Lagrange multiplier vector, $-\boldsymbol{\lambda}^*$, as $\mathbf{x}^*$.

Chapter 13

- Page 411, Eq. (13.11b) – Change $\mathbf{A}$ to $\mathbf{A}^T$.
- Page 418, Eq. (13.29a) – Delete ";".
- Page 431, line −5 – Change the equation number from (13.66a) to (13.66b).
- Page 442, Algorithm 13.8 – The title of the algorithm should read as follows:

  Ellipsoid method for constrained CP problems

- Page 446, Prob. 13.10(b), last line – Change "positive definite" to "positive semidefinite".
- Page 446, Prob. 13.12(a) – Change "differentiable" to "convex and differentiable".
- Page 447, Prob. 13.13(a) – Change "Sec. 13.4" to "Sec. 13.3".

Chapter 14

- Page 485, fist line after Eq. (14.101c) – Replace "$\hat{c}_i \in R^{n_i \times 1}$" by "$\hat{\mathbf{c}}_i \in R^{n_i \times 1}$", i.e., $\hat{c}_i$ should be bold $\hat{\mathbf{c}}_i$.
- Page 491, line 2 – Change $\mathbf{z}_i$ to $\mathbf{a}_i$, i.e., the equation should read as follows:

$$\delta_i(\mathbf{a}_i^T\mathbf{x} + c_i) \geq 1$$

- Page 491, line −1 – Matrix $\mathbf{A}$ should read as follows:

$$\mathbf{A} = [\hat{\mathbf{A}}_1 \ \hat{\mathbf{A}}_2 \ \cdots \ \hat{\mathbf{A}}_q]$$

- Page 492, line 3 – Replace "$\mathbf{x} = [x_1 \ x_2 \ \cdots \ x_q]^T$ with $x_i \in \mathcal{K}_i$" by "$\mathbf{x} = [\mathbf{x}_1^T \ \mathbf{x}_2^T \ \cdots \ \mathbf{x}_q^T]^T$ with $\mathbf{x}_i \in \mathcal{K}_i$"
- Page 492, line −7 – Change $(\mathbf{x}, \ \mathbf{y})$ to $(\mathbf{s}, \ \mathbf{y})$.
- Page 494, Algorithm 14.5, Step 1 – Change "parameters q and n_i " to "parameters q, σ, and n_i".
- Page 495, lines −10 to −6 should read as follows:

$$\mathbf{s}_0 = \mathbf{c} - \mathbf{A}^T\mathbf{y}_0 = [-\beta \ 1 \ 3.5 \ 0 \ 0 \ 1 \ 0.25 \ 0.5 \ 1 \ -0.3535 \ -0.1767]^T$$

$n_1 = 5$, $n_2 = 3$, and $n_3 = 3$, choosing $\beta = -3.7$ guarantees that $\mathbf{s}_0 \in \mathcal{F}_d^o$. This gives

$$\mathbf{y}_0 = [-3.7 \ -1.5 \ -0.5 \ -2.5 \ -4]^T$$

and

$$\mathbf{s}_0 = [3.7 \ 1 \ 3.5 \ 0 \ 0 \ 1 \ 0.25 \ 0.5 \ 1 \ -0.3535 \ -0.1767]^T$$

- Page 498, Prob. 14.16 – Change "$\mathbf{F}(\mathbf{x}) = \mathbf{F}_i+$" to "$\mathbf{F}(\mathbf{x}) = \mathbf{F}_0+$".

Chapter 15

- Page 519, line -3 – Change

$$\mathbf{A}_{k+1}^T \approx \mathbf{A}_k^T + \sum_{i=1}^{q} \nabla^2 c_i(\mathbf{x}_k)\boldsymbol{\Delta}\mathbf{x}_k$$

to

$$\mathbf{A}_{k+1}^T \approx \mathbf{A}_k^T + [\nabla^2 c_1(\mathbf{x}_k)\boldsymbol{\Delta}\mathbf{x}_k \;\; \nabla^2 c_2(\mathbf{x}_k)\boldsymbol{\Delta}\mathbf{x}_k \cdots \nabla^2 c_q(\mathbf{x}_k)\boldsymbol{\Delta}\mathbf{x}_k]^T$$

- Page 529, Prob. 15.3 – Change "$c_1(\mathbf{x}) = x_1x_2 - 25 \geq 0$" to "$c_1(\mathbf{x}) = -x_1x_2 + 25 \geq 0$".

- Page 520, Eq. (25.53) – Replace $-\boldsymbol{\gamma}_k$ by $\boldsymbol{\gamma}_k$, i.e., Eq. (25.53) should read as follows:

$$\Delta\mathbf{y}_k = \mathbf{Y}_k\boldsymbol{\Lambda}_k^{-1}(\boldsymbol{\gamma}_k - \Delta\boldsymbol{\lambda}_k) \tag{15.53}$$

Chapter 16

- Pages 541 – 549 – Change equation numbers 16.21–16.38 to 16.20–16.37, i.e., equation numbers 16.21, 16.22, ..., 16.38, should read 16.20, 16.21, ..., 16.37.

- Page 552, Eq. (16.46) – Change $\mathbf{F}$ to $\mathbf{H}$, i.e., Eq. (16.46) should read as follows:

$$\begin{bmatrix} \mathbf{D} & \mathbf{H} \\ \mathbf{H}^T & \mathbf{G} \end{bmatrix} \succ \mathbf{0} \tag{16.46}$$

- Page 557 Eq. (16.63) – The second line in Eq. (16.63) should read as follows:

$$(\mathbf{Y}\mathbf{S}^{-1}\mathbf{Y}^T)_{j,j} \tag{16.63}$$

- Page 557, line -1 – The inequality should read as follows:

$$(\mathbf{Y}\mathbf{S}^{-1}\mathbf{Y}^T)_{jj} \leq u_{j,\max}^2 \qquad \text{for } j = 1, 2, \ldots, p$$

- Page 567, Eq. (16.79) – Change u_1 to μ_i, i.e., Eq. (16.79) should read as follows:

$$\mathbf{P}_i = \begin{bmatrix} \mu_i c_{i1} & 0 & c_{i2} \\ 0 & \mu_i c_{i1} & c_{i3} \\ c_{i2} & c_{i3} & \mu_i c_{i1} \end{bmatrix} \succeq \mathbf{0} \tag{16.79}$$

- Page 575, Eq. (16.101a) – Change K to $K+1$, i.e., Eq. (16.101a) as follows:

$$\hat{\mathbf{X}} \succeq \mathbf{0},\ \hat{x}_{ii} = 1 \qquad \text{for } 1 \leq i \leq K+1 \tag{16.101a}$$

- Page 583 – Change d in Eq. (16.117) to e as follows:

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_x^\infty e^{-v^2/2}\, dv \tag{16.117}$$

- Page 588, Prob. 16.10, line -7 – Change the second $\mathbf{Y}$ to $\mathbf{Y}^T$, i.e., the expression should read as follows:

$$(\mathbf{Y}\mathbf{S}^{-1}\mathbf{Y}^T)_{jj} \leq u_{j,\max}^2$$

- Page 588, Prob. 16.11(c), line -2 – Delete the "to" after "assure".

Appendix A

- Page 592, second line after Eq. (A.1) – Change "exit" to "exist".

- Page 602, line -3 – Change "$\|\mathbf{x}\| = 581.68$" to "$\|\mathbf{x}\|_2 = 581.68$".