

CP 6570: Socioeconomic GIS
William J. Drummond
Fall 2020

Course Syllabus Version 3

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Office Hours: Mon/Wed 1:00 - 2:00
and other times
by appointment

Course description

CP 6570 is an advanced GIS course that focuses on the collection, management, analysis, and display of socioeconomic data. It is a companion course to Environmental GIS (CP 6541) and Transportation GIS (CP 6542). It requires successful completion of a first GIS course (such as CP 4510 or CP 6514) or a year of experience in working with GIS, preferably ArcGIS.

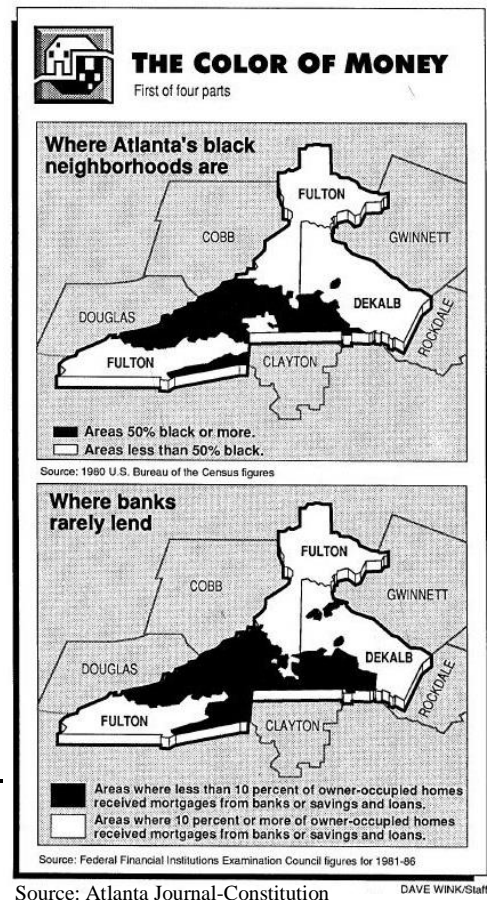
Socioeconomic GIS addresses human activity patterns over space and time within the context of general end-values such as sustainability, resilience, equity, economy, and livability. In particular, the course includes GIS-based consideration of demographics (age, race, sex, ethnicity), economics (income and employment), and housing (both individual units and community characteristics). Within each of these socioeconomic areas the course identifies the major sources of spatial and attribute data, considers basic and advanced data management techniques, and presents appropriate geostatistical analysis models.

Socioeconomic GIS is especially relevant to many questions related to equity, inequity, and illegal discrimination. This includes such issues as bank redlining, environmental justice, and public health. For an especially dramatic example, see the above image from the 1989 Pulitzer-prize-winning investigation of bank redlining by the Atlanta Journal-Constitution.

Teaching methods

The major teaching methods for this class include lectures, in-class labs, class discussions, required readings, homework assignments, exams, and a major project using socioeconomic GIS data and analysis techniques.

All students are expected to attend all class sessions, and the required readings should be done before the first class of the week in which they are assigned. Some classes, or portions of



classes, will be focused on class discussion of the readings and lecture materials, and every student will be expected to participate in discussion.

Learning objectives

Students successfully completing the course will:

1. Appreciate the fundamental advantages and disadvantages of working with socioeconomic spatial information compared to other fundamental types of GIS data such as environmental or transportation,
2. Be familiar with the major sources of socioeconomic GIS data, including the Census of Population, American Community Survey, County Business Patterns, and local government parcel databases,
3. Be capable of creating the most appropriate database structures for manipulating different types of socioeconomic GIS attribute data,
4. Understand the concept of spatial autocorrelation and its implications for statistical analysis of spatial data,
5. Calculate a variety of spatial descriptive statistics including Moran's I, LISA, and Gettis-Ord measures of hotspot and coldspot clustering,
6. Interpolate surfaces with methods such as inverse distance weighting and kriging, and
7. Apply the major families of socioeconomic causal analysis including OLS regression, spatial dummy variables, spatial polynomial regression, spatial error regression, and spatial lag regression.

Students with disabilities

Students with disabilities needing academic accommodation should provide documentation to the Access Disabled Assistance Program for Tech Students (<http://www.adapts.gatech.edu/>) and bring an ADAPTS accommodation letter to the instructor indicating the nature of accommodations required. This should be done within the first week of class or as soon as possible after a new disability condition arises. All effort will be made to provide reasonable accommodation.

Grading

The Georgia Tech Honor Code is in effect throughout this course. You should review this code and make sure you understand your responsibilities. If you have any questions, please contact the instructor.

Test, exam, and assignment grades may be curved upward or downward depending on the actual distribution of grades in a particular test, exam, or assignment.

Due to the extraordinary local, national and international circumstances, students will have three options for grading schemas. However, students must choose one of the three grading options by 12:00 noon Wednesday April 8th. Email your choice to bill.drummond@design.gatech.edu by 12:00 noon Wednesday April 8th with a subject line of "SEGIS grading option". The options are:

Option A: Class project and final exam:

Test #1 (Midterm):	20 percent
Virtual class attendance:	10 percent
Final exam:	35 percent
Class project:	35 percent
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Total	100 percent

Option B: Final exam without course project

Test #1 (Midterm):	30 percent
Virtual class attendance:	20 percent
Final exam:	50 percent
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Total	100 percent

Option C: Course project without final exam

Test #1 (Midterm):	30 percent
Virtual class attendance:	20 percent
Course project:	50 percent
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Total	100 percent

Course readings

Students are expected to purchase the main course textbook, which is:

Urban Policy and the Census

By Heather MacDonald and Alan Peters

ISBN: 589482220

Course midterm and final exam (Revised)

The original course schedule listed dates for two tests and the final examination. The revised course schedule omits Test #2. The final exam, for students who choose to take it, will now be a full-period exam that, in-effect, combines Test #2 and the previous 90 minute final exam. The entire final exam will be open book, open note, and open computer. I still recommend that each student develop quick reference sheets similar to the information sheets allowed in Test #1. As before, students must plan to take the final examination at the time scheduled by the Registrar and posted at the bottom of the class schedule, except for the specific circumstances explained in the Registrar's Web site at <https://registrar.gatech.edu/registration/exams>.

Course project (unchanged, except see schedule for new due date):

The assignment for this course is to produce a GIS project based upon the socioeconomic data and spatial analysis capabilities we will be learning throughout the course. Your project can be in any substantive area of interest, such as transportation, environment, land use, economic development, real estate, or any other area utilizing socioeconomic data and analysis. If you wish, you may combine this project with work for another class. However, you must turn in all your final products for both classes to both instructors so the effort made for each course can be individually assessed.

This is a demonstration project whose basic purpose is to show the importance of socioeconomic GIS for actual policy decisions or research investigation in your area of interest. You may use real data, hypothetical data, or a combination of the two. If you use any hypothetical data, the data should be realistic so that the demonstration is convincing. Do not plan to use a dataset any larger than that needed for a successful demonstration. Most SEGIS projects can be adequately completed with small to moderate datasets.

On the due date listed in the syllabus, you will turn in a short project prospectus. It should include:

- The main question your project is intended to answer. State this in one sentence as a question.
- A single paragraph, ½ page, description of your project. Explain why the topic is important and what you hope to explain, learn, and/or accomplish?
- Include a listing of the required GIS datasets and their sources (Census Bureau, Z drive, etc.).

Your written report course project is due at the date listed in the course schedule. It should include about 2,400 to 3,000 words (8-10 pages) of project report text and a set of well-formatted maps integrated with the project text. Your project report should include (at a minimum) the following information:

- Problem description
- Data sources and description
- Analysis techniques used
- Analysis results with printed maps
- Discussion of the significance of the results

Class meetings and office hours

Classes will be held via BlueJeans meetings. See the course Canvas site for the meeting ID. Office hours will also be held via BlueJeans. Use Canvas to sign up for one or more slots and note the BlueJeans meeting ID for office hours. If you have a conflict with all posted office hour slots, email me for an alternate time. To reserve office hours appointment slots, in Canvas select your course, then View course calendar, then Find appointment.

Major Data Sources for Socioeconomic GIS

www.ipums.org: Interactive PUMS with microdata from American Community Survey and Decennial Census. You must register, but access is free. The lowest level of geography is Public Use Microsample Areas with a minimum population of 100,000.

www.socialexplorer.com: Commercial site only available from Georgia Tech computers. Table data from American Community Survey and Decennial Census. Only one user from Georgia Tech is allowed at a time, so please close your browser window when you are finished. You must use a GT machine or be connected through the VPN to access this data.

<https://data.census.gov>: interactive site for download of Census data. This location is not as easy to use as www.socialexplorer.com.

<https://www.bts.gov/browse-statistical-products-and-data>: transportation-related surveys and data

<https://s4.ad.brown.edu/Projects/Diversity/Researcher/Bridging.htm>: Longitudinal census tract correspondence project. Datasets and tools to convert 1970, 1980, 1990, 2000, and 2010 Census data to the same spatial areas (tracts). Includes many actual Census variables already processed to common 2010 tract boundaries.

<https://www.bea.gov/data/economic-accounts/regional>: Bureau of Economic Analysis time-series regional data from 1969. Lowest level of geography is the county.

<http://mcdc.missouri.edu/applications/geocorr2014.html>: MABLE/Geocorr Geographic Correspondence Engine. Creates tables relating different Census 2010 (and later) geographies with allocation factors of either population or land area.

<http://lehd.ces.census.gov/data/>: Census Longitudinal Employer-Household Dynamics datasets. Includes [Quarterly Workforce Indicators employment data](#) at the county level and [Origin-Destination Employment Statistics \(LODES\)](#) at the census block level.

<https://www.epa.gov/ejscreen>: EPA's environmental justice screening tool and datasets

<https://www.opportunityatlas.org/>: The Opportunity Atlas addresses the question: "Which neighborhoods in America offer children the best chance to rise out of poverty?"

<https://www.bts.gov/geospatial/national-transportation-atlas-database>: contains comprehensive national transportation-related datasets.

<https://www.nhgis.org/>: historical census (and other) data plus boundary files from 1790 to present.

<https://opendata.atlantaregional.com/>: Atlanta Regional Commission statewide, regional, and (some) local city or county GIS and attribute data

z:\gisdata (on College computers): state, regional, local datasets, including Fulton County parcels

Revised Course Schedule

Classes	Topics	Readings
Week 1: January 6 - January 8	Basic theory and concepts of socioeconomic GIS	Urban Policy chapter 1; online Herman article
Week 2: January 13 - January 15	Geocoding databases and methods	Online readings in Geocoding section
Week 3: January 22	Geostatistical analysis principles	ArcGIS Geostatistical Analyst chapters 1, 2, and 3
Week 4: January 27 - January 29	Spatial and geographically weighted regression	ArcGIS Geostatistical Analyst chapter 4
Week 5: February 3 - February 5	Spatial interpolation; <u>Project prospectus due Feb 5</u>	ArcGIS Geostatistical Analyst chapter 5
Week 6: February 10 - February 12	Kriging; <u>Test 1: Feb 10</u>	ArcGIS Geostatistical Analyst chapter 6
Week 7: February 17 - February 19	Cluster analysis and redistricting	ArcGIS Geostatistical Analyst chapter 7
Week 8: February 24 - February 26	Cluster analysis and redistricting (continued)	ArcGIS Geostatistical Analyst chapter 7
Week 9: March 2 - March 4	Equity and vulnerability analyses	Online readings in Equity section
Week 10: March 9 - March 11	Equity and vulnerability analyses (continued)	Online readings in Equity section
Week 11: March 16 - March 18	Spring break	
Week 12: March 23 - March 25	Transition week	
Week 13: March 30 - April 1	Parcel-based data and analysis	Urban Policy chapter 5
Week 14: April 6 - April 8	Census spatial and attribute data	Urban Policy chapters 2 & 3
Week 15: April 13 - April 15	American Community Survey spatial and attribute data	Urban Policy chapter 4
Week 16: April 20	Economic and employment data analysis	Urban Policy chapter 6
Week 17: Exam week	<u>Final exam: Wednesday, April 29, 2:40 PM - 5:30 PM</u> <u>Projects due: Wednesday, April 29, 10:00 AM</u>	