

Fundamentals of Algorithms

Data assimilation is an approach that combines observations and model output, with the objective of improving the latter. This book places data assimilation into the broader context of inverse problems and the theory, methods, and algorithms that are used for their solution. It provides a framework for, and insight into, the inverse problem nature of data assimilation, emphasizing “why” and not just “how.” Methods and diagnostics are emphasized, enabling readers to readily apply them to their own field of study.

Readers will find:

- a comprehensive guide that is accessible to nonexperts;
- numerous examples and diverse applications from a broad range of domains, including geophysics and geophysical flows, environmental acoustics, medical imaging, mechanical and biomedical engineering, economics and finance, and traffic control and urban planning;
- the latest methods for advanced data assimilation, combining variational and statistical approaches.

The core audience is advanced undergraduate and early graduate students in applied mathematics, environmental sciences, and any domain (engineering, social science, biology, etc.) that deals with inverse problems related to physical measurements. A strong potential audience is practicing researchers and engineers engaged in (partial) differential equation-based data assimilation, inverse problems, optimization, and optimal control.



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Mark Asch currently leads an action theme in the Belmont Forum Data Management and e-Infrastructure initiative, is a co-organizer of the BDEC (Big Data and Extreme-Scale Computing) forum, and is a full professor of mathematics at Université de Picardie Jules Verne. He was program manager for Mathematics, Computer Science, HPC, and Big Data at the French National Research Agency (ANR). From 2012 to 2015, he was scientific officer for mathematics and e-infrastructures at the French ministry of research.



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Data Assimilation
Methods, Algorithms, and Applications

Mark Asch · Marc Bocquet · Maëlle Nodet

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