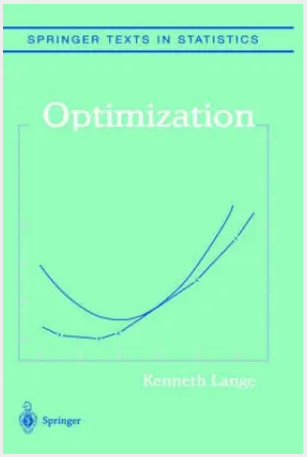
Lange

Optimization



Lange is a Springer author of other successful books. This is the first book that emphasizes the applications of optimization to statistics. The emphasis on statistical applications will be especially appealing to graduate students of statistics and biostatistics.

Finite-dimensional optimization problems occur throughout the mathematical sciences. The majority of these problems cannot be solved analytically. This introduction to optimization attempts to strike a balance between presentation of mathematical theory and development of numerical algorithms. Building on students' skills in calculus and linear algebra, the text provides a rigorous exposition without undue abstraction. Its stress on convexity serves as bridge between linear and nonlinear programming and makes it possible to give a modern exposition of linear programming based on the interior point method rather than the simplex method. The emphasis on statistical applications will be especially appealing to graduate students of statistics and biostatistics. The intended audience also includes graduate students in applied mathematics, computational biology, computer science, economics, and physics as well as upper division undergraduate majors in mathematics who want to see rigorous mathematics combined with real applications. Chapter 1 reviews classical methods for the exact solution of optimization problems. Chapters 2 and 3 summarize relevant concepts from mathematical analysis. Chapter 4 presents the Karush-Kuhn-Tucker conditions for optimal points in constrained nonlinear programming. Chapter 5 discusses convexity and its implications in optimization. Chapters 6 and 7 introduce the MM and the EM algorithms widely used in statistics. Chapters 8 and 9 discuss Newton's method and its offshoots, quasi-Newton algorithms and the method of conjugate gradients. Chapter 10 summarizes convergence results, and Chapter 11 briefly surveys convex programming, duality, and Dykstra's algorithm. Kenneth Lange is the Rosenfeld Professor of Computational Genetics in the Departments of Biomathematics and Human Genetics at the UCLA School of Medicine. He is also Interim Chair of the Department of Human Genetics. At various times during his career, he has held appointments at the University of New Hampshire, MIT, Harvard, the University of Michigan, and the University of Helsinki. While at the University of Michigan, he was the Pharmacia & Upjohn Foundation Professor of Biostatistics. His research interests include human genetics, population modeling, biomedical imaging, computational statistics, and applied stochastic processes. Springer-Verlag previously published his books Mathematical and Statistical Methods for Genetic Analysis, 2nd ed., Numerical Analysis for Statisticians, and Applied Probability.

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