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Nota di contenuto	1 Introduction.-2 Fundamental definitions and basic existence results -- 3 Optimality conditions for unconstrained problems in Rn -- 4 Optimality conditions for problems with convex feasible set -- 5 Optimality conditions for Nonlinear Programming -- 6 Duality theory -- 7 Optimality conditions based on theorems of the alternative -- 8 Basic concepts on optimization algorithms -- 9 Unconstrained optimization algorithms -- 10 Line search methods -- 11 Gradient method -- 12 Conjugate direction methods -- 13 Newton’s method -- 14 Trust region methods -- 15 Quasi-Newton Methods -- 16 Methods for nonlinear equations -- 17 Methods for least squares problems -- 18 Methods for large-scale optimization -- 19 Derivative-free methods for unconstrained optimization -- 20 Methods for problems with convex feasible set -- 21 Penalty and augmented Lagrangian methods

-- 22 SQP methods -- 23 Introduction to interior point methods -- 24 Nonmonotone methods -- 25 Spectral gradient methods -- 26 Decomposition methods -- Appendix A: basic concepts of linear algebra and analysis -- Appendix B: Differentiation in Rn -- Appendix C: Introduction to convex analysis.

Sommario/riassunto

This book has two main objectives: • to provide a concise introduction to nonlinear optimization methods, which can be used as a textbook at a graduate or upper undergraduate level; • to collect and organize selected important topics on optimization algorithms, not easily found in textbooks, which can provide material for advanced courses or can serve as a reference text for self-study and research. The basic material on unconstrained and constrained optimization is organized into two blocks of chapters: • basic theory and optimality conditions • unconstrained and constrained algorithms. These topics are treated in short chapters that contain the most important results in theory and algorithms, in a way that, in the authors' experience, is suitable for introductory courses. A third block of chapters addresses methods that are of increasing interest for solving difficult optimization problems. Difficulty can be typically due to the high nonlinearity of the objective function, ill-conditioning of the Hessian matrix, lack of information on first-order derivatives, the need to solve large-scale problems. In the book various key subjects are addressed, including: exact penalty functions and exact augmented Lagrangian functions, non monotone methods, decomposition algorithms, derivative free methods for nonlinear equations and optimization problems. The appendices at the end of the book offer a review of the essential mathematical background, including an introduction to convex analysis that can make part of an introductory course.