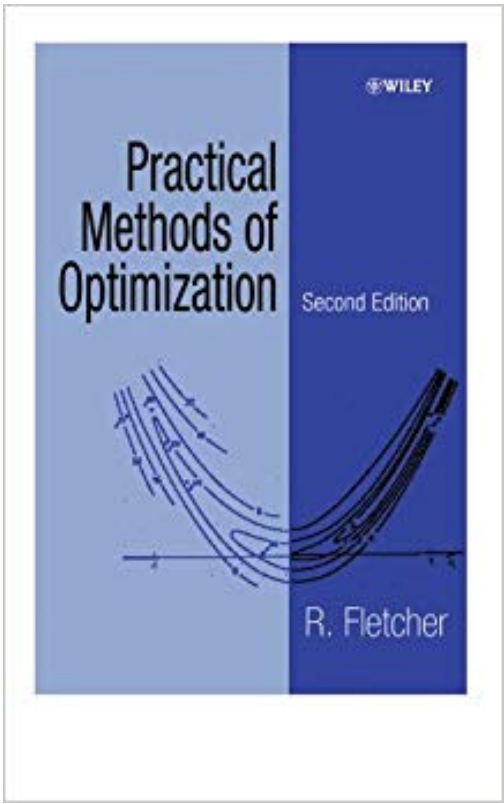
Practical Methods of Optimization *by* R. Fletcher



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Fully describes optimization methods that are currently most valuable in solving real-life problems. Since optimization has applications in almost every branch of science and technology, the text emphasizes their practical aspects in conjunction with the heuristics useful in making them perform more reliably and efficiently. To this end, it presents comparative numerical studies to give readers a feel for possibile applications and to illustrate the problems in assessing evidence. Also provides theoretical background which provides insights into how methods are derived. This edition offers revised coverage of basic theory and standard techniques, with updated discussions of line search methods, Newton and quasi-Newton methods, and conjugate direction methods, as well as a comprehensive treatment of restricted step or trust region methods not commonly found in the literature. Also includes recent developments in hybrid methods for nonlinear least squares; an extended discussion of linear programming, with new methods for stable updating of LU factors; and a completely new section on network programming. Chapters include computer subroutines, worked examples, and study questions.

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Reviews of the Practical Methods of Optimization *by* R. Fletcher

Mogelv
I'm a software engineer with only a BS in computer science who worked in a team translating a Matlab prototype of in-house non-linear multilevel optimizer to C++. I had no theoretical background in optimization and, during the time I was working on the project, I did not have (or bother) a chance to sit and study the subject. When I finally did and found this book, all the thick and widespread clouds over my head that persisted for years started clearing up immediately. This book may not cover the state of the art algorithms or theory but is a great place to start. It gives us a solid foundation before moving on to more specialized or theoretical topics on our own (or motivate us enough to go back to school!).
Walan
This book is a great mix of insight and rigor. The text is mixed with mathematical propositions/proofs and a lively writing style. The proofs aren't gratuitous, as opposed to most texts, but meant to build insight and demonstrate properties of algorithms. After each proof Fletcher doesn't meander in the weeds of the math, but he takes a step back and provides insight about WHAT this means for a particular algorithm.

Fletcher then highlights the algorithms by bringing in his own experience and provides insight on how the algorithms work on real problems, not just what the theory says. He writes that many algorithms, including several developed by him, are inferior to other variants on real-world problems. (Fletcher is the "F" in BFGS, DFP, and Fletcher-Reeves conjugate gradient.)

This coupling of mathematical rigor with candid insight makes this book invaluable.

On the negative side, I have found (as others have noted) a few typos, including a couple obvious ones in the pseudocode. This book is meant "to teach a man to fish," not "give a man a fish." So, if you're looking for something like Numerical Recipes that gives you verbatim software to type into your computer, then Fletcher's book isn't for you. However, after digesting Fletcher's math and insight, I have been able to reduce the computation of my (formerly NR-based) codes by an order of magnitude on some standard-battery optimizations.
monotronik
This book is very thorough in its treatment of select nonlinear programming techniques for both unconstrained and constrained problems. The author provides an in-depth coverage of several useful methods, including newton, quasi-newton, least-squares, penalty, augmented lagrangian, quadratic, SQP, and even discontinuous nonlinear programming. Much emphasis is placed upon various quadratic approximation methods. It should be noted that several other well-known methods are not treated in any significant detail. The author seems to have made a conscious choice to concentrate on a set of core techniques at the expense of some others. In my view, this decision makes this book an excellent reference for those wishing to better understand the nuances and implementation details for the chosen methods. For the same reason, this book is probably not as well-suited as an introduction to the broader range of optimization methods. Since there are plenty of other books to choose from for this purpose, the author's choice to focus on some core methods enables his book to stand apart quite uniquely.

While the book's content is excellent, the presentation could be improved somewhat. More examples and illustrations would help on this count, as would a better arrangement of headings and sub-headings. Since it appears that the author's intended audience are those who already have some primary knowledge of the field, this shortcoming is not significant. This is a book designed to take

such readers to the next level, which it does quite well.
Shistus
This is a very well-written book. It achieved both mathematical clearness and simplicity. I especially like the first part, unconstrained optimization. On the one hand, unconstrained optimization is very widely used. On the other hand, there isn't much content in it. Yet, there aren't many books explaining this small area clearly. This book starts with describing the structures of all methods, which gives you a sort of bird's eye view. It then devotes one chapter to each of the 3 major families of optimization methods. Comparing with another popular book, Numerical Recipes, which is orgnized by individual algorithms, this book will cerntainly gives the reader better understanding of the essence of all the algorithms. And as the name says, it's about 'practial' methods. You'll have no problem to implement the algorithms in the book and there are also many working examples to help you see how an algorithm works and help verify the implementation.
Hulore
I recommend this book for anybody needing to learn the basics of optimization as well as a reference for people already in the field. Dr. Fletcher covers the basics, advantages, and disadvantages of optimization methods capitalizing on his long experience on the field. I find the book to be clearly written and easy to follow. Although notation is clearly explained when introduced, the author gives a notation summary at the begining of the book. This makes the book usefull as a learning as well as a reference. Although the book has not changed since the second edition, the optimization methods it describes are still the most-widely-applicable ones.
Usic
This is a good book from an award winning author and researcher in this subject. However, the 2000 publication date shown refers to the release of the paperback version. There is no new content since 1987 when the 2nd ed. was originally published in hardcover.
I prefer Dennis and Schnabel's _Numerical Methods for Unconstrained Optimization and Nonlinear Equations_ for Newton-derived methods in unconstrained optimization, but Fletcher's book has the added material on constrained optimization (Part 2) that makes it more complete if one wants a single reference that covers the gamut of optimization.
Oghmaghma
Still the best book on numerical optimization 30 years after it was written.

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