Course description and objectives

The objective of this course is to introduce basic statistical methods for describing, modeling, and analyzing spatial (geographical) data. The majority of this course will focus on the statistical analysis of non-spatial data, such as descriptive statistics, analysis of variance, correlation analysis, regression analysis, and principal component analysis. The rest of this course will focus on spatial data handling. In particular, spatial pattern analysis and spatial regression will be introduced. This course can be viewed as ‘Introduction to’ Spatial Analysis, and students interested in more advanced methods are encouraged to take Geog 625 Intermediate GIS.

Learning outcomes

1. Understand and explain major concepts, including variability, probability distribution, and error
2. Compute descriptive statistics and interpret their meaning
3. Analyze spatial data at a basic level
4. Set up and test a hypothesis

<table>
<thead>
<tr>
<th>Lecture Time &amp; Location</th>
<th>Lab time &amp; location</th>
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</thead>
<tbody>
<tr>
<td>Mo 14:00-16:30 LUB S165</td>
<td>Lab 801: Tu 15:00-16:50 BOL 289</td>
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<td>Lab 802: Th 10:00-11:50 MIT 353</td>
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</tbody>
</table>

Instructor

Dr. Woonsup CHOI
Office: BOL 496
Phone: 229-2671
Email: choiw@uwm.edu
Office Hours: Tu 14:00-15:00 or by appointment

TA

Mr.
Office: BOL 446
Email: @uwm.edu
Office Hours: find on the lab syllabus

Textbooks

Required:

Optional (available at the library reserve for checkout for two days):

**Software for exercise**

(1) SPSS (references can been found at the UWM Library)
(2) ArcGIS Spatial Analysis toolbox or GeoDa

**Class Web site**

Class Web site can be accessed through D2L. Some materials from previous years are already available. Non-private inquiries must be posted on D2L-Discussions.

**Time expected for the class**

Credit hours: 4
Time in the classroom: 2.5 hrs/wk
Time in the lab instruction: 1.8 hrs/wk
Time for completing assignments: 4 hrs/wk
Time for preparation and study: 4 hrs/wk

**Course requirements**

Prerequisites:
Junior or above; Geog 247(P); or Graduate standing; or Special Student (including School Specials, Post-Baccalaureate, Certificate, University Specials, 2nd Degree)

Exercises: learning outcomes 1 & 2
Ten take-home exercises will be given and collected corresponding to the topic covered in the class. Each of them will be made available during a lab session and must be submitted to TA by the beginning of the following lab session. Exercises constitute the largest component of the final grade, so should be taken serious. The lowest score will be dropped from calculating the final grade.

Examinations: learning outcomes 1-3
There will be two examinations for this course. The exams can be seen as extended exercises.

Pop quizzes: learning outcome 1
A few pop quizzes will be given without prior notice during the semester for bonus points.

Class participation: learning outcome 1
Attendance and participation in class discussion are expected to all students. Posting substantive comments to reading presentations on D2L-Discussion will count towards your participation score.

Reading presentation: (graduates only): learning outcomes 1&4
Each graduate student must choose an article from the reading list on a first-come-first-served basis and give a summary presentation in class as scheduled. Notify Instructor of your choice as soon as possible. The articles adopt research methods that you learned in class or are very similar to what you learned. They also serve as examples of the most outstanding term papers.

Class project (graduates only): learning outcome 4
A project that utilizes spatial analysis techniques to solve research problems is required for each graduate student. The topic is generally open, but it must include some spatial aspect. In other words, some results from the project must be presented as maps. The project consists of topic (1 page), bibliography (minimum 10 references), in-class presentation, preliminary paper (with major analysis done), and final paper, each of which is due on different days and graded separately. Each item must be submitted by 9:30 of the due date on D2L. Formatting instruction for the final paper is given on the last page of the syllabus. FINAL PAPER DUE DATE: 9:30, Tuesday, 15th of December (on D2L). I may seek publication of the term papers of good quality in academic journals after the semester. Authors will be contacted individually.

Reading presentation and discussion paper (optional for UG students): learning outcomes 1&4
UG students can earn up to 40 bonus points by electing both to give a reading presentation from the reading list and write a discussion paper about the article. See Instructor later for details.

Evaluation

Grades will be assigned on the basis of the total points accumulated from the course requirements throughout the semester.

<table>
<thead>
<tr>
<th>Points</th>
<th>UG</th>
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<tbody>
<tr>
<td>Exams</td>
<td>80</td>
<td>80</td>
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<tr>
<td>Exercises</td>
<td>180</td>
<td>180</td>
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<tr>
<td>Reading presentation</td>
<td>N/A</td>
<td>20</td>
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<tr>
<td>Project</td>
<td>N/A</td>
<td>100 (see D2L-Grades for details)</td>
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<tr>
<td>Participation</td>
<td>20</td>
<td>20</td>
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<td>TOTAL</td>
<td>280</td>
<td>400</td>
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Grading scale:
- A: over 90%, A-: over 87%
- B+: over 83%, B: over 80%, B-: over 77%
• C+: over 73%, C: over 70%, C-: over 67%
• D+: over 64%, D: over 61%, D-: over 59%
• F: 59% or less

Other course policies

Disability statement:
Any student who feels he or she may need an accommodation based on the impact of a disability should contact Instructor privately as early as possible to discuss his or her specific needs.

Late submissions:
Any late submission results in a 20% reduction. No submission will be accepted after seven days from the deadline without prior arrangement. No excuses will be accepted regarding technical problems.

Religious observances:
A student should notify Instructor, within the first three weeks of the beginning of class, of the specific days or dates on which he or she will request relief from an examination or academic requirement for a religious observance. The exam or academic requirement will be rescheduled or the student will be given a make-up. The student notification will be kept confidential.

Finality of grade:
All grades, once released on D2L or PAWS, are final except in cases of clerical error.

Class etiquette:
I expect that you will conduct yourself in class in the same manner that you yourself would like to be treated. Class disruptions will not be tolerated as it erodes the educational environment for everyone. Laptop users are to be seated in back rows of the classroom so that other students are less distracted.

Other notice:
• Make-ups will be allowed at the discretion of Instructor when a pre-approval has been obtained or in case of emergency with written proof
• Cheating on exams, quizzes, or lab exercises will not be tolerated. Additional information about the policies and procedures can be found at http://www4.uwm.edu/secu/SyllabusLinks.pdf and are posted in the Geography Department main office
• Other unspecified matters will be handled according to the University policies listed on http://www4.uwm.edu/secu/SyllabusLinks.pdf
• If you are having any trouble in class, please see Instructor as soon as possible.
• Email is the best way to contact Instructor for private matters. Your emails will be responded to by the end of the next office hour. Make sure to have the subject of the mail start with [Geog 547].
### Tentative schedule (subject to minor change)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture topic</th>
<th>Chapt Lab and exercise</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>4-sept</td>
<td>Labor Day</td>
<td>No lab this week</td>
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<tr>
<td>2</td>
<td>11-sept</td>
<td>Introduction to statistical analysis 1, 2</td>
<td>SPSS: introduction, descriptive statistics</td>
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<tr>
<td></td>
<td></td>
<td>Descriptive statistics and data distribution</td>
<td>Exercise 1 handed out</td>
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<tr>
<td>3</td>
<td>18-sept</td>
<td>Probability</td>
<td>3, 4</td>
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<tr>
<td></td>
<td></td>
<td>SPSS: descriptive statistics, data distribution</td>
<td>Exercise 2 handed out</td>
<td>Dannenberg</td>
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<tr>
<td>4</td>
<td>25-sept</td>
<td>Hypothesis testing and sampling</td>
<td>5 SPSS: binomial test</td>
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<td><strong>Project topic due</strong></td>
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<td>5</td>
<td>2-oct</td>
<td>Analysis of variance</td>
<td>6 SPSS: t-test</td>
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<td></td>
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<td>Correlation</td>
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<tr>
<td>6</td>
<td>9-oct</td>
<td><strong>Exam 1</strong></td>
<td>SPSS: ANOVA</td>
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<td>Exercise 4 handed out</td>
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<tr>
<td>7</td>
<td>16-oct</td>
<td>Regression analysis</td>
<td>8 SPSS: correlation</td>
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<td></td>
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<td><strong>Project bibliography due</strong></td>
<td>Exercise 5 handed out</td>
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<tr>
<td>8</td>
<td>23-oct</td>
<td>Multiple regression</td>
<td>9 SPSS: simple regression</td>
<td>Schlünzen, Engstrom</td>
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<td>Exercise 6 handed out</td>
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<tr>
<td>9</td>
<td>30-oct</td>
<td>Principal component analysis</td>
<td>12 SPSS: multiple regression</td>
<td>Lorenz, Hong</td>
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<td>Exercise 7 handed out</td>
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<tr>
<td>10</td>
<td>6-nov</td>
<td>Spatial patterns</td>
<td>10 SPSS: PCA</td>
<td>Webster</td>
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<td>Exercise 8 handed out</td>
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<tr>
<td>11</td>
<td>13-nov</td>
<td><strong>Exam 2</strong></td>
<td>10 ArcGIS: Spatial distribution</td>
<td>Stow, Selle</td>
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<td>12</td>
<td>20-nov</td>
<td>Spatial regression</td>
<td>11 ArcGIS: Spatial pattern and cluster</td>
<td>Allen, Wei</td>
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<td><strong>Preliminary result presentation</strong></td>
<td>Exercise 9 handed out</td>
<td></td>
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<tr>
<td>13</td>
<td>27-nov</td>
<td>Spatial regression</td>
<td>11 <strong>No lab this week</strong></td>
<td>Andresen, Li</td>
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<tr>
<td>14</td>
<td>4-déc</td>
<td>Spatial regression</td>
<td>11 ArcGIS: Spatial pattern and cluster</td>
<td>Chang</td>
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<td>Exercise 10 handed out</td>
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<td>15</td>
<td>11-déc</td>
<td>Project presentation</td>
<td><strong>No lab this week</strong></td>
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<tr>
<td>18</td>
<td>12-déc</td>
<td><strong>Term paper due</strong></td>
<td><strong>No lab this week</strong></td>
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</table>

### Reading list

FINAL PAPER FORMAT

Text must be in a 11-point font with 3.8 cm (1.5 inch) margins. All parts of the paper (abstract, text, and references) must be single-spaced and paginated. Format papers as follows, starting each section on a new page: (1) title page, (2) abstract, (3) text, (4) references, and (5) appendix (if applicable). Papers should be longer than 3000 words and shorter than 5,000 words when counting only the text section.

Title Page. The title serves as the author’s invitation to a diverse audience; it should be chosen with care.

Abstract/Key Words. Include an abstract of 250 words or less that summarizes the purpose, methods, and major findings of the paper. All authors should provide three to five key words or phrases by which an article can be indexed in periodical references. These should appear at the end of the abstract.

Text. The main text should consist of the following elements, with possible variations: introduction, materials and methods, results, discussion, and conclusions. Each element should contain only relevant paragraphs, table, figures, and equations as necessary.

Units of Measure. Use the International System of Units (metric) in all cases; other units should be noted in parentheses.

Equations. Equations should appear in the text in an appropriate type style (Greek letters, bold type, etc.). Authors should carefully distinguish between capital and lower-case letters, Roman and Greek characters, and letters and numerals. Number equations sequentially, in parenthesis on the right edge of the text.

References. References should be cited parenthetically in the text in this order: author’s last name, year of publication (and page number only for direct quotes). All sources in the text of a paper must be listed in the references section and vice versa. List all references alphabetically by the author’s last name and chronologically, and if possible, please include full names for all authors. Provide the full, unabbreviated title of books and periodicals. Personal communications can be cited either in endnotes or in the references section. All newspaper articles and articles from weekly magazines should be fully cited in the references section rather than worked into the text of the paper. For examples of the correct style for various forms of publication, see recent articles in International Journal of Geospatial and Environmental Research (IJGER, available on dc.uwm.edu/ijger).

Tables. All tables must be referenced in the text. Each table must be typed (no screen capture) single-spaced in the same 11-point font as the text, and numbered sequentially with Arabic numerals. Each table must have a descriptive title above the table as well as informational column and row headings. Decimals appearing in tables and elsewhere in the paper should include leading zeros: 0.1273 rather than .1273. For examples of the preferred table style see recent articles in IJGER.

Illustrations. Maps, graphs, and photos should convey ideas efficiently and tastefully. Graphics must be legible, concise, and referenced in the text. Figure captions must be placed below the figure. All graphics must be computer generated. Type sizes below 6 point should be avoided.