GIST 4302/5302: Spatial Analysis and Modeling

Review

Guofeng Cao

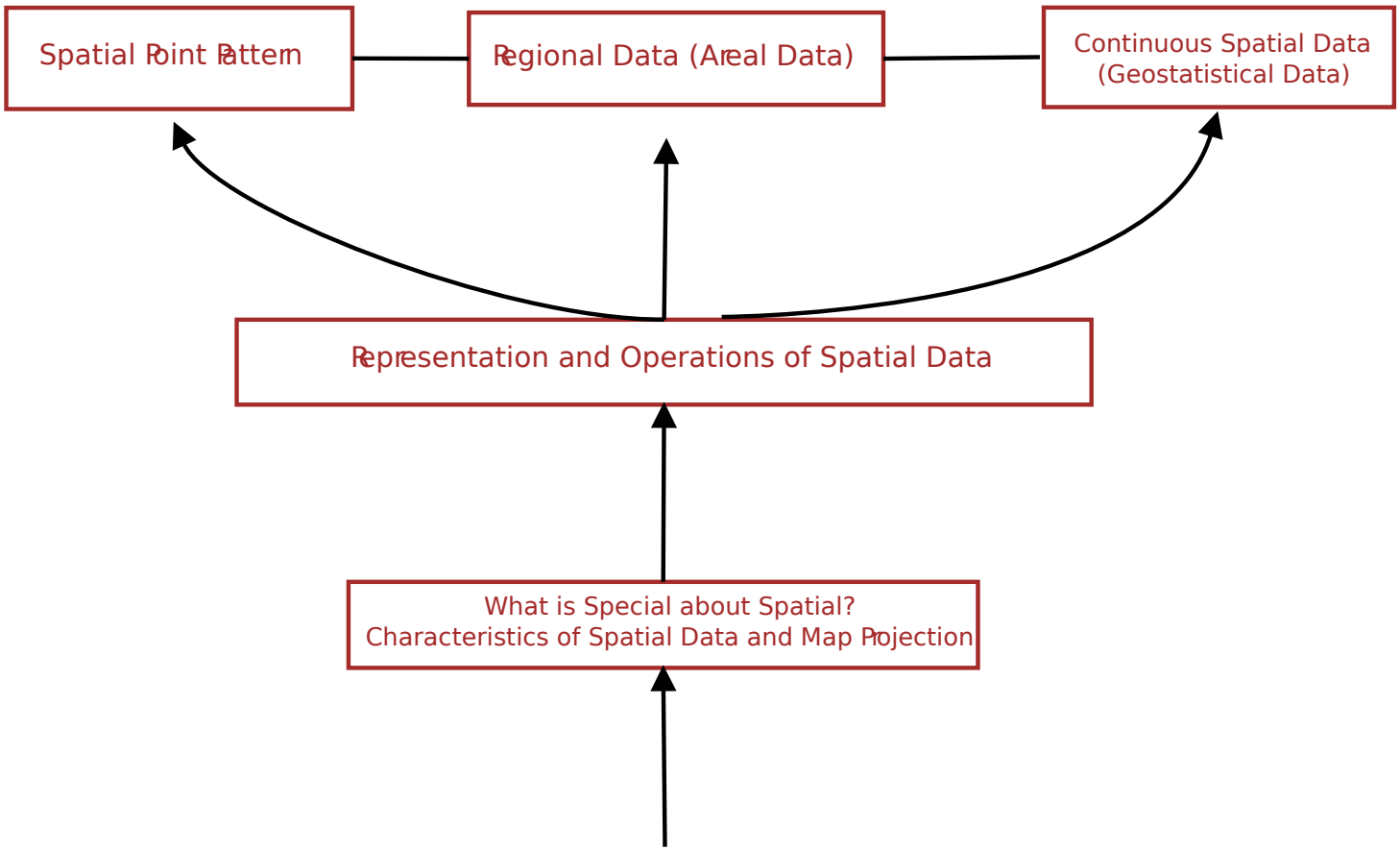
www.gis.ttu.edu/starlab

Department of Geosciences
Texas Tech University

guofeng.cao@ttu.edu

Spring 2018

Course Outlines



Basic Probability and Statistics

Statistical tools

- histogram
- mean, median, variance
- covariance, correlation coefficient
- p-value
- QQ-plot, box-plot

Pitfalls of spatial data

- MAUP
  - zone effect
  - scale effect
- Ecological fallacy

Spatial Point Pattern Analysis

Geographic distribution

- mean center, median center
- standard distance, standard ellipsoid distance

Point pattern analysis methods

- 1st order
  - Quadrat methods
  - Density estimation
- 2nd order
  - nearest neighbour distance
  - distance functions K,G,F

Hypothesis testing of CSR

- CSR: complete spatial randomness
- Hypothesis testing
  - Monte Carlo test

Lab

- Lab 7: Point Pattern Analysis
- Homework assignment

Areal data and spatial autocorrelation

Basics

- Spatial neighbourhood
- Spatial weight matrix

Measuring spatial autocorrelation

- Joint count
- Moran's I and Moran's I scatter plot
- Hypothesis testing
  - permutation test

Consequences of ignoring spatial autocorrelation

Lab

- Lab 8-a: Getting started with GeoDa
- Lab 8-b: Exploratory analysis using GeoDa

Spatial Fields

Representation of spatial fields

- Contours
- Lattice
- TIN

Derivatives of spatial fields

- Gradient
- Slope/Aspect

Spatial interpolation

- Deterministic interpolator
  - Nearest neighour
  - Natural neighours
  - Trend surface
  - Inverse distance weighting
  - Spatial splines
  - Triangulation
- Stochastic interpolator
  - Kriging family of methods

Advantage of Kriging methods over the deterministic methods

Kriging

- Semivariogram, covariogram
  - Range, nugget, sill
  - Empirical semivariogram and theoretical semivariogram models
- Kriging
- Advantages of Kriging over determistic methods, such as IDW

Lab

- Lab 9: Spatial interpolation and Kriging

Labs and software

Lab topics

- Map projection
- Find what's inside
- Find what's nearby
- Raster spatial analysis
- Model builder
- Geocoding
- Point pattern analysis
- Exploratory analysis (Moran's I)
- Spatial interpolation
- Kriging

Labs and software

Software

- ArcMap
  - Arctoolbox: 3D analytst, spatial analysis, spatial statistics, geostatistics
- GeoDa (open-source)
- OpenStreetMap (mapathon)

Evaluation

Project report due: COB Saturday, December 8

- put your report on your folder on Techshare
- upload your project materials, including presentation, datasets and results to your folder on Techshare

Exam format

- December 4th, 2:00-3:00pm, HH 121 (classroom)
- open books and open notes, but access to any digital devices (e.g, phones, tables, computers) are not allowed
- multiple choices plus writing questions

New class and links

New class available at Fall

- Geog 5330: Applied Spatial and Spatiotemporal Data Analysis
- Graduate level class

Map links

- @ttugis, @guofengcao

Course evaluation

- Online evaluation now, you should have received the link.

Thanks

Class evaluation

Thank you, any questions/comments