GEOGRAPHY 4132/5132
Spatial Modeling for Social and Economic Applications
McEniry 432
T\TH 2:00-3:15

Instructor: Dr. Elizabeth C. Delmelle
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PH: 704-687-5932
Office Hours: W: 9:00-10:00 am; TH: 12:30-1:30pm

Teaching Assistant: Elizabeth Major
Email: gmajor@uncc.edu
Office: McEniry 306
Office Hours: Wednesdays 1-4pm

Course Description:
Scientific models, broadly defined as abstractions or simplified representations of reality, strive to make a particular part of feature of the world easier to understand, define, quantify, visualize, or simulate. Models often form the foundation of the scientific method and are used in conjunction with mathematical methods to explore a given theory or test a stated hypothesis in a real-world setting. This course will focus on models featuring a geographic component, or spatial models, used in social science applications. Students will be exposed to the fundamentals of ‘model thinking’ and the ‘modeling process’. A number of specific geographic models will be covered and practical experience will be gained through a series of exercises.

Course Requirements:
Exercises: A series of exercises will be assigned throughout the semester to illustrate each of the models and methods covered in the class. At least one class period will be devoted to working on the assignments; attendance to these meetings is mandatory. Failure to attend the class when the exercise is assigned will result in an automatic 5 point deduction from the assignment. Each assignment is worth 15 total points. Assignments are typically due one week after they are initially assigned – the due date will always be clearly indicated on the assignment. The late-fee policy is as follows:

- Up to 1 day late (24h): -25%
- 1 – 2 days late: -50%
- More than 2 days late: No Longer Accepted

Readings: In order to illustrate the application of the models discussed in this class, a series of journal articles are assigned. Students are to provide a summary (~1 page) that should be ready (i.e. printed out and brought to class) at the start of the lecture period for which they appear on the schedule below. Late Reading Assignments are Not Accepted.
For each of the articles, the following items should be addressed in the summary:
1. The research question(s) being asked;
2. The stated hypothesis (if any);
3. Methodology used to answer the question(s);
4. Source of Data;
5. Results (answers to the question being asked);
6. Any particular limitation, weakness you observe in the study and/or any great strength (something you thought was very clever etc.).

Each reading summary will be worth 5 points.

Graduate students will have a greater number of readings than the undergraduates and more reflection on the articles is expected. In addition, graduate students will be responsible for “teaching” or presenting the material from one article to the class. A signup sheet will be available at the end of the first class for graduate student topics.

**Final Project (Graduate Students Only):** Graduate students will complete a research project. The project will be structured in the same manner as the journal articles reviewed and should feature a research question or hypothesis, a literature review, collected data, a methodology for answering the question, and results and conclusions. More details will be provided later in the semester.

**Course Evaluation:**

- Exercises (10)  
  15 points each
- 1 Quiz  
  15 Points
- Reading Summaries  
  5 points each
- Midterm Exam  
  50 points
- Final Exam  
  50 points
- Graduate Final Project  
  50 points

**Grading Scale**
- **Undergraduates:** 89.5-100% A; 79.5-89.4% B; 69.5-79.4% C; 59.5-69.4% D; <59.4 F
- **Graduates:** 89.5-100% A; 79.5-89.4% B; 69.5-79.4% C; < 69.4% U

**Course Materials:**

We will cover much of the material in: **The ESRI Guide to GIS Analysis. Volume 2: Spatial measurements & statistics by Andy Mitchell** (Referred to as “Mitchell” in the reading list below). This book is not very expensive and it is highly recommended that you purchase a copy. All other readings will be available on Canvas.

**Ethics:** If you are contemplating an ethical failure please read the code of student academic integrity: http://www.legal.uncc.edu/policies/ps-105.html, so you can plan for the consequences. Students are encouraged to work on their own, but helping each other understanding the concepts is fine. In other words, you may work with other students on lab assignments but you may not copy projects or written answers to questions from another student. Plagiarism in article summaries or in your final term paper is strictly forbidden. If a student is caught plagiarizing in an assignment, the result the first time will be a score of 0 on that particular assignment; a second infraction will be handled by the University Academic Integrity Board (please see the aforementioned website for details).

**Email Policy:** I will do my best to answer your emails in a timely manner, however, please allow up to 24 hours for a response. You may use email for quick clarifications or to arrange meetings with me,
however, please do not use email in lieu of visiting my office hours or attending class. I will not respond with detailed explanations of concepts or provide detailed feedback on assignments via email – please come to my office hours or schedule a meeting at another time for these matters.

**Students with disabilities:** Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services and follow the instructions of that office for obtaining accommodations.

Tentative Schedule. Please follow on Canvas for any changes or updates.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lectures &amp; Labs</th>
<th>Readings</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>T Jan 10</td>
<td>Course Outline &amp; Introduction, Overview of Models &amp; Modeling</td>
<td>Syllabus</td>
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<td></td>
<td>TH Jan 12</td>
<td>Data &amp; Geographic Distributions</td>
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<td>2</td>
<td>T Jan 17</td>
<td>Exercise 1: Geographic Distributions</td>
<td>Reading Summary 1 Due</td>
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<td>TH Jan 19</td>
<td>Sources of Socioeconomic Data/Intro to Census</td>
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<td>3</td>
<td>T Jan 24</td>
<td>Exercise 2: Geodatabase for socioeconomic data</td>
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<td>TH Jan 26</td>
<td>Testing statistical significance/Hypothesis Testing</td>
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<td>4</td>
<td>T Jan 31</td>
<td>Hypothesis Testing Continued</td>
<td>Reading Summary 2 Due</td>
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<td>TH Feb 2</td>
<td>Exercise 3: Hypothesis Testing</td>
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<td>5</td>
<td>T Feb 7</td>
<td>Quiz 1. Introduction to Spatial Autocorrelation</td>
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<td>TH Feb 9</td>
<td>Spatial Autocorrelation Continued</td>
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<td>T Feb 14</td>
<td>Exercise 4: Spatial Autocorrelation</td>
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<td>TH Feb 16</td>
<td>Local Spatial Autocorrelation</td>
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<td>T Feb 21</td>
<td>Local Spatial Autocorrelation Cont.</td>
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<td>TH Feb 23</td>
<td>Exercise 5: Local Spatial Autocorrelation</td>
<td>Reading Summary 3 Due</td>
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<td>8</td>
<td>T Feb 28</td>
<td>Review</td>
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<td>TH March 2</td>
<td>Midterm Exam</td>
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<td>March 7</td>
<td>Spring Break!!!</td>
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<td>March 9</td>
<td>Spring Break!!!</td>
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<td>10</td>
<td>T March 14</td>
<td>Spatial Interaction Modeling (Gravity)</td>
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<td>TH March 16</td>
<td>Exercise 6: Gravity Model Team Challenge</td>
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<td>T March 21</td>
<td>Gravity Team Challenge Continued</td>
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<td>TH March 23</td>
<td>Huff Model</td>
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<td>T March 28</td>
<td>Spatial Accessibility</td>
<td>Reading Summary 4 Due</td>
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<td>TH March 30</td>
<td>Spatial Accessibility. Exercise 7: Spatial Accessibility</td>
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<td>13</td>
<td>T April 4</td>
<td>AAG Meeting – Instructor Away. Work on Exercise 7: Spatial Accessibility</td>
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<td>TH April 6</td>
<td>No Class</td>
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<td>14</td>
<td>T April 11</td>
<td>Markov Modeling</td>
<td>Reading Summary 5 Due</td>
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<td>TH April 13</td>
<td>Exercise 8: Markov Modeling</td>
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<td>15</td>
<td>T April 18</td>
<td>Geodemographic Modeling</td>
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<td>TH April 20</td>
<td>Exercise 9: Geodemographic Modeling</td>
<td>Reading Summary 6 Due</td>
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</table>
Please read, but no summary required. Paper for reference in relation to lecture material.

Graduate Students only

Reading 1: Geographic Distributions
NS Mitchel Chapters 1&2


Reading 2: Testing statistical significance (Hypothesis Testing)

(G) https://www.youtube.com/watch?v=0zZYBALbZgg

(G) https://www.youtube.com/watch?v=eyknGvncKLw


Reading 3: Spatial Autocorrelation
NS Mitchell Ch. 3 pg. 104-133 (Global Autocorrelation)

NS Mitchell Ch. 4 pg. 163-181 (Local Clusters)


Reading 4: Spatial Interaction


**Reading 5: Spatial Accessibility**

(NS) GIS-Based Measures of spatial accessibility and application in examining health care access. In: Quantitative Methods and Applications in GIS.


**Reading 6: Markov Model**


**Reading 7: Geodemographic Modeling**