The book is an excellent introduction to the world of continuous optimization. The authors are successful in balancing the theoretical background and the usable algorithms and optimization methods. In contrast to similarly oriented books the authors equipped the chapters with a concise historical overview of mathematical developments, what makes the book less stringent and more readable. The authors deserve an appreciation of the connection between theory and usage of mathematical tools as `Matlab` and `Maple`. Most of the treated topics are accompanied by numerous solved examples, which demonstrate the particular procedures.

The book starts with motivating introduction and key properties of constrained problems and necessary and sufficient optimality conditions. This theoretical introduction issues in the Karush-Kuhn-Tucker conditions. Then they study methods for unconstrained optimization problems as a basis of solution techniques for more complicated problems solved under various types of constraints. First, linearly constrained optimization problems are treated together with two basic methods, which are the revised simplex algorithm and the active set method. The linear problems are then generalized by considering quadratic objective functions, and the pool of solving techniques is enlarged by gradient-based methods. After linearly constrained problems, the nonlinearly constrained ones are dealt with. In connection with the treatment of these more complex optimization problems, interior and exterior penalty functions are introduced and sequential quadratic programming methods are presented. The sixth chapter can be proclaimed the climax of the book. It is devoted to the interior point method, which has concluded the solving technique development for linear optimization problems. Various applications of this method are still topics of current research. The next chapter comprehends an extension of this originally linear programming method to a solving technique for semi-definite optimization problems. The last chapter deals with global optimization and gives a useful introduction to this field trying to connect some specific characteristics of the global optimization with the local optimization discussed before. Generally, it can be stated that this book constitutes a valuable guide for researchers and advanced students to the field of optimization.

Jaroslav Janáček (Žilina)
Keywords: unconstrained and constrained optimization; optimality conditions; interior point method; semi-definite optimization
Classification:
∗90-01 Textbooks (optimization)
90C05 Linear programming

90C20 Quadratic programming
90C30 Nonlinear programming
49M15 Methods of Newton-Raphson, Galerkin and Ritz types
90C46 Optimality conditions, duality
90C55 Methods of successive quadratic programming type
90C51 Interior-point methods
90C22 Semidefinite programming
90C26 Nonconvex programming

CHOICE REVIEWS ONLINE

Few mathematics books manage to serve simultaneously the needs of many different types of readers, but this book by FORST (Ulm Univ., Germany) and HOFFMANN (Univ. of Konstanz, Germany) offers satisfaction to everyone interested in optimization, regardless of whether that interest involves theory, rigor, visual intuition, illuminating examples, counterexamples, meaty problems, working computer code, classical methods, recent directions, overall framework, and/or historical development. Multilayered texts need strategic design, and the truly exemplary layout — spacing, typefaces, copious two-colored diagrams, intelligent internal conventions — should aid all who navigate this dense wealth of material, whether for study or reference. ⋯

SPRINGER also deserves commendation, in this era of sloppy desktop production, for investing in the requisite copyediting and professional translation.

Summing Up: Highly recommended. All levels/libraries.

D. V. FELDMAN, University of New Hampshire, Choice, Vol. 48 (9), May, 2011

MR2675748 (2011d:90001) 90-01 (90Cxx)

Forst, Wilhelm (D-ULMM); **Hoffmann, Dieter** (D-KNST-MS)

★**Optimization—theory and practice.**

Springer Undergraduate Texts in Mathematics and Technology.

Springer, New York, 2010. *xviii*+402 *pp*. $74.95. *ISBN* 978-0-387-78976-7

Publisher's description: "Optimization is an important field in its own right but also plays a central role in numerous applied sciences, including operations research, management science, economics, finance, and engineering.

"*Optimization—theory and practice* offers a modern and well-balanced presentation of various optimization techniques and their applications. The book's clear structure, sound theoretical basics complemented by insightful illustrations and instructive examples, makes it an ideal introductory textbook and provides the reader with a comprehensive foundation in one of the most fascinating and useful branches of mathematics.

"Notable features include:

- Detailed explanations of theoretic results accompanied by supporting algorithms and exercises, often supplemented by helpful hints or MATLAB®/MAPLE® code fragments;
- an overview of the MATLAB® Optimization Toolbox and demonstrations of its uses with selected examples;
- accessibility to readers with a knowledge of multi-dimensional calculus, linear algebra, and basic numerical methods.

"Written at an introductory level, this book is intended for advanced undergraduates and graduate students, but may also be used as a reference by academics and professionals in mathematics and the applied sciences."

Review by Brian Borchers, on 10/09/2010;

The Mathematical Association of America©

... The Karush-Kuhn-Tucker optimality conditions for nonlinear optimization are one of the high points of this book. The authors provide careful statements of the optimality conditions together with complete proofs. The discussion of constraint qualifications is unusually thorough. The authors state and prove the connections between the Guignard, Abadie, Mangasarian-Fromovitz, and Slater constraint qualifications.

Another strong aspect of this book is the discussion of interior point methods for linear and semidefinite programming. Interior point methods are often not included in introductory optimization courses, and when they are included the discussion is typically limited to linear programming. Here, the authors have included an extended discussion of primal-dual interior point methods for linear programming, complete with analysis of both short-step and long-step path following methods. The authors then introduce semidefinite programming (SDP), develop duality theory for SDP, and discuss interior point methods for SDP.

...

The book contains many illustrations, some of which are particularly helpful in visualizing the mathematical theory. An appendix discusses optimization software including the MATLAB Optimization Toolbox, SeDuMi, and Maple. All of this software would be very appropriate for use in a course based on this textbook. There are many exercises, ranging from theoretical problems to computational exercises that require programming.

The required level of mathematical maturity makes the book suitable for a first graduate course in optimization.