Syllabus for GTECH 705
Spatial Analysis
Fall 2008
Mo 5:35 – 8:15 PM

Instructor: Jochen Albrecht
Office: Hunter N1030
E-Mail: jochen@hunter.cuny.edu

Class room: Hunter N1022
Office hours: by appointment (via email)
Phone: (212) 772-5265

E-Mail: jochen@hunter.cuny.edu

Course Overview:
This course provides an overview to a number of techniques aimed at the analysis of spatial data. We will study local and neighborhood level methods, regionalized variables, and the modifiable area unit problem. While most techniques have a geographic origin, we will address all geospatially relevant methods, including geophysical, landscape ecological, epidemiological, and regional science approaches. As this is a graduate course, the bulk of the content will come from you, the student. The role of the instructor is mostly to provide structure and guidance. On the practical side, students will be introduced to five different software packages. Each student conducts an individual software project that relates to spatial analysis. The choice of software package is up to the respective student. The application area (field) is to be chosen by the student, who in turn is responsible for gathering the necessary data.

Textbook: There is no required textbook. A small list of books relevant to this course will be discussed during our first session. Reading material for each session will be made available in advance through the course BlackBoard site. In addition, every student will receive pointers to specific readings for their assigned methods session. Recommended books are:

Ripley, 1988 Statistical Inference for Spatial Processes
Longley and Batty, 1996 Spatial Analysis: modeling in a GIS environment
Fotheringham et al., 2000 Quantitative Geography
Schabenberger and Gotway, 2005 Statistical Methods for Spatial Data Analysis
Wang, 2006 Quantitative Methods and Applications in GIS

Pre- and co-requisites: GTECH 702 (advised), and permission of the instructor.

Policies:
Attendance is crucial. Given that the class-learning environment is active learning, meaning that most of the student performance is practical assignments rather than tests, adherence to protocols and the course timetable is very important. Lateness in arriving at class, both lectures and laboratory/discussion sections will not be tolerated. Active involvement in the course is evidenced in part by undertaking the mechanics of the practical assignments systematically, and learning the tools by hours of practice. In so doing the tools soon come to be seen as a means to an end, rather than the end itself. For example, you will make many maps, and may get caught up in this creative activity, but remember that the maps are being made for particular scientific purposes. Class participation includes timely attendance at laboratory sessions, participation in organized class discussions, accomplishments of in-class tasks, accomplishment of the preliminary assignment on time, and participation in the map poster display (if this is a part of the course this semester). Remember that a good part of your grade depends on class participation.
Plagiarism is simply not acceptable. Helping other students on use of the software is encouraged. However, do not help other students answer questions from the labs. Many of the problems have a "sample" problem, which includes the answer. The best way to help your fellow students is to work the sample problem. If a sample problem is not available, create an exercise similar to the problem in the lab and solve that problem. You can't actually learn this material unless you do the work yourself. Therefore, do not share your calculations or measurements with other students. You must do your own work (and it is easy to see when students copy work from other students). Students with labs showing copied work can receive failing grades.

Special accommodations for persons with disabilities are provided upon request. Please see the instructor if you feel the need for them.

Lab policies are described in detail in http://everest.hunter.cuny.edu/~tbw/spars/rules.html

Assignments are to be submitted electronically via BlackBoard. I expect assignments, big and small, to be submitted by announced dates. I may give grace periods (maximum of a few days) if logistical problems arise. It is in your best interests to keep up with the work and meet deadlines for assignments. Following Hunter policies, incomplete grades and time extensions are not an option. There are no "extra-credit" assignments. Unless otherwise instructed, you will submit assignments in electronic form. For all labs, you are expected to show all the work you did in order to complete the assignment. It is more important how you did the work, than whether you got the right answer. Partial credit will be given for good work but incorrect results.

Criteria for evaluation:

Evaluation of academic performance is based on the preparation and presentation of your own session, a methods report, your lab exercises, your software project and your participation according to the following breakdown:

- Method presentation: 15%
- Method write-up: 15%
- Lab exercises: 30%
- Software project: 30%
- Participation: 10%

Numeric scores will be used throughout the semester. The course letter grade will be determined only at the end of the semester, although guidance as to letter grade standing will be given along the way.

All labs exercises are designed for a 4-hour period. You are free to work with them at your own leisure either in our computer labs, in your home department, or at your private home. As you are graduate students, you can use our computer labs at any time outside of the posted instruction times for other courses. It is your responsibility to manage your time to conduct both the labs as well as project work during the hours that the lab room is accessible. Of course, you are free to work at home as much you want – if you can arrange for access to the software that you need.

Each student conducts an individual semester-long software project that involves the quantitative analysis of a substantial geographical problem. There are no requirements with respect to what software the student uses. In a similar vein, the application area (field) is to be chosen by the student, who is also responsible for gathering the necessary data. Basically, you can choose whatever topic you want, provided it has to do with geographical analysis; the stress is on both words! It is your responsibility to find a suitable project, which will have to be accepted by the instructor. A few ready-made projects are available but experience shows that motivation increases when students take pride in their own project.
Schedule (subject to change):

<table>
<thead>
<tr>
<th>Session #</th>
<th>Date</th>
<th>Topic</th>
<th>BlackBoard Reading(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 31</td>
<td>Introduction, syllabus, rules What is special about spatial</td>
<td>Syllabus Anselin</td>
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<tr>
<td>2</td>
<td>Sep 7</td>
<td>Visual data exploration theory Lab 1: Visual data exploration</td>
<td>Bailey &amp; Gatrell Ch 3</td>
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<tr>
<td>3</td>
<td>Sep 14</td>
<td>Descriptive spatial statistics Local vs. global; terminology</td>
<td>tbd</td>
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<tr>
<td>4</td>
<td>Sep 21</td>
<td>Point pattern analysis Lab 2: NNA and k-hat</td>
<td>tbd</td>
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<tr>
<td>5</td>
<td>Sep 28</td>
<td>Landscape ecological measures and spatial crime analysis Lab 3: CrimeStat / FragStats</td>
<td>tbd</td>
</tr>
<tr>
<td>6</td>
<td>Oct 5</td>
<td>Regression review; autocorrelation</td>
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<tr>
<td>7</td>
<td>Oct 12</td>
<td>Residuals and GWR Lab 4: Autocorrelation lab and GWR</td>
<td>tbd</td>
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<tr>
<td>8</td>
<td>Oct 19</td>
<td>Spatial regression</td>
<td>tbd</td>
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<tr>
<td>9</td>
<td>Oct 26</td>
<td>Bayes and Markov</td>
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<td>10</td>
<td>Nov 2</td>
<td>Spatial interaction modeling</td>
<td>tbd</td>
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<td>11</td>
<td>Nov 9</td>
<td>Geostatistics Lab 5: Kriging</td>
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<td>12</td>
<td>Nov 16</td>
<td>GeoComputation</td>
<td>tbd</td>
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<tr>
<td>13</td>
<td>Nov 30</td>
<td>Comparison of software packages</td>
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<tr>
<td>14</td>
<td>Dec 7</td>
<td>Presentation of projects</td>
<td>tbd</td>
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It is the student’s responsibility to regularly check the course website on BlackBoard to become aware of changes to the schedule or other announcements.

Instructor expectations

**Hunter College...**

This is a place where students come to learn. It’s a place where knowledge is developed and hopefully it’s a place where students can see and participate in its development. Unlike previous schooling you don't have to be here, so we’ll assume that you want to be here and that you are here to actively seek knowledge and skills. With assumptions that you are (a) here of your own free will and (b) are actively seeking to gain knowledge and skills, there is only one fuzzy area (for some) - how to succeed! It’s really quite simple: have fun. If you are enjoying what you are doing, you will succeed; if you are taking subjects or studying in a particular program and not enjoying it, you are unlikely to be successful.

A few words on success and enjoyment. Success is not just measured by your grade (but passing does help!), it is also measured by how you feel about what you are doing. You are the only person who can really judge whether you are successful - have you met your own expectations? Enjoyment does not necessarily mean stress free living (although maybe it is for some!). Taking only subjects that you were told were "easy" doesn't guarantee enjoyment; some of us require a challenge in life! Again, only you are in a position to determine what you find enjoyable.

A final thought on what a university is: this is also a place where faculty comes to learn...
GTECH 705 Spatial Analysis

Students: to be successful you should be taking this subject because you want to take it, not because someone told you that you need to take it and you must be actively seeking knowledge and skills. This subject is a good participation "sport", but it's not a really good spectator event. You need to be proactive, be able to try something new, look at things from a new (spatial) perspective, ask questions, read read read. You need to know when to take a break, get some fresh air, rest your eyes (a Buddhist philosophy is quite useful...). Attend the lectures and practical sessions. when your absence is unavoidable, make sure you catch up on what was missed. Plan your week as best as possible and make the commitment to spend the amount of time needed for you to be successful. get a study partner or three, if this works for you.

Faculty: to be successful, I need to know that I've "made a difference" to at least some of my students, i.e., they feel successful. I'll provide a coherent subject structure, I'll deliver the best lecture possible on the day, and pointers to resources where possible and my tutors and I will provide sound practical instruction and practice our listening skills so that we can understand what difficulties you may be having, so that we can resolve them. Furthermore, we are available and approachable; ask questions in lectures, labs and at other times; use our office hours or make appointments to see us. Faculty have shown disappointing prowess at extra-sensory perception, please help us out!

We often lecture in subjects we are considered to have some expertise in; we are therefore fairly interested in the subject matter. We too are students in that we are continuing to learn new things in our areas of expertise and sometimes we are the ones who develop new knowledge in our areas of expertise!

Theory vs. practice: in lectures I try to provide an overview of the most important knowledge, but this never replaces the reading material. sometimes lectures and readings will cover the same ground, but often, the best that can be done in some fourteen sessions is to provide just a "flavor" of the subject matter, something to whet your appetite, something to set the context for your readings.

Finally...

The reason for this page of amateur pop psychology is two fold: (a) first I hope that prospective students take this subject for the right reasons (i.e. they believe that they will enjoy it) and are in the right frame of mind to be successful and (b) second, I hope that with a little mutual empathy the learning experience can be made better for both student and teacher. If we are not having fun, we are both doing something wrong!

I wish us a lot of fun in this course,

[Signature]