

BIOST/STAT 578 A: Advanced Spatial Statistics for Public and Global Health

Quarter: Spring 2020

Time and Location: M W 2:30-3:50 p.m., Health Sciences Building E216

Grading: 3 credits, CR/NC. Assessment via a quarter long class project of student's choice.

Instructors: Jon Wakefield (jonno@uw.edu), Departments of Biostatistics and Statistics, Adjunct Appointment in Department of Health Metrics Sciences; and Bobby Reiner (bcreiner@uw.edu), Department of Health Metrics Sciences, Adjunct Appointment in Department of Biostatistics

Prerequisites: STAT 554 or BIOST 555, or permission of instructors (e.g., graduate students working on spatial modeling)

SLN: 11497 (BIOST) / 19770 (STAT)

- Overview of Gaussian process (GP) models and Model-Based Geostatistics (MBG): Fixed rank kriging; lattice kriging; stochastic partial differential equations (SPDE); predictive processes; interpretation of the nugget.
- SPDE in detail: theory; implementation in INLA; mesh formation; prior specification, including penalized complexity priors.
- Methods for point process data: K functions (and associated measures of clustering); likelihood methods for point process models.
- Advanced methods in small area estimation, including methods for prevalence mapping.
- Space-time-age models: identifiability and constraints.
- Ecological inference: ecological bias; confounding; measurement error; pure specification bias; combining individual and ecological data.
- Spatial methods for infectious disease data: space-time interactions models for count data.
- Visualization, including expressing uncertainty; ranking areas.
- Spatial survival methods.
- Assessing model adequacy.
- Methods for missing data.
- Model fitting in R-INLA and Template Model Builder (TMB).
- Spatial big data.