Corrections to *Numerical Optimization*, Second Edition
Published August 2006
(Last updated May 17, 2008)

1. p. 5, line −11. "from a a finite" → "from a finite"
2. p. 9, line 18. "n the 1940s" → "in the 1940s"
3. p. 23, line −5. "∇f"→ "$\nabla^2 f$"
4. p. 25, line 1. "...,is" → "is, respectively, (6.25) and"
5. p. 26, line 8. "positive definite p_k" → "positive definite"
6. p. 32, line 8. "$k = 0, 1, \ldots$" → "$k = 1, 2, \ldots$"
7. pp. 34-35, Figures 3.4 and 3.5. "desired slope" → "minimum acceptable slope"
8. p. 40, line −9. "will be able" → "will not be able"
9. p. 49, line 15. "For a proof this result" → "For a proof of this result"
10. p. 49, line 15. "For problems in which ∇f^* is close to singular" → "For problems in which $\nabla^2 f(x^*)$ is close to singular"
11. p. 55, Example 3.2. Replace formula (3.52) by

$$L = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ \frac{1}{9} & \frac{2}{3} & 1 & 0 \\ \frac{2}{9} & \frac{1}{3} & \frac{5}{7} & 1 \end{bmatrix}, \qquad B = \begin{bmatrix} 0 & 3 & 0 & 0 \\ 3 & 4 & 0 & 0 \\ 0 & 0 & \frac{7}{9} & 0 \\ 0 & 0 & 0 & \frac{45}{63} \end{bmatrix}.$$

    Also, make the replacement "Note that both diagonal blocks in B are 2×2" → "Note that the leading diagonal block in B is 2×2"

12. p. 75, line −3. "In the latter case, we compute the appropriate" → "When $\|p^{\mathrm{U}}\| \leq \Delta$, the appropriate value of τ is obtained from

$$\tau = \frac{\Delta}{\|p^{\mathrm{U}}\|}.$$

    Otherwise, when $\|p^{\mathrm{U}}\| < \Delta < \|p^{\mathrm{B}}\|$, we compute the appropriate"

13. p. 80, line −3. Delete "for some $t \in (0, 1)$,".
14. p. 81, line 1. "to denote the Lipschitz" → "to denote half the Lipschitz"
15. p. 84, line −5. "$\lambda \neq \lambda_j$" → "$\lambda \neq -\lambda_j$"

16. p. 85, on the line after (4.40). "whcih" → "which"

17. p. 90, line 9. "global minimum" → "global minimizer".

18. p. 93, line 9. "neighborhhod" → "neighborhood"

19. p. 99, line 1. "the sequence $\{\|g\|\}$" → "the sequence $\{\|g_k\|\}$"

20. p. 99, Exercise 4.6. "positive definite" → "symmetric positive definite".

21. p. 145, lines 14-15. Item 2 should read "If $y_k = B_k s_k$, then the trivial updating formula $B_{k+1} = B_k$ satisfies the secant condition."

22. p. 158, formula (6.57) should be

$$\tilde{M}_k = \frac{\|\tilde{y}_k\|^2}{\tilde{y}_k^T \tilde{s}_k} \leq \frac{(1 + \bar{c}\epsilon_k)^2}{1 - \bar{c}\epsilon_k}.$$

23. p. 158, formula (6.58) should be

$$\tilde{M}_k \leq 1 + \frac{3\bar{c} + \bar{c}^2\epsilon_k}{1 - \bar{c}\epsilon_k}\epsilon_k \leq 1 + c\epsilon_k.$$

24. p. 162, exercise 6.5 should read "Prove that if $y_k \neq B_k s_k$ and $(y_k - B_k s_k)^T s_k = 0$, then there is no symmetric rank-one updating formula that satisfies the secant condition.

25. p. 167, line 9. The first line of this displayed multiline formula should be

$$\nabla f_{k+1} = \nabla f_k + \nabla^2 f_k p_k + \int_0^1 [\nabla^2 f(x_k + tp_k) - \nabla^2 f(x_k)] p_k \, dt$$

(The quantities in the integral should be Hessians, not gradients.)

26. p. 171, line 8 of Algorithm 7.2. Remove "in (4.5)".

27. p. 176, eq (7.14). "Q_j" → "Q_j^T".

28. p. 192, line 5. "its area is q^2" → "its area is q^{-2}"

29. p. 232, line 6. "$k = 1, 2, \dots$" → "$k = 0, 1, 2, \dots$"

30. p. 238, line 18. "toward this value" → "toward the best vertex".

31. p. 238, line 19. "after some defining some notation" → "after defining some notation".

32. p. 238, line −9. Should be

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i.$$

33. p. 239, line 12. "$f_{-1/2} = \bar{x}(-1/2)$" $\rightarrow$ "$f_{-1/2} = f(\bar{x}(-1/2))$"

34. p. 239, line 17. "$f_{1/2} = \bar{x}(1/2)$" $\rightarrow$ "$f_{1/2} = f(\bar{x}(1/2))$"

35. p. 239, line 23. "three-dimensional" $\rightarrow$ "two-dimensional"

36. p. 240, caption of Figure 9.4. "simplex method in $\mathbb{R}^3$" $\rightarrow$ "simplex method in $\mathbb{R}^2$"

37. p. 253, line -11. "less sentitive to" $\rightarrow$ "less sensitive to"

38. p. 255, line -3. "can applied to study" $\rightarrow$ "can be applied to study"

39. p. 260, lines 2 and 4. "λI" $\rightarrow$ "$\sqrt{\lambda} I$".

40. p. 269, Exercise 10.1. Delete the phrase ", and let $y \in \mathbb{R}^m$ be a vector"

41. p. 269, Exercise 10.5. "Assume also that the r_j are bounded on $\mathcal{D}$, that is, there exists $M > 0$ such that $|r_j(x)| \leq M$ for all $j = 1, 2, \ldots, m$ and all $x \in \mathcal{D}$." $\rightarrow$ "Assume also that the r_j and ∇r_j are bounded on $\mathcal{D}$, that is, there exists $M > 0$ such that $|r_j(x)| \leq M$ and $\|\nabla r_j(x)\| \leq M$ for all $j = 1, 2, \ldots, m$ and all $x \in \mathcal{D}$."

42. p. 276, formula (11.11) should be

$$w(x_k, x^*) = \int_0^1 \left[J(x_k + t(x^* - x_k)) - J(x_k) \right] (x_k - x^*) \, dt. \tag{1}$$

43. p. 279, line 11. "at most 1/2" $\rightarrow$ "at most 3/4".

44. p. 294, line -7. "$\int_0^1 \beta_L ||p_k||^2 dt$ " $\rightarrow$ "$\int_0^1 t\beta_L ||p_k||^2 dt$".

45. p. 295, line -2. "not be increased" $\rightarrow$ "not be decreased".

46. p. 303, line 1. "decreasing in λ" $\rightarrow$ "decreasing in $\lambda > 0$"

47. p. 314, line -7. "it s easy to identify vectors d that satisfies" $\rightarrow$ "it is easy to identify vectors d that satisfy"

48. p. 315, line -9. "closed convex set" $\rightarrow$ "closed set"

49. p. 317, line -2. "sequence are ($d = (0, \alpha)^T$" $\rightarrow$ "sequence are ($d = (0, \alpha)^T$ with $\alpha \geq 0$"

50. p. 324, line 14. "positive scalars such" $\rightarrow$ "positive scalars such that"

51. p. 324, line -8. "At $t = 0$, $z = x^*$, and the Jacobian of R at this point is" $\rightarrow$ "At $t = 0$, we have $z = x^*$, and the Jacobian of R with respect to z at this point is"

52. p. 325, Replace the paragraph starting on line 1 and ending on line 10 (that is, "It remains to verify...." through "proof of (ii) is complete") with the following paragraph:

    In fact, the solution z of (12.40) is an implicit function of t; we can write it as $z(t)$, and note that $z_k = z(t_k)$. The implicit function theorem states that z is a *continuously differentiable* function of t, with

    $$z'(0) = -\nabla_z R(x^*, 0)^{-1} \nabla_t R(x^*, 0),$$

    and we can use (12.40) and (12.41) to deduce that $z'(0) = d$. Since $z(0) = x^*$, we have that

    $$\frac{z_k - x^*}{t_k} = \frac{z(0) + t_k z'(0) + o(t_k) - x^*}{t_k} = d + \frac{o(t_k)}{t_k},$$

    from which it follows that (12.29) is satisfied (for $x = x^*$), Hence, $d \in T_\Omega(x^*)$ for an arbitrary $d \in \mathcal{F}(x^*)$, so the proof of (ii) is complete.

53. p. 325, line −11. "at which all feasible sequences" → "at which all feasible sequences approaching x"

54. p. 328, line 6. "$2t$" → "2α" in the second equation of this line.

55. p. 329, formula (12.51). "$A(x^*)^T\lambda^*$" → "$A(x^*)^T\lambda$"

56. p. 333, formula (12.63). replace the term

    $$\tfrac{1}{2} t_k^2 w^T \nabla_{xx}^2 \mathcal{L}(x^*, \lambda^*)$$

    by

    $$\tfrac{1}{2} t_k^2 w^T \nabla_{xx}^2 \mathcal{L}(x^*, \lambda^*) w$$

57. p. 333, line −7. "condition (12.65) by" → "condition (12.65) can be replaced by"

58. p. 336, line −3. The matrix in the formula should be

    $$\begin{bmatrix} -0.8 & 0 \\ 0 & 1.4 \end{bmatrix}$$

59. p. 337, add after line 12: " where $|\mathcal{A}(x^*)|$ denotes the cardinality of $\mathcal{A}(x^*)$."

60. p. 341, statement of Lemma 12.9. "Then t the normal cone" → "Then the normal cone"

61. p. 341, lines 16 and 19. In these two displayed formulae, replace $\Rightarrow$ by $\Leftrightarrow$.

62. p. 344, line 3. "$q : \mathbb{R}^n \to \mathbb{R}$" → "$q : \mathbb{R}^m \to \mathbb{R}$"

63. p. 344, formula (12.84) should be

    $$\max_{\lambda \in \mathbb{R}^m} q(\lambda) \qquad \text{subject to } \lambda \geq 0. \tag{2}$$

64. p. 351, in formula (12.96), replace $x^6 \sin(1/x) = 0$ by $x^6 \sin(1/x)$.

65. p. 443, line 15. "from from" $\rightarrow$ "from".

66. p. 444, line 14. "if does not" $\rightarrow$ "if it does not".

67. p. 455, line 15. "to obtain $\hat{y}$" $\rightarrow$ "to obtain $\hat{z}$".

68. p. 461, line 15. "the scaled $n \times n$ projection matrix" $\rightarrow$ "the $n \times n$ matrix".

69. p. 468, line -6. "positive definite" $\rightarrow$ "positive semidefinite".

70. p. 488, line -13. "else (ii) Δt^*" $\rightarrow$ "else (ii) if Δt^*".

71. p. 600, line -6. "is a nonnegative multiple" $\rightarrow$ "is a multiple"

72. p. 602, line 16. "(i) the whole space $\mathbb{R}^n$" $\rightarrow$ "the whole space $\mathbb{R}^2$"

73. p. 609, line 14. "set $x = P^T z$" $\rightarrow$ "set $x = Pz$"

74. p. 615. lines -12 to -9. Replace this sentence by the following: "By combining these expressions, we find that the difference between this result and the true value $x - y$ may be as large as a quantity that is bounded by $\mathbf{u}(|x| + |y| + |x - y|)$ (ignoring terms of order $\mathbf{u}^2$)."

75. p. 616, displayed formula on line -4. "$\approx$" $\rightarrow$ "$\leq$"

76. p. 617, formula (A.32). "$\approx$" $\rightarrow$ "$\leq$"

77. p. 618, line 7. This displayed formula should be

$$\|x_k - \hat{x}\| \leq \epsilon, \quad \text{for some } k \geq K.$$

78. p. 620, line 16. "have $(1 + (0.5)^k) - 1| = (0.)^k$" $\rightarrow$ "have $|(1 + (0.5)^k) - 1| = (0.5)^k$"

79. p. 629, line -1. "$1/\sqrt{13}$" $\rightarrow$ "$1/\sqrt{3}$"

Thanks to Carlos Henao, Jorgen Sand, Marc Steinbach.