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**Sinopsis**

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?This book is a solid treatise on the (contemporary) calculus of variations. The material presented is quite extensive and slightly nontraditional. For example, the authors include a chapter on convex duality and subdifferential calculus. Often, books on the modern calculus of variations and books devoted to convex optimization have little if any overlap. I believe readers will appreciate the nontrivial overlap in the present text.?
? Rustum Choksi, Associate Professor of Applied and Computational Mathematics, Simon Fraser University.

"The second part has some discussion of more advanced background material (such as BV and SBV functions) needed for work on many modern variational problems, as well as discussions of recent results on a variety of problems, including variational approaches to image segmentation, fracture mechanics, and shape optimization."
? Robert Jerrard, Professor of Mathematics, University of Toronto.

This self-contained book is excellent for graduate-level courses devoted to variational analysis, optimization, and partial differential equations (PDEs). It provides readers with a complete guide to problems in these fields as well as a detailed presentation of the most important tools and methods of variational analysis. New trends in variational analysis are also presented, along with recent developments and applications in this area. Variational Analysis in Sobolev and BV Spaces: Applications to PDEs and Optimization is not just for students, however; it is a comprehensive guide for anyone who wants to approach the field of variational analysis in a systematic way, starting from the most classical examples and working up to a research level. This book also contains several applications to problems in geometry, mechanics, elasticity, and computer vision, along with a complete list of references.

Organized in a way that makes it accessible to a large audience, the book is divided into two parts. In Part I, classical Sobolev spaces are introduced and the reader is provided with the basic tools and methods of variational analysis and optimization in infinite dimensional spaces, with

applications to classical PDE problems. The last chapters in Part I introduce finite element methods and spectral analysis methods, the two most powerful tools that allow the computation of approximate solutions of variational problems. In Part II, BV( ) spaces are introduced and new trends in variational analysis are presented. In this part the reader is introduced to the flexibility of variational methods.

Audience

This book is primarily for graduate students and researchers who want to approach the field of variational analysis in a systematic way. It also can be used as supplementary reading for engineers and researchers in phase transitions, computer vision, and applied optimization who have a solid background in mathematics.