GEOG 5020/6020 Advanced Spatial Analysis

**Texts**

4. Additional materials provided by instructor

**Prerequisites**

1. Inferential Statistics (GEOG 3020 or permission of instructor)
2. Intro GIS (GEOG 3140 or permission of instructor)

**Course Description**

Spatial Analysis consists of set of techniques used for statistical modeling and problem solving in Geography. As such, it plays an integral role in the detection of spatial processes and the identification of their causal factors. It is therefore a key component in one's preparation for applied or theoretical quantitative work in GIScience, Geography, and other cognate disciplines. Space, of course, is treated explicitly in spatial analytical techniques, and the goal of many methods is to quantify the substantive impact of location and proximity on human and environmental processes in space.

**Student Outcomes**

By the end of the course, students will be able to:

- understand the particular pitfalls and benefits of analyzing spatial data;
- appropriately select, apply, and interpret advanced spatial statistical techniques;
- accurately identify and remediate spatial effects in geographic processes;
- confidently use the R environment for spatial statistical computing and visualization

**Course Policies**

1) Individual extra credit will not be assigned
2) An "incomplete" will be given only in extreme cases when conditions beyond the student's control require an extended period of absence. Even in this case, at least 80% of the course requirements must be completed.
3) Examinations must be taken during scheduled times announced in class. If you have a legitimate excuse (such as medical, family illness or unavoidable work conflicts), you must contact the instructor before the examination. If you do not contact the instructor before the examination you will not be able to make up the examination unless the circumstances were extreme and contacting the instructor was impossible.
4) The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). [www.sa.utah.edu/ds](http://www.sa.utah.edu/ds). CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.
5) **Academic misconduct will not be tolerated**. Penalties may include failure of an assignment, the entire course, and/or the filing of formal charges with appropriate university authorities. Academic misconduct includes, but is not limited to, cheating, misrepresenting one’s work, and plagiarism:
   - *Cheating* involves the unauthorized possession or use of information in an academic
exercise, including unauthorized communication with another person during an exercise such as an examination.

- **Misrepresenting** one’s work includes, but is not limited to, representing material prepared by another as one’s own work or submitting the same work in more than one course without prior permission of all instructors.

- **Plagiarism** means the intentional unacknowledged use or incorporation of any other person’s work in one’s own work offered for academic consideration or public presentation.

### Evaluation

**GEOGR 5020**: Evaluation will consist of lab assignments (50%), several examinations (30%), and a final project done *in groups* (20%). The final examination will *not* be comprehensive. The examinations will cover the assigned reading material, lectures and class discussion.

**GEOGR 6020**: Evaluation will consist of lab assignments (20%), several examinations (30%), and a final project done *individually* (50%). The final examination will *not* be comprehensive. The examinations will cover the assigned reading material, lectures and class discussion.

### Final Project

The final project consists of an applied spatial analysis research report on a topic selected by the student (with instructor’s consent). Students are responsible for generating their own research questions and for providing their own data for analysis. The instructor will work with the student to develop an appropriate analysis plan. Student’s will present their projects to the class and submit a typed report to the instructor.

**Important deadlines:**

1. One-page abstract due (approximately 500 words): TBD
2. Meeting with the professor: TBD
3. Presentation slides due: TBD
4. Final paper due: TBD

### Schedule of Topics and Readings

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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>Tu. Aug. 21</td>
<td>Introduction</td>
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<tr>
<td>Th. Aug. 23</td>
<td>Working with R</td>
<td>[R] Chapter 1 and Appendix A</td>
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<tr>
<td>Tu. Aug. 28</td>
<td>Simple Regression</td>
<td>[SS] Chapter 2</td>
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<tr>
<td>Th. Aug. 30</td>
<td>Simple Regression Diagnostics</td>
<td>[SS] Chapter 3</td>
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<td>Tu. Sep. 4</td>
<td>Lab 1: Simple Regression</td>
<td>[SS] Chapter 5</td>
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<td>Th. Sep. 6</td>
<td>Multivariate Regression</td>
<td>[SS] Chapter 5</td>
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<tr>
<td>Tu. Sep. 11</td>
<td>Multivariate Regression</td>
<td>[SS] Chapters 6,7</td>
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<tr>
<td>Th. Sep. 13</td>
<td>Lab 2: Multivariate Regression</td>
<td>[SS] Chapter 5</td>
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<td>Tu. Sep. 18</td>
<td>GISci 2012</td>
<td>TBD</td>
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<td>Th. Sep. 20</td>
<td>GISci 2012</td>
<td>TBD</td>
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<td>Th. Sep. 25</td>
<td>Spatial Autocorrelation Detection</td>
<td>[BPG] Chapter 9</td>
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<tr>
<td>Th. Sep. 27</td>
<td>Local Spatial Autocorrelation</td>
<td>[BPG] Chapter 9, A1, A2</td>
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<td>Tu. Oct. 2</td>
<td>Lab 3: Autocorrelation</td>
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<td>Th. Oct. 4</td>
<td>Test</td>
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<td>Fall Break</td>
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<tr>
<td>Tu. Oct. 16</td>
<td>Spatial Econometrics</td>
<td>[BPG] Chapter 10</td>
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<td>Th. Oct. 18</td>
<td>Lab 4: Spatial Econometrics</td>
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Tu. Oct. 23 | Spatial Filtering I | A3
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Th. Oct. 25 | Spatial Filtering II | A4
Tu. Oct. 30 | Lab 5: Filtering | 
Th. Nov. 1 | Trend Surface Analysis | Lecture Notes Provided
Tu. Nov. 6 | Spatial Expansion Method | A5
Th. Nov. 8 | Practice Exercises | 
Tu. Nov. 13 | Geographically Weighted Regression | Lecture Notes Provided
Th. Nov. 15 | Practice Exercises | 
Tu. Nov. 20 | Lab 6: Spatial Heterogeneity | 
Th. Nov. 22 | Thanksgiving | Thanksgiving
Tu. Nov. 27 | Review | 
Th. Nov. 29 | Test | 
Tu. Dec. 4 | Project Work | 
Th. Dec. 6 | Presentations | 

Additional readings used in the Schedule:


Additional texts can be found online and at the Marriott Library on campus. Students are encouraged to use additional resources to complete their studies where necessary.


