



Meets: M, W, F 10:50–11:50 a.m.
Carnegie 107

Instructor: Laura Smith
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Office hours: M 1:30–2:30 p.m.
T, W 1:15–2:15 p.m.
Th 1:30–2:30 p.m.
or by appointment

Teaching Assistants: Elizabeth Abramson, Orion Dick-Neal, Ari Lutze-Jahiel

I. COURSE CONTENT AND GOALS

This course focuses on the statistical methods that geographers use to describe and analyze places and themes. You will learn both descriptive and inferential statistical methods for use in geographical research. Applications from all subfields of geography will be used for in-class examples and out-of-class exercises.

This course emphasizes applied statistics. My primary objective is to teach you to use statistics appropriately. Statistics are a valuable tool in geographic analysis, but too often they are used improperly, without a basic understanding of underlying principles and assumptions. You will learn to evaluate and develop statistical research designs, including the preparation and presentation of an original research project of your own.

We will begin the semester with various methods for exploratory data analysis, such as graphical display and the preliminary mapping of spatial information. Topics such as elementary spatial statistics, point-pattern analysis, geographic sampling, and the mapping of residuals from linear regression will also be incorporated into the course. In completing the exercises, you will gain practical experience in the application of statistical methods to spatial problems through the use of statistical software.

By the end of the course, you should be able to think logically and carefully through each step of the research process, from originating the research question to acquiring and evaluating data, operationalizing the question of interest, selecting and using the appropriate statistical tools, analyzing the results, and interpreting the findings.

II. TEXTBOOK

McGrew, Jr., J. Chapman, Arthur J. Lembo, Jr., and Charles B. Monroe. 2014. *An Introduction to Statistical Problem Solving in Geography*, 3rd ed.

Any other required readings will be posted to our Moodle site. Data for the exercises can also be found on our Moodle site. A basic calculator will be needed for completion of the exercises, and during some class periods.

III. EXPECTATIONS AND GRADING

Grading

You will be expected to demonstrate a general knowledge of statistical research methods. Class attendance (and participation) is also expected. Your grade will be based on the following:

Exercises and Assignments (12 @ 25 pts. each)	= 40%
Midterm Exam (150 pts.)	= 20%
Final Exam (188 pts.)	= 25%
Final Project and Presentation (112 pts.)	= 15%

The exams will include short answer questions and problem solving, with an emphasis on the appropriate application of the different statistical tests available. You will be evaluated in part on your ability to apply different statistical methods properly and also on your understanding of the rationale for using a given statistical procedure.

Late assignments are penalized 10% per day; *this rule will be enforced!* Assignments must be turned in at the start of class (not later in the day) to be considered on time. No assignment will be accepted once past one week overdue.

Grade cut-off percentages are as follows: A = 93-100%; A- = 90-92.9%; B+ = 87-89.9%; B = 83-86.9%; B- = 80-82.9%; C+ = 77-79.9%; C = 73-76.9%; C- = 70-72.9%; D+ = 67-69.9%; D = 63-66.9%; D- = 60-62.9%; NC = <60%.

Make-up exams, extensions

Make-up exams are given only for excused absences. In such cases, notify me as soon as possible before the exam. Extensions on assignments or course incompletes will not be granted unless exceptional circumstances require it and prior arrangements have been made.

Technology use

Within the classroom, students are welcome to use laptops for academic purposes; technology use that is disruptive to an academic space is not welcome. When communicating with me via email, I will answer messages within 24 hours.

The course syllabus, final project directions, exercises and data, readings, and other information and announcements will be posted to our Moodle site. Select course information is also available on the Geography Department website at <https://www.macalester.edu/geography/>.

Academic resources

The Macalester Academic Excellence (MAX) Center (<http://www.macalester.edu/max/>), located on the first floor of Kagin Commons, provides numerous academic resources from time management and study strategy workshops to quantitative material and writing assistance.

Academic accommodations

In some circumstances, course design may pose barriers to a student's ability to access or demonstrate mastery of course content. Academic accommodations can be implemented in such circumstances. If you think you need an accommodation for a disability, please contact the Disability Services Office (<http://www.macalester.edu/studentaffairs/disabilityservices/>) at your earliest convenience. You may schedule an appointment by emailing disabilityservices@macalester.edu, or calling the Disability Services Office at 651-696-6974.

Academic honesty

Academic honesty and integrity are expected at all times. You are responsible for knowing what constitutes plagiarism. If you have questions about Macalester's academic integrity policy, please refer to the *Student Handbook* (<http://www.macalester.edu/studentaffairs/studenthandbook/>).

All sources used in preparing your work must be cited; this includes data sources. APA is the preferred citation style of the Geography Department; see the library's citation guides and resources under the Research Guides menu at <https://libguides.macalester.edu/citation>.

IV. SCHEDULE AND ASSIGNMENTS

(Please note: schedule subject to revision)

Date	Topic	Reading/Assignment Due
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Week 1

1. Fri-Jan 25	Introduction	
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<u>Date</u>	<u>Topic</u>	<u>Reading/Assignment Due</u>
<u>Week 2</u>		
2. Mon-Jan 28	History of geographic thought <i>with Professor Lanegran</i>	Hart (pp. 1-14); Golledge et al.
3. Wed-Jan 30	Discussion: The Quantitative Revolution	Article of choice (see list on p. 7)
4. Fri-Feb 1	The discipline of geography and quantitative methods	Burt et al. (pp. 8-16) DUE: Discussion summary
<u>Week 3</u>		
5. Mon-Feb 4	Data measurement and classification	Text ch. 1, ch. 2 (sections 2.1-2.3)
6. Wed-Feb 6	Displaying quantitative information	Text ch. 2 (section 2.4), ch. 3 (pp. 40-41 histogram, ogive)
7. Fri-Feb 8	Data quality and validity	Stack and Gundlach (1992); Stack and Gundlach (1994)
<u>Week 4</u>		
8. Mon-Feb 11	Data sources and acquisition	Saulny; Robertson DUE: Exercise 1
9. Wed-Feb 13	Descriptive statistics	Text ch. 3 (sections 3.1-3.2)
10. Fri-Feb 15	Descriptive statistics	Text ch. 3 (sections 3.3-3.4)
<u>Week 5</u>		
11. Mon-Feb 18	Descriptive spatial statistics	Text ch. 4 (section 4.1)
12. Wed-Feb 20	Descriptive spatial statistics	Text ch. 4 (section 4.2) DUE: Exercise 2
13. Fri-Feb 22	Probability theory and distributions	Text ch. 5 (section 5.1), ch. 6
<u>Week 6</u>		
14. Mon-Feb 25	Probability theory and distributions	DUE: Exercise 3
15. Wed-Feb 27	Probability theory and distributions	Text ch. 5 (sections 5.2-5.4)
16. Fri-Mar 1	Sampling	Text ch. 7 DUE: Project proposal

<u>Date</u>	<u>Topic</u>	<u>Reading/Assignment Due</u>
<u>Week 7</u>		
17. Mon-Mar 4	Estimation in sampling	Text ch. 8 (sections 8.1-8.3) DUE: Exercise 4
18. Wed-Mar 6	Estimation in sampling	
19. Fri-Mar 8	Introduction to qualitative methods <i>with Professor Trudeau</i>	
<u>Week 8</u>		
20. Mon-Mar 11	MIDTERM EXAM (covering chapters 1-7)	
21. Wed-Mar 13	Estimation in sampling	Text ch. 8 (section 8.4)
22. Fri-Mar 15	Hypothesis testing (one-sample)	Text ch. 9
<i>(Spring Break – March 16-24)</i>		
<u>Week 9</u>		
23. Mon-Mar 25	Hypothesis testing (one-sample)	DUE: Exercise 5
24. Wed-Mar 27	Hypothesis testing (two-sample)	Text ch. 10 (sections 10.1-10.2)
25. Fri-Mar 29	Hypothesis testing (two-sample); ANOVA	Text ch. 10 (section 10.3), ch. 11 (sections 11.1 and 11.3)
<u>Week 10</u>		
26. Mon-Apr 1	Goodness-of-fit; Chi-square	Text ch. 12 (section 12.1) DUE: Exercise 6
27. Wed-Apr 3	<i>No class – American Association of Geographers (AAG) conference</i>	
28. Fri-Apr 5	<i>No class – AAG conference</i>	DUE: Article review
<u>Week 11</u>		
29. Mon-Apr 8	Contingency analysis (cross-tabs)	Text ch. 12 (section 12.2) DUE: Exercise 7
30. Wed-Apr 10	Correlation	Text ch. 16
31. Fri-Apr 12	Correlation	Mauk et al.

Date	Topic	Reading/Assignment Due
Week 12		
32. Mon-Apr 15	No class – Geography Honors Day	DUE: Exercise 8
33. Wed-Apr 17	Regression	Text ch. 17
34. Fri-Apr 19	Regression; Multiple regression	Rosenshein et al.; Text ch. 18 (section 18.1)
Week 13		
35. Mon-Apr 22	Geographically weighted regression; Inferential spatial statistics	Text ch. 13, ch. 14 (section 14.1) DUE: Exercise 9
36. Wed-Apr 24	Inferential spatial statistics	Text ch. 15 (section 15.1) Mitchell (pp. 71-79; 104-111)
37. Fri-Apr 26	Inferential spatial statistics	Text ch. 15 (sections 15.2-15.3)
Week 14		
38. Mon-Apr 29	Final project presentations	DUE: Exercise 10
39. Wed-May 1	Final project presentations	
40. Fri-May 3	Final project presentations	
Week 15		
41. Mon-May 6	Final review	DUE: Final Project

FINAL EXAM: Thursday, May 9 10:30 a.m. – 12:30 p.m.

Readings and resources: (available on Moodle and/or in library)

Burt, James E., Gerald M. Barber, and David L. Rigby. 2009. *Elementary Statistics for Geographers*, 3rd ed. New York: The Guilford Press.

Fotheringham, A. Stewart, Chris Brunsdon, and Martin Charlton. 2002. *Geographically Weighted Regression: The Analysis of Spatially Varying Relationships*. West Sussex, England: John Wiley & Sons.

Golledge, Reginald G., et al. 1982. Commentary on 'The Highest Form of the Geographer's Art.' *Annals of the Association of American Geographers* 72(4): 557-9.

Hart, John Fraser. 1982. Presidential Address: The Highest Form of the Geographer's Art. *Annals of the Association of American Geographers* 72(1): 1-29.

Mauk, Gary W., Matthew J. Taylor, Karl R. White, and T. Scott Allen. 1994. Comments on Stack and Gundlach's "The Effect of Country Music on Suicide." An "Achy Breaky Heart" May Not Kill You. *Social Forces* 72(4): 1249-55.

- Mitchell, Andy. 2005. *The ESRI Guide to GIS Analysis: Spatial Measurements and Statistics*. Redlands, CA: ESRI Press. (Available in GIS lab)
- Nelson, Trisalyn A. 2012. Trends in Spatial Statistics. *The Professional Geographer* 64(1): 83-94.
- Robertson, Campbell. 2011. Smaller New Orleans After Katrina, Census Shows. *New York Times*. February 3.
- Rogerson, Peter A. 2001. *Statistical Methods for Geography*. Thousand Oaks, CA: SAGE Publications.
- Rosenshein, Lauren, Lauren Scott, and Monica Pratt. 2011. Finding a Meaningful Model. *ArcUser*. Winter.
- Saulny, Susan. 2011. Counting by Race Can Throw Off Some Numbers. *New York Times*. February 9.
- Spielman, Seth E. and Alex Singleton. 2015. Studying Neighborhoods Using Uncertain Data from the American Community Survey: A Contextual Approach. *Annals of the Association of American Geographers* 105(5): 1003-1025.
- Stack, Steven and Jim Gundlach. 1994. Country Music and Suicide: A Reply to Maguire and Snipes. *Social Forces* 72(4): 1245-48.
- Stack, Steven and Jim Gundlach. 1992. The Effect of Country Music on Suicide. *Social Forces* 71(1): 211-18.

To choose from for Quantitative Revolution discussion:

- Adams, John S. 2001. The Quantitative Revolution in Urban Geography. *Urban Geography* 22(6): 530-9.
- Barnes, Trevor J. 2008. Geography's Underworld: The Military-Industrial Complex, Mathematical Modelling and the Quantitative Revolution. *Geoforum* 39: 3-16.
- Berry, Brian J. L. 1993. Geography's Quantitative Revolution: Initial Conditions, 1954-1960, a Personal Memoir. *Urban Geography* 14(5): 434-41.
- Getis, Arthur. 1993. Scholarship, Leadership, and Quantitative Methods. *Urban Geography* 14(6): 517-25.
- Hanson, Susan. 1993. 'Never Question the Assumptions' and Other Scenes from the Revolution. *Urban Geography* 14(6): 552-6.
- King, Leslie J. 1993. Spatial Analysis and the Institutionalization of Geography as a Social Science. *Urban Geography* 14(6): 538-51.