Syllabus 2017 Human-Social Information Sciences

Spatial Information Analysis

Japanese

Basic information

held this year:	yes
instructor(s)	Ryo Inoue
room	
schedule	The latter period (Friday) 13:00-14:30
begins on:	10/06

Objectives and outline

This lecture covers the statistical analysis methods for spatial information. Spatial information is data that is related to spatial positions, and is useful information to understand the current status of cities and regions. The spatial information is divided into three types: spatial point pattern data such as locations of facilities, observation data at certain locations such as temperature data, and aggregated data by certain spatial boundaries such as population of municipalities. These data types require different methods to analyze.
The purpose of lecture is to study the statistical analysis methods of spatial data in a comprehensive manner, considering their similarities and differences.

Class plan

1. Introduction

[I. Analysis of spatial point pattern]
1-2. Tessellation [Voronoi diagram, Delaunay Triangulation]
3. Models of spatial point process [Binomial point process, Poisson point process]
4-5. Analysises of point pattern [Kernel density estimation, Nearest distance analysis, K function]
6. Spatial cluster detection [Multiple testing problem, spatial scan statistics, FDR-controlling method]
7. Analysis of a multivariate process, a process on network, and a spatio-temporal process

[II. Analysis of spatial attributes]
8. Statistic of spatial autocorrelation [Join count statistics, Moran's I, LISA]
9-10. Linear regression analysis [OLS, Maximum likelihood, Multicollinearity, Serial correlation]
11. Models of spatial autocorrelation (Spatial regression models) [SAR, SEM]
12. Models of spatial autocorrelation (Spatial process models) [intrinsic stationarity, second order stationarity, variogram, covariogram]
13. Spatial prediction (interpolation) [Best linear unbiased prediction, kriging, cokriging]
14. Analysis of spatial data without stationarity [GWR]

15. Summary of lecture and Exam

Evaluation

Students are evaluated on the midterm and final examinations.

Textbook(s)

Handouts are provided in the first lecture session.

Cressie, N. Statistics for Spatial Data, Wiley, 1993.
Fischer, M.F. and Getis, A. Eds. Handbook of Applied Spatial Analysis, Springer, 2010.
Okabe, A., Boots, B., and Sugihara, K. Spatial Tessellations, Wiley, 1992.
Wackernagel, H.: Multivariate Geostatistics, Springer, 1995.

Web site

Office hours

Friday morning

Other information

Students are required to have mastered the basics of probability theory and statistics.

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