

Syllabus - GEOG 242Q: Geographic Data Analysis

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Catalog course description: An introduction to the use of quantitative methods in conducting research, with particular emphasis on the processing and analysis of geographic data.

Description of actual course: An introduction to the analysis of geographical and spatial data by statistical and linked visual means. The course covers a variety of descriptive and inferential statistics that are commonly used in analyzing data with locational reference. Emphasis is on analyses that use both numerical and visual information in the context of the emerging field of GIScience. Students are introduced to a variety of relevant software packages.

Background: At its basic level, geographic information science (GIScience) is the hybridization of cartographic and related forms of analysis developed in geography and spatial statistical analysis. It is a rapidly emerging field that focuses on spatial - geographical information analysis from both theoretical and applied perspectives. The increase in interest in GIScience has developed along two fronts. One front is theoretical and is linked to the growing awareness that many interesting problems have spatial contexts; the locational characteristics of phenomena yield important insights. The other front is technical and is linked to the development of extraordinarily high speed data processing using small-scale computer platforms (from work station down to notebooks) and the development and distribution of software specifically designed for spatial data analysis. Both theoretical and applied GIScience are fundamentally methodological. That methodological nature gives GIScience a strong interdisciplinary appeal, and it is useful in research across a large number of physical and social sciences.

The breadth of that appeal is illustrated across departments at UConn. GIScience is well represented across the schools and colleges. For example, it is used in research and course work in Ecology and Evolutionary Biology in the College of Liberal Arts & Sciences, in Real Estate in the School of Business, and especially in Natural Resource Management and Engineering in the College of Agriculture and Natural Resources.

Reading: There is no conventional text for the course. Two software applications manuals: Luc Anselin's *Exploring Spatial Data with GeoDa™: A Workbook* (2005) and MathSoft's *S+ Spatial Stats Version 1.5 Supplement* (2000) are provided on the Vista site. Additional readings may be recommended (and posted on the Vista site) during the semester. Other useful material is found at various websites. A link to the Spatial Analysis Laboratory site, GeoDa™'s home, is provided on the Vista site, and additional links will be provided during the semester.

Grading: Course grades will be determined from the average score on a series of weekly quizzes (30%), the average score on a series of weekly exercises (50%), and the score on an individual course project (20%). There are 12 weekly quizzes scheduled (starting January 29); the lowest score will be dropped. Students may substitute their scores on an optional final exam on the course for their average quiz scores. There are 10 scored exercises (starting January 31). Each exercise is due (using the HuskyCT assignment tool) one week after it is assigned. Late exercises will have their scores reduced 10 percentage points per day. No exercise will be accepted more than one week past its due date. An initial, non-scored, exercise will be assigned on January 24; other exercises will not be accepted until the preliminary exercise is completed. Individual course projects will be discussed later in the course. They must be developed in consultation with Professor Hanink.

Course Outline:

1. Introduction
 - A. Geographical data, spatial data, and related issues
 - B. Introduction to statistical and graphics software
2. Descriptive Statistics for Geographical and Spatial Data
 - A. Standard and resistant measures for aspatial data
 - B. Measures of location
 - C. Measures of shape
 - D. Measures of geographical concentration (concentration at places)
 - E. Measures of spatial concentration (concentration across places)
 - F. Exploratory spatial data analysis as a research tool
3. Review of Sampling Distributions and Basic Inferential Statistics
 - A. Basic rules of probability
 - B. Sampling distributions
 - C. Inference and hypothesis testing
4. Point Pattern Analysis
 - A. Quadrat analysis
 - B. Nearest neighbor analysis
 - C. First and second order properties
5. Geostatistical Data Analysis
 - A. Variograms and semi-variograms
 - B. Ordinary kriging
 - C. Universal kriging
6. Lattice Data Analysis
 - A. Map correlations
 - B. Global spatial autocorrelation
 - C. Local spatial autocorrelation and spatial concentration revisited
 - D. Spatial regression