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Statistics for spatio-temporal data. (English) Zbl 1273.62017

Wiley Series in Probability and Statistics. Hoboken, NJ: John Wiley & Sons (ISBN 978-0-471-69274-4/hbk). xxii, 588 p. (2011).

Publisher's description: A state-of-the-art presentation of spatio-temporal processes, bridging classic ideas with modern hierarchical statistical modeling concepts and the latest computational methods.

From understanding environmental processes and climate trends to developing new technologies for mapping and public-health data and the spread of invasive-species, there is a high demand for statistical analyses of data that take spatial, temporal, and spatio-temporal information into account. The book presents a systematic approach to key quantitative techniques that incorporate the latest advances in statistical computing as well as hierarchical, particularly Bayesian, statistical modeling, with an emphasis on dynamical spatio-temporal models.

The authors supply a unique presentation that incorporates ideas from the areas of time series and spatial statistics as well as stochastic processes. Beginning with separate treatments of temporal data and spatial data, the book combines these concepts to discuss spatio-temporal statistical methods for understanding complex processes.

Topics of coverage include:

- Exploratory methods for spatio-temporal data, including visualization, spectral analysis, empirical orthogonal function analysis, and LISAs;
- Spatio-temporal covariance functions, spatio-temporal kriging, and time series of spatial processes;
- Development of hierarchical dynamical spatio-temporal models (DSTMs), with discussion of linear and nonlinear DSTMs and computational algorithms for their implementation;
- Quantifying and exploring spatio-temporal variability in scientific applications, including case studies based on real-world environmental data.

Throughout the book, interesting applications demonstrate the relevance of the presented concepts. Vivid, fullcolor graphics emphasize the visual nature of the topic, and a related FTP site contains supplementary material. This is an excellent book for a graduate level course on spatio-temporal statistics. It is also a valuable reference for researchers and practitioners in the fields of applied mathematics, engineering, and the environmental and health sciences.

MSC:

- 62-02** Research exposition (monographs, survey articles) pertaining to statistics
- 62-04** Software, source code, etc. for problems pertaining to statistics
- 62M30** Inference from spatial processes
- 62M10** Time series, auto-correlation, regression, etc. in statistics (GARCH)
- 62M15** Inference from stochastic processes and spectral analysis

Cited in **1** Review
Cited in **162** Documents

Software:

[R](#); [R-INLA](#); [SGeMS](#)