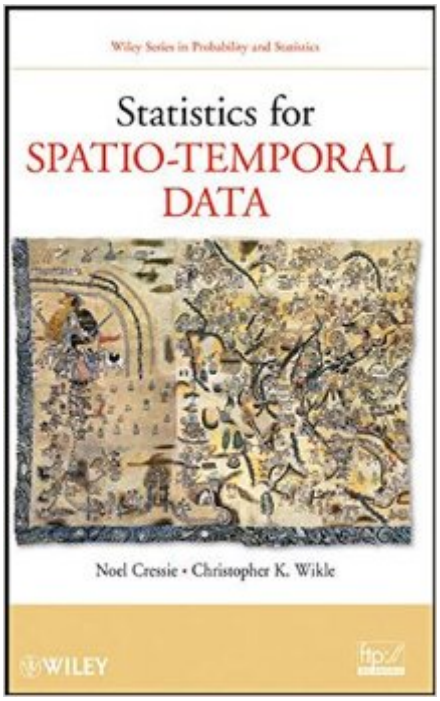
Statistics For Spatio-Temporal Data



Synopsis

Winner of the 2013 DeGroot Prize. A state-of-the-art presentation of spatio-temporal processes, bridging classic ideas with modern hierarchical statistical modeling concepts and the latest computational methods Noel Cressie and Christopher K. Wikle, are alsoÂ winners of the 2011 PROSE Award in the Mathematics category, for the book â œStatistics for Spatio-Temporal Dataâ • (2011), published by John Wiley and Sons. (The PROSE awards, for Professional and Scholarly Excellence, are given by the Association of American Publishers, the national trade association of the US book publishing industry.) Statistics for Spatio-Temporal Data has now been reprinted with small correctionsÂ to the text and theÂ bibliography. The overall content and pagination of the new printing remains the same; the differenceÂ comesÂ in the form of corrections to typographical errors, editing of incomplete and missing references, and some updated spatio-temporal interpretations. From understanding environmental processes and climate trends to developing new technologies for mapping 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. Statistics for Spatio-Temporal Data 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. Cressie and WikleÂ 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, full-color graphics emphasize the visual nature of the topic, and a related FTP site contains supplementary material. Statistics for Spatio-Temporal Data 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.

Book Information

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Customer Reviews

Cressie and Wikle's book is one of the first to address space time models from a statistical point a view and using many of the latest statistical models (the soon to be updated 2003 book Hierarchical Modeling and Analysis for Spatial Data also covered the topic). Hierarchical space time models, Dynamical linear models, incorporating scientific knowledge into your statistical model, and handling massive data by using Fixed Rank Kriging are some of the topics covered. However, there are many intricacies that need to be addressed when modelling spatial data or temporal data. So writing a book covering data using both indices is no easy task. The task to write a book on spatio-temporal models only becomes harder when the goal is to cover the topic from a Bayesian point of view (a field of analysis with its own intricacies that need to be addressed). I believe the authors did a good job in presenting some of the latest space-time models proposed in research. However, there are big issues that are not covered in the book.- The importance of convergence diagnostics for Bayesian models must be emphasized one way or another when discussing these types of methods. The book pretty much does not touch on convergence at all.- Research has shown that Matern covariance parameters such as the smoothing parameter and the range, cannot be consistently estimated. This may lead to convergence problems when using MCMC techniques to extract characteristics from the posteriors of these parameters of interest (I found out about this the hard way as a grad student). As a result, at best, only partially reliable inference from your Bayesian analysis may be obtained, a disappointing fact given how computationally intensive Bayesian methods are for space-time models.

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