Errata of *Modern Nonconvex Nondifferentiable Optimization*

July 29, 2022

- Page 5, the first paragraph of the proof of Proposition 1.1.1.

  Replace the sentence *"For each positive integer ν, let i_ν be the smallest integer greater than ν such that $\|x^{i_\nu} - x^\infty\| > \delta$"* with the following one:

  Let $\{x^{j_\nu}\}$ with $j_{\nu+1} > j_\nu$ be a subsequence in the neighborhood of $\mathcal{N}(x^\infty, \delta)$ converging to x^∞. For each ν, let i_ν be the smallest integer $i > \max(j_\nu, i_{\nu-1})$ such that $\|x^{i_\nu} - x^\infty\| > \delta$.

- Page 5, the last line. The second S_{ν_1} should be S_{ν_2}.
- Page 19, the last line. The term $x = x^* + J_xF(x^*, y^*)^{-1}[e(x, y) + F(x^*, y)]$ should be $x = x^* - J_xF(x^*, y^*)^{-1}[e(x, y) + F(x^*, y)]$.
- Page 20, the third display, $x(y) - x(z) = \cdots$ should be $x(z) - x(y) = \cdots$.
- Page 20, the display below (1.15) and the last display on this page, the most right sides should have an additional term $o(\|x(y^* + h) - x(y^*)\|)$.
- Page 26, Exercise 1.2.4. Change to the following:

  For a vector x (or a matrix A), let $|x|$ (or A) be the vector (or the matrix) whose components are equal to the absolute values of the corresponding components of x (or A). A norm $\| \bullet \|$ on $\mathbb{R}^n$ is said to be *monotonic* if $|x| \leq |y|$ implies $\|x\| \leq \|y\|$ for all x and y in $\mathbb{R}^n$. Similarly, a norm $||| \bullet |||$ on $\mathbb{R}^{n\times n}$ is monotonic if $|A| \leq |B|$ implies $|||A||| \leq |||B|||$.

  Show the following:

  (a) A vector norm $\| \bullet \|$ is monotonic if and only if $\|x\| = \| \, |x| \, \|$ for all $x \in \mathbb{R}^n$.

  (b) A matrix norm induced by a monotonic vector norm is monotonic.

- Page 29, the last inequality in the proof of Proposition 1.2.3,

  $$||| \, (\mathbb{I} - A)^{-1} \, ||| \geq \frac{||| \, \mathbb{I} \, |||}{||| \, \mathbb{I} + A \, |||}$$

  should be

  $$||| \, (\mathbb{I} - A)^{-1} \, ||| \geq \frac{||| \, \mathbb{I} \, |||}{||| \, \mathbb{I} - A \, |||}.$$

- Page 32, line 13. "each column of Q is an eigenvector of the corresponding diagonal entry of A" should be "....of the corresponding diagonal entry of D".
- Page 39, the proof from (h) $\Rightarrow$ (i) only shows the nonnegativity of trace(AB) and does not show this term is strict positive if $B \neq 0$.
- Page 43, line 18. A "β" is missing in the third equation. The correct one should be

  $$Ar = Aq - \beta \, Ap = e^{i\theta_2} \, Az - \beta \, e^{i\theta_1} \, Ax = \rho(A)r.$$

- Page 51, line -2. "n" should be ℓ.
- Page 53, line -3 in proof of Proposition 1.4.1. The exponent -1 in $\beta_{\nu-1}$ should be removed.
- Page 56, fifth line below Exercise 1.5.1, $\Phi : \mathbb{R}^n \rightrightarrows \mathbb{R}^n$ should be $\Phi : \mathbb{R}^n \rightrightarrows \mathbb{R}^m$.
- Page 58, Theorem 1.5.1. Let $\Phi : \mathcal{O} \rightrightarrows \mathbb{R}^m$ should be $\Phi : \mathcal{O} \rightrightarrows \mathbb{R}^n$.

- Page 66, Proposition 2.1.1(3). It should be: there exists $y \geq 0$ such that $A^\top y < 0$.
- Page 91, Lemma 2.5.1. The correct statements should be:

  Suppose that f is continuously differentiable. Let $\{x^\nu\}$ be an infinite sequence generated by Algorithm 2.5.1. If $\{x^\nu\}$ and $\{d^\nu\}$ are bounded, then the following statements must hold:

  (a) The sequence $\{f(x^\nu)\}$ converges.

  (b) $\lim_{\nu \to \infty} \nabla f(x^\nu)^\top d^\nu = 0$.
- Page 92, Theorem 2.5.1. Need to assume that the direction d^ν to be *gradient related* to $\{x^\nu\}$, i.e., for any subsequence of $\{x^\nu\}_{\nu \in \kappa}$ converging to a nonstationary point, $\limsup_{\nu \to \infty} \nabla f(x^\nu)^\top d^\nu < 0$.
- Page 134. The term $Y^\top Z$ should be $\mathrm{tr}(Y^\top Z)$.
- Page 140. The closure of the set is $\mathbb{R}^2$.
- Page 167, line 14. The term x' should be w'.
- Page 475, Lemma 8.3.1, the convexity of the set X needs to be dropped (the proof remains valid) because in the application to Proposition 8.5.6, the set $S_c(x)$ may not be convex.
- Page 536, Theorem 9.2.1 and related results, the Lipschitz continuity of f on the closed set X should be replaced by its Lipschitz continuity on an open set where the boundedness condition: $f'(\bar{x}; v) \leq L\|v\|$ holds; e.g., in a neighborhood of $\bar{x}$.
- Page 663, line 2. The term p^q should be p^{-q}.
- Page 667, one line before expression (11.9): "be" should be "being"; first line after expression (11.9): b_{i1} should be β_{i1}.
- Page 671, second bullet in statement of Proposition 11.2.1, ∇_x should be ∇_{x^i}.
- Page 672, Proposition 11.2.2 needs the map Φ to be nonempty-valued and compact-valued.
- Page 678, Proposition 11.2.3 requires the same nonempty-valuedness and compact-valuedness of Φ.
- Page 679, line -3 before end of proof: τ should be τ_ν.
- Page 679, Exercise 11.3.1. First line $\{\widehat{f}\}_{i=1}^N$ should be $\{\widehat{f}_i\}_{i=1}^N$.
- Page 687, 5 lines below Example 11.4.1: asterisk * is missing in x^{-i}.
- Page 696, expression (11.36): $-g(x)$ should be on the next line.
- Page 696, line -4: "constraint" −¿ "condition".
- Page 699, 2 lines in proof of Lemma 11.5.1: $\widehat{\bar{\Xi}}$ should be $\bar{\Xi}$ and a superscript transpose $^\top$ is missing after $\bar{\pi}$.
- A lot of places: *implicit* convex-concave functions should be *implicitly* convex-concave functions.