An Easy Path to Convex Analysis and Applications (Synthesis Lectures on Mathematics and Statistics)

By Boris S. Mordukhovich, Nguyen Mau Nam

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Convex optimization has an increasing impact on many areas of mathematics, applied sciences, and practical applications. It is now being taught at many universities and being used by researchers of different fields. As convex analysis is the mathematical foundation for convex optimization, having deep knowledge of convex analysis helps students and researchers apply its tools more effectively. The main goal of this book is to provide an easy access to the most fundamental parts of convex analysis and its applications to optimization. Modern techniques of variational analysis are employed to clarify and simplify some basic proofs in convex analysis and build the theory of generalized differentiation for convex functions and sets in finite dimensions. We also present new applications of convex analysis to location problems in connection with many interesting geometric problems such as the Fermat-Torricelli problem, the Heron problem, the Sylvester problem, and their generalizations. Of course, we do not expect to touch every aspect of convex analysis, but the book consists of sufficient material for a first course on this subject. It can also serve as supplemental reading material for a course on convex optimization and applications.

Table of Contents: Preface / Acknowledgments / List of Symbols / Convex Sets and Functions / Subdifferential Calculus / Remarkable Consequences of Convexity / Applications to Optimization and Location Problems / Solutions and Hints for Exercises / Bibliography / Authors' Biographies / Index

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