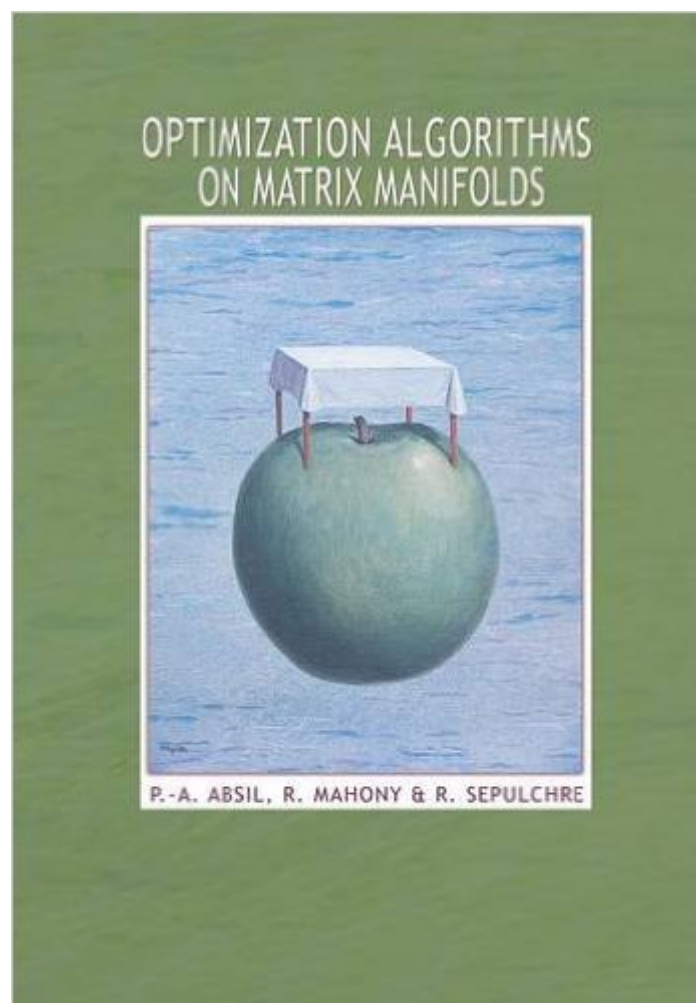


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# Optimization Algorithms On Matrix Manifolds



## Synopsis

Many problems in the sciences and engineering can be rephrased as optimization problems on matrix search spaces endowed with a so-called manifold structure. This book shows how to exploit the special structure of such problems to develop efficient numerical algorithms. It places careful emphasis on both the numerical formulation of the algorithm and its differential geometric abstraction--illustrating how good algorithms draw equally from the insights of differential geometry, optimization, and numerical analysis. Two more theoretical chapters provide readers with the background in differential geometry necessary to algorithmic development. In the other chapters, several well-known optimization methods such as steepest descent and conjugate gradients are generalized to abstract manifolds. The book provides a generic development of each of these methods, building upon the material of the geometric chapters. It then guides readers through the calculations that turn these geometrically formulated methods into concrete numerical algorithms. The state-of-the-art algorithms given as examples are competitive with the best existing algorithms for a selection of eigenspace problems in numerical linear algebra. Optimization Algorithms on Matrix Manifolds offers techniques with broad applications in linear algebra, signal processing, data mining, computer vision, and statistical analysis. It can serve as a graduate-level textbook and will be of interest to applied mathematicians, engineers, and computer scientists.

## Book Information

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## Customer Reviews

Very well written book and accessible to people who don't know classical differential geometry and manifolds. The author is a central figure in the Riemannian manifold approaches and is natural to

make that the focus of the book. I do wish the alternatives are mentioned - e.g. directly working with Grassmannian and Steifel manifolds. Which some argues might be more appropriate for some important class of problems - optimization under a unitary constraint. Still a book I will recommend.

This is a very useful book, especially for beginners in the subject. The essentials from differential geometry and topology are carefully collected and illustrated with the most popular matrix manifolds. The optimization algorithms are considered in great details usually omitted in the research papers. The list of references shows the great variety of areas where optimization on matrix manifolds would be appropriate.

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