

A mathematical view of interior-point methods in convex optimization

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Abstrak

This compact book, through the simplifying perspective it presents, will take a reader who knows little of interior-point methods to within sight of the research frontier, developing key ideas that were over a decade in the making by numerous interior-point method researchers. It aims at developing a thorough understanding of the most general theory for interior-point methods, a class of algorithms for convex optimization problems. The study of these algorithms has dominated the continuous optimization literature for nearly 15 years. In that time, the theory has matured tremendously, but much of the literature is difficult to understand, even for specialists. By focusing only on essential elements of the theory and emphasizing the underlying geometry, *A Mathematical View of Interior-Point Methods in Convex Optimization* makes the theory accessible to a wide audience, allowing them to quickly develop a fundamental understanding of the material.

The author begins with a general presentation of material pertinent to continuous optimization theory, phrased so as to be readily applicable in developing interior-point method theory. This presentation is written in such a way that even motivated Ph.D. students who have never had a course on continuous optimization can gain sufficient intuition to fully understand the deeper theory that follows. Renegar continues by developing the basic interior-point method theory, with emphasis on motivation and intuition. In the final chapter, he focuses on the relations between interior-point methods and duality theory, including a self-contained introduction to classical duality theory for conic programming; an exploration of symmetric cones; and the development of the general theory of primal-dual algorithms for solving conic programming optimization problems.

Rather than attempting to be encyclopedic, *A Mathematical View of Interior-Point Methods in Convex Optimization* gives the reader a solid understanding of the core concepts and relations, the kind of understanding that stays with a reader long after the book is finished.