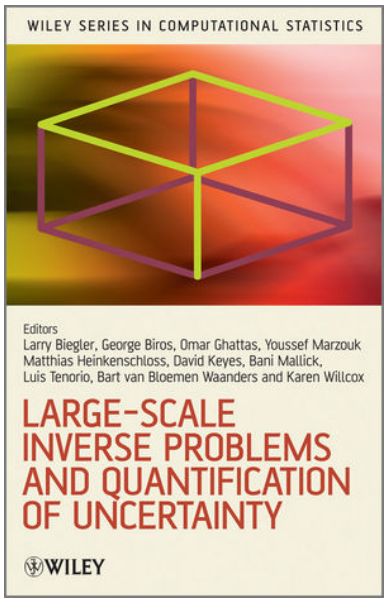

Large-Scale Inverse Problems and Quantification of Uncertainty

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DESCRIPTION

This book focuses on computational methods for large-scale statistical inverse problems and provides an introduction to statistical Bayesian and frequentist methodologies. Recent research advances for approximation methods are discussed, along with Kalman filtering methods and optimization-based approaches to solving inverse problems. The aim is to cross-fertilize the perspectives of researchers in the areas of data assimilation, statistics, large-scale optimization, applied and computational mathematics, high performance computing, and cutting-edge applications.

The solution to large-scale inverse problems critically depends on methods to reduce computational cost. Recent research approaches tackle this challenge in a variety of different ways. Many of the computational frameworks highlighted in this book build upon state-of-the-art methods for simulation of the forward problem, such as, fast Partial Differential Equation (PDE) solvers, reduced-order models and emulators of the forward problem, stochastic spectral approximations, and ensemble-based approximations, as well as exploiting the machinery for large-scale deterministic optimization through adjoint and other sensitivity analysis methods.

Key Features:

• Brings together the perspectives of researchers in areas of inverse problems and data assimilation.

• Assesses the current state-of-the-art and identify needs and opportunities for future research.

• Focuses on the computational methods used to analyze and simulate inverse problems.

• Written by leading experts of inverse problems and uncertainty quantification.

Graduate students and researchers working in statistics, mathematics and engineering will benefit from this book.

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