SPATIAL STATISTICAL DATA ANALYSIS FOR GIS USERS

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CHAPTER 5: METHODS FOR SENSITIVITY AND UNCERTAINTY ANALYSIS

Example of sensitivity analysis in GIS
Monte Carlo simulation
Bayesian belief network
Fuzzy set theory
Fuzzy logic
Raster maps comparison
Assignments:

- *1) Use the Bayesian belief network for relating the risk of asthma to environmental factor*
- *2) Classify environmental variables using fuzzy logic*
- *3) Using fuzzy inference, find areas that most likely contain large number of people with a high irradiation dose*

Further reading

CHAPTER 6: TYPES OF SPATIAL DATA, STATISTICAL MODELS, AND MODEL DIAGNOSTICS

Three types of spatial data
Goals of spatial data modeling
Goals of spatial data exploration
Examples of applications with input data of different types: radioecology, fishery, agriculture, wine grapes quality model, wine price formation, forestry, criminology
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Stationarity and isotropy
Model diagnostic
Methods for indicator (yes/no) prediction
Methods for continuous prediction: cross-validation and validation
Summary of spatial modeling
Assignments:

- *1) Choose the appropriate model for analyzing the quantity of good-sized shoots produced by the vine*
- *2) Investigate possible models for the variation of malaria prevalence*
- *3) Calculate and display indices for indicator prediction using ozone concentration measured in June 1999 in California*
- *4) Investigate the variability of yields of individual trees*

Further reading

CHAPTER 9: PRINCIPLES OF MODELING GEOSTATISTICAL DATA: KRIGING MODELS AND THEIR ASSUMPTIONS

CHAPTER 10: OPTIMAL NETWORK DESIGN AND PRINCIPLES OF GEOSTATISTICAL SIMULATION

Spatial sampling and optimal network design
Monitoring design in the precomputer and early computer era
Ideas on a network design formulated after 1963
Sequential versus simultaneous network design
Geostatistical simulation
Unconditional simulation and conditioning by kriging
Sequential Gaussian simulations
Simulating from kernel convolutions
Simulated annealing
Applications of unconditional simulations
Applications of conditional simulations
Assignments:

- *1) Find optimal places for the addition of new stations to monitor air quality in California*
- *2) Simulate a set of candidate sampling locations from inhomogeneous Poisson process*
- *3) Reduce the number of monitoring stations in the network using validation diagnostics*
- *4) Discuss two simulation algorithms proposed by GIS users that are based on estimated local mean and standard error*
- *5) Conditional simulation with Geostatistical Analyst 9.3*

Further reading

CHAPTER 11: PRINCIPLES OF MODELING REGIONAL DATA

Geostatistics and regional data analysis
The question of applying geostatistics to regional data
Binomial and Poisson kriging
Distance between polygonal features
Regional data modeling objectives
Spatial smoothing
Cluster detection methods
Spatial regression modeling
Simultaneous autoregressive model
Markov random field and conditional autoregressive model
Assignments:

- *1) Investigate the new proposal of mapping risk of disease*
- *2) Smooth the data for the tapeworm infection in red foxes*