



## GEO-SCI591D Spatial Data Analysis

Department of Geosciences

University of Massachusetts - Amherst

3 cr, Spring 2012

### [Syllabus in Print version \(PDF\)](#)

**Course Location:** Morrill IV South 271  
**Lecture Time:** TuTh 2:30PM - 3:45PM  
**Instructor:** Dr. Qian Yu, Morrill IV South 267, qyu@geo.umass.edu  
**Office Hours:** TuTh 11:00-12:00pm or by appointment

**Purpose:** The course covers a broad range of spatial data analysis methods from basic statistics to advanced computational techniques. The topics include point pattern analysis, spatial prediction based on deterministic methods and Geostatistical theory, spatial autocorrelation and regression, and raster analysis. The labs are based on ArcGIS and statistical software.

The goal of this course is to introduce students various quantitative methods, particularly multivariate regression and spatial analysis, used in geographical data and applications; to teach students to understand these concepts and to be able to apply them in geographical problems.

### Teaching Format

60% lectures and class discussions, 40% class exercises including computer lab and project. Take home exercises and lab practice will be assigned to students to get familiar with the concepts discussed in class.

### Prerequisite

- Basic statistical knowledge
- Introductory level GIS and know how to use ArcGIS

### Textbook

David O'Sullivan, David J. Unwin, Geographic Information Analysis, Wiley, Inc, Hoboken, New Jersey, ISBN: 978-0-470-28857-3, Hardcover, 432 pages, March 2010

### References

- Bailey TC, Gatrell AC, Interactive spatial data analysis. Harlow, Essex, England: Longman, 1995.  
Isaaks EH, Srivastava RM, An Introduction to Applied Geostatistics, Oxford University Press, 1989.

**Lab software:** ArcGIS and R.

**Course Evaluation:** Assignment 40%, Class Participation 10%, Reading and discussion 10%, Project (including presentation and report) 40%

## Class schedule and reading

Available at <http://www.geo.umass.edu/courses/geo591d/>. It will be updated with classes progressing.

Notes, assignments, notices and announcement will be published on the Moodle.

### Class arrangement (Tentative)

| Week      | Class                | Arrangement       | Topic  | Reading            |
|-----------|----------------------|-------------------|--|--------------------|
| 1 Jan 23  | Tu                   | Lecture 1         | Concepts in spatial data and models  | O'Sullivan's ch1-2 |
|           | Th                   | Lecture 2.1       | Point Pattern Analysis: point pattern measure and test                                       | O'Sullivan's ch3-5 |
| 2 Jan 30  | Tu                   | Lecture 2.2       | Cont...  |                    |
|           | Th                   | Lecture 2.3       | Cont...  |                    |
| 3 Feb 6   | Tu                   | Lab 1             | Point Pattern Analysis   |                    |
|           | Th                   | Lecture 3         | Exploring spatial continuous data  | Bailey's p155-181  |
| 4 Feb 13  | Tu                   | Lecture 4.1       | Modeling spatial continuous data, variogram and simple kriging                               | Bailey's p181-201  |
|           | Th                   | Lecture 4.2       | Cont...  |                    |
| 5 Feb 20  | Tu                   | Lecture 5.1       | Modeling spatial continuous data, extensions of simple kriging, geospatial analyst in ArcGIS | Bailey's p181-201  |
|           | Th                   | Lecture 5.2       | Cont...  |                    |
| 6 Feb 27  | Tu                   |                   |  |                    |
|           | Th                   | Lab 2             | Variogram exploration and Kriging prediction   |                    |
| 7 Mar 5   | Tu                   | Lecture 6.1       | Area objects and spatial autocorrelation, Moran's I, Geary's C                               | Bailey's p261-291  |
|           | Th                   | Lecture 6.2       | Cont...  |                    |
| 8 Mar 12  | Tu                   | Lecture 6.3       | Cont...  |                    |
|           | Th                   | Lab 3             | Area data analysis (demo in class)   |                    |
| 9 Mar 19  | Spring recess        |                   |  |                    |
| 10 Mar 26 | Tu                   | Lecture 7         | Modelling area data<br>GLS and spatial autoregressive models                                 | Bailey's p261-291  |
|           | Th                   | Lab 4             | Spatial regression analysis  |                    |
|           | Final project starts |                   |  |                    |
| 11 Apr 2  | Tu                   |                   | Paper discussion   |                    |
|           | Th                   | Tutorial and demo | Paper discussion   |                    |
| 12 Apr 9  | Tu                   |                   | Project proposal due   |                    |
|           | Th                   |                   | Hydrology modeling and model builder   |                    |
| 13 Apr 16 | Tu                   |                   | Monday schedule, no class  |                    |
|           | Th                   |                   |  |                    |
| 14 Apr 23 | Tu                   |                   |  |                    |
|           | Th                   |                   |  |                    |
| 15 Apr 30 | Tu                   |                   | Final project presentation   |                    |
|           |                      |                   |  |                    |
| May 10    |                      |                   | Final project report due   |                    |