Stat 547L- Topics in Statistics
Spatial Statistics
2017/2018, Term 1
Instructors: Peter Guttorp (University of Washington), Jim Zidek

Time and Place: T/TR, 2:30-4:00 pm, September 28- December 9, ESB 4192

Prerequisites: Regression and some understanding of likelihood. If in doubt, please contact instructor, or attend the first lecture

Tentative list of topics to be covered:

1. Kriging
   Spatial estimation at unobserved sites. Some history. The Gaussian regression theory. Simple and ordinary kriging. Standard errors. Universal kriging. Bayesian kriging.
2. Spatial covariance
   The key concept needed for spatial estimation. Classes of spatial covariance functions.
3. Nonstationary structures I: deformations
   Geometric anisotropy. Generalization to nonstationary models. Thin-plate splines. Principal warps.
4. Nonstationary structures II: linear combinations etc.
   Process convolution. Basis function approaches.
5. Space-time models
   Singular value decomposition. Space-time covariance. Dynamic linear models.
6. Markov random fields
   Sparse precision matrices. Gaussian MRF simulation and estimation. The stochastic PDE approach. Integrated nested Laplace approximations.
7. Misalignment and use of deterministic models
   Hierarchical models. Downscaling. Upscaling. Change of support.
8. Air quality standards
   (Re)design of monitoring networks. Interaction between geostatistical and health effects models.
9. Wavelet tools
   Continuous wavelets. Discrete time versions. Multiscale analysis. Long term memory processes. Wavelet analysis of trend
10. Statistical climatology
    Space-time trends in regional climate models: means and extremes.