Besag, Julian; **Kooperberg, Charles**

On conditional and intrinsic autoregressions. (English) Zbl 0899.62123

Biometrika 82, No. 4, 733-746 (1995).

Summary: Gaussian conditional autoregressions have been widely used in spatial statistics and Bayesian image analysis, where they are intended to describe interactions between random variables at fixed sites in Euclidean space. The main appeal of these distributions is in the Markovian interpretation of their full conditionals. Intrinsic autoregressions are limiting forms that retain the Markov property. Despite being improper, they can have advantages over the standard autoregressions, both conceptually and in practice. For example, they often avoid difficulties in parameter estimation, without apparent loss, or exhibit appealing invariances, as in texture analysis. However, on small arrays and in nonlattice applications, both forms of autoregression can lead to undesirable second-order characteristics, either in the variables themselves or in contrasts among them.

This paper discusses standard and intrinsic autoregressions and describes how the problems that arise can be alleviated using Dempster's algorithm [*A. P. Dempster*, Biometrics 28, 157-175 (1972)] or an appropriate modification. The approach represents a partial synthesis of standard geostatistical and Gaussian Markov random field formulations. Some nonspatial applications are also mentioned.

MSC:

62M30 Inference from spatial processes
62M05 Markov processes: estimation; hidden Markov models
62M40 Random fields; image analysis
86A32 Geostatistics

Cited in **103** Documents

Keywords:

agricultural experiments; conditional autoregression; geographical epidemiology; multi-way table; prior distribution; spatial statistics; surface reconstruction; texture analysis; Bayesian image analysis; intrinsic autoregressions; Dempster's algorithm

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