

Boris S. Mordukhovich, Variational Analysis and Generalized Differentiation I: Basic Theory

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and

Boris S. Mordukhovich, Variational Analysis and Generalized Differentiation II: Applications

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Optimization theory is perhaps as old as our civilization. In addition, the area of optimization has become more interdisciplinary with a diverse spectrum of problems needed to be analyzed and solved. New theories, mathematical and algorithmic tools have been developed during the last decades.

Variational methods has been developed to study important classes of optimization and equilibrium problems. Progress in variational analysis has permitted us to handle problems whose equilibrium constraints are not obtained by the minimization of a functional.

This two volume comprehensive monograph reflects the abiding and enthusiastic interest of the author in variational analysis.

It covers the major theoretical issues of variational analysis and generalized differentiation in both finite-dimensional and infinite-dimensional spaces with a full calculus of all the constructions and properties involved.

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The main approach is geometric based on the so-called extremal principle (a variational counterpart of separation in nonconvex setting). Numerous applications are discussed including constrained and multiobjective/vector optimization, equilibria, variational inequalities and complementarity, optimal control of differential and evolution inclusions, ODEs, PDEs, functional-differential and differential-algebraic systems, mechanics, and economics. There are also numerical issues, e.g., involving discrete (finite-dimensional) approximations of continuous-time control systems.

Besides mathematics, there are extensive commentaries on the history and genesis of major topics under consideration (starting with the beginning of the calculus of variations and differential calculus), open problems, and an extensive bibliography (1379 references). These features make the book appreciated by students and experts in the field.

The book will definitely serve as a fundamental read and also a useful reference. It is highly recommended to all libraries and researchers in the area of variational analysis and optimization.