

20008 - CE 597, Fall 2019, 3 credits

Geospatial Data Analytics

WNG 2555; 10:30-11:20am, MWF

Instructor: Professor Jie Shan

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Note: the course will also be offered in distance learning mode (20009 - CE 59700 – EPE)

A. Scope and objectives

The course will introduce fundamental theories, analytical methods and programming skills, all of which are needed to work with geospatial data. Students will learn the techniques to access, visualize, analyze and model various geospatial data through programming practice and/or using open source GIS software. Besides, the course will provide each student an opportunity to apply the course content to a topic area of their own interest. By successfully completing the course, students should be able to

- 1) Command the theories and methods
- 2) Implement and practice typical geospatial methods
- 3) analyze and visualize these implementations
- 4) be familiar with open source GIS tools and data

B. Prerequisites

- 1) Graduate students with an introductory GIS course, preferably at graduate level
- 2) having experience in computer programming
- 3) or under consent of the instructor

C. Contents

- 1) Introduction
 - Geospatial data
 - R basics
- 2) Data visualization and mapping with R
 - Reading and writing of geospatial data
 - Mapping geospatial data
 - Create descriptive statistics
 - Access to open source geospatial data
- 3) Geospatial analysis (GIS) with R
 - Geometric calculation
 - Topologic analysis
 - Object and layer operations
 - Raster/image analysis
- 4) Geospatial regression
 - Autocorrelation
 - Geographically weighted regression
- 5) Point pattern analysis with R
 - Basic statistics and metrics
 - Kernel density methods
 - Hot and cold spots
- 6) Surface modeling
 - De-noising and filtering
 - Triangulation and mesh
 - Spatial interpolation
- 7) Object modeling
 - Model recognition
 - Boundary detection and regularization
 - Model based data fitting

D. Data to be handled

- 1) Conventional geographic data (e.g., census, roads, images, point clouds, etc.)
- 2) GPS trajectory and social media data
- 3) Domain specific data

E. Tools to use

- 1) R and Python (some samples are provided)
- 2) Open source GIS packages/QGIS