MM Optimization Algorithms

By Kenneth Lange

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MM Optimization Algorithms offers an overview of the MM principle, a device for deriving optimization algorithms satisfying the ascent or descent property. These algorithms can separate the variables of a problem, avoid large matrix inversions, linearize a problem, restore symmetry, deal with equality and inequality constraints gracefully, and turn a nondifferentiable problem into a smooth problem.

The author presents the first extended treatment of MM algorithms, which are ideal for high-dimensional optimization problems in data mining, imaging, and genomics; derives numerous algorithms from a broad diversity of application areas, with a particular emphasis on statistics, biology, and data mining; and summarizes a large amount of literature that has not reached book form before.

Audience: This book is intended for those interested in high-dimensional optimization. Background material on convexity and semidifferentiable functions is derived in a setting congenial to graduate students.

Contents: Chapter 1: Beginning Examples; Chapter 2: Convexity and Inequalities; Chapter 3: Nonsmooth Analysis; Chapter 4: Majorization and Minorization; Chapter 5: Proximal Algorithms; Chapter 6: Regression and Multivariate Analysis; Chapter 7: Convergence and Acceleration; Appendix A: Mathematical Background.

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Editorial Review

About the Author
Kenneth Lange is the Rosenfeld Professor of Computational Genetics at UCLA and a faculty member in the Departments of Biomathematics, Human Genetics, and Statistics. He has held appointments at the University of New Hampshire, MIT, Harvard, the University of Michigan, the University of Helsinki, and Stanford. He is a fellow of the American Statistical Association, the Institute of Mathematical Statistics, and the American Institute for Medical and Biomedical Engineering. He won the Snedecor Award from the Joint Statistical Societies in 1993 and gave a platform presentation at the 2015 International Congress of Mathematicians. His research interests include human genetics, population modeling, biomedical imaging, computational statistics, optimization theory, and applied stochastic processes. He has published four previous books, *Mathematical and Statistical Methods for Genetic Analysis*, *Numerical Analysis for Statisticians*, *Applied Probability*, and *Optimization*, all with Springer and all in second editions.

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