



The University of Chicago
Department of Statistics
Seminar Series

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Gaussian Random Fields and Spatial Statistics

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133 Eckhart Hall, 5734 S. University Avenue
Refreshments following the seminar in Eckhart 110.

ABSTRACT

In recent decades, there has been much progress and interest in spatial statistics, with applications in agriculture, epidemiology, geology and other areas of environmental science and in image analysis. Two contrasting approaches have emerged, one based on Markov random fields, the other on geostatistics. The development of Markov Chain Monte Carlo as a computational tool has been phenomenal and has made Bayesian inference for spatial models relatively easy to perform, whereas frequentist inference still presents difficult problems. In this talk, we explore both lattice-based Gaussian Markov random fields and the continuum models in geostatistics that are based on the logarithmic variogram (de Wijs process) and originate in mining applications. We investigate connections between the two approaches. Keeping practical applications in mind, we describe a general hierarchical set up for spatial models where we observe a dataset y that is a stochastically degraded version of an underlying spatial component x , often in the presence of covariate information. We analyze a crop experiment and demonstrate the unity between different formulations. We also discuss statistical inference for large data sets, using Markov random fields to approximate the de Wijs process, and give an example. Finally, we will discuss applications in geographical epidemiology.

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