SSCI 583 – Spatial Analysis
Course Syllabus Spring 2014 (PRELIMINARY)

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Office Hours: Monday and Wednesday, 9-10 a.m. (PST – Pacific Standard Time)
I am always available asynchronously via e-mail. I am also available for synchronous chats via phone, audio or video most days and times *by prior arrangement* via e-mail. Or we can meet in my Adobe Connect room. Just get in touch!

Course Scope and Purpose

Spatial analysis is key to the successful application of GIS to today's difficult and critical environmental and social challenges. While digital mapping technologies such as Google Maps, Google Earth and Microsoft's Bing Maps are now in widespread general use, GIS only reaches its full potential when the power of spatial analysis is engaged. While the consumer oriented mapping tools are simple and intuitive for most people to use, spatial analysis requires a much deeper awareness of the underlying assumptions and methods. In fact, the easy access to very advanced spatial analytical tools in today's GIS is deceptive as it is fairly simple to walk through wizards and push buttons to perform an analysis, but much more difficult to produce a valid, defensible analytical result. Helping you become an informed spatial analyst is the goal of this course.

This course aims to provide students with the knowledge and skills necessary to investigate the spatial patterns which result from social and physical processes operating on or near the Earth's surface. Essential theoretical concepts of quantitative geography are examined, including measures of geographical distribution (including point and areal pattern analysis) and spatial autocorrelation, interpolation and network connectivity. The focus is on understanding the theories and context of spatial analysis so that you are equipped to find and apply the best analytical tool for your problem and to correctly and appropriately interpret and present your results. Since proficient spatial analysis requires imaginative application of a myriad of available tools, there are far more tools and techniques available than we can possibly cover in a single course. Therefore, practical assignments in this course are not intended to provide comprehensive training in any of the wide range of available tools, but rather to develop skills that will help you find, understand and use the multitude of tools and, importantly, the related learning resources when you need them in the future.

Learning Outcomes

On completion of this course, students should be able to:

- Plan, design and implement a spatial analysis project demonstrating the ability to select, apply and critically interpret appropriate methods for the analysis of geographical information.
- List several different approaches to spatial analysis and differentiate between them.

- Outline the geographic concepts of distance, adjacency, interaction and neighborhood and discuss how these are fundamental in performing spatial analysis.
- Explain how point patterns, including clustering, can be identified and understood as realizations of spatial processes.
- Discuss how linear feature concepts of length, direction and connection are represented and analyzed in networks.
- Apply appropriate spatial references (datum and projection) to spatial data before undertaking analysis.
- Outline the central role that spatial autocorrelation plays in spatial analysis and explain how it helps and hinders the use of current tools.
- Demonstrate how different concepts about nearness and neighborhoods result in a variety of interpolation methods that produce different results.
- Outline various ways that overlay is implemented in GIS.
- List several emerging geographical analysis techniques using temporal and 3D analysis.

Textbook and other readings

The required textbooks for this course are:

O'Sullivan, D, and DJ Unwin, 2010. *Geographic Information Analysis*, 2nd Edition. John Wiley & Sons. *While you may purchase this book if you wish to own a bound copy, it is now available on-line through the USC library. Sign on to the USC library and search for this title.*

Mitchel, Andy. *The Esri Guide to GIS Analysis* (three volumes), Esri Press.
1999. Volume 1: Geographic Patterns and Relationships
2005. Volume 2: Spatial Measurements and Statistics
2012. Volume 3: Modeling Suitability, Movement, and Interaction

Since the O'Sullivan and Unwin text is available free on-line, you are asked also to purchase an additional three Esri publications about spatial analysis. The more practical Miller books are useful in association with the theoretical text as a means of bringing theory into a working context. Used copies of these books are widely available on-line, so there's no need to pay the full retail price.

Additional readings will be assigned from many sources, including:

de Smith, MJ, MF Goodchild and PA Longley, 2006-2011. *Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools*, 3rd Edition. Available in both print and a (free!) web version at www.spatialanalysisonline.com.

Kemp, K.K., ed. 2008. *Encyclopedia of Geographic Information Science,* Sage Publications. Available online from USC library.

Course Structure

The main theoretical concepts are provided through a directed reading of the text *Geographic Information Analysis*. The course reader will emerge as a collection of reading notes that provide the basis for an informed review of most chapters. Additional readings will be assigned to expand on the text contents when needed. The course will generally unfold on a biweekly basis.

When possible, assignments will be given in advance, but usually they will be posted on or before Mondays.

Practical exercises utilize published tutorial materials using ArcGIS and a final project allows students to demonstrate their ability to apply spatial analytical tools in an appropriate, informed manner.

Assessment

Assessment is by coursework. There will be three kinds of assessments which unless otherwise noted are due by 11:59pm Pacific Time on MONDAYS. Grade penalties apply for late assignments. Your attention to on-time assignment submission is essential if I am to meet my goal to return comments on your submitted assignments before the next one is due. Sometimes this is impossible, so I will post a notice on anticipated delays if needed.

Readings Homework – 7 making up 30% of course grade. These will focus on the text and other readings assigned in the course with one due approximately every other week. Their objective is to help you evaluate and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work, some will be individual efforts, one early in the term will involve a one-on-one presentation to the instructor. These are graded on an A/B/C scale - A is excellent, B is good, C is not acceptable. *Late submissions will be docked one grade. No grade will be given for assignments turned in over one week late.*

Tutorials (Credit) – 6 making up 25% of course grade. Due almost every other week, a hands-on tutorial from the Esri tutorial collection will be used to practice the techniques covered in the text. A brief written report will be assigned to demonstrate that you have completed each tutorial. These are graded on a credit/no credit basis, *with no credit given for late submissions.* The following final grade calculation will be used:

- All assignments completed, on time, with credit = A
- All assignments but 1 completed, on time, with credit = B
- All but 2 completed, on time, with credit = C
- More than 2 not completed = no grade for the hands-on exercises component

Tutorial (Graded) – 1 making up 5% of course grade. One of the hands-on exercises is more substantial, requiring more thought and effort. This one will be graded, like Readings Homework, on the A/B/C scale as described above. *Late submissions will be docked one grade. No grade will be given for assignments turned in over one week late.*

Final Project – several components making up 40% of course grade. To integrate learning of all the material covered in the course, for the final project, students will design, undertake and report on an individually chosen spatial analysis project that will be the context of discussion in several of the assignments. In addition to submitting a fully annotated and illustrated project report, students will present a public presentation. The Final Project will have several components including a proposal, background research, data assessment, analysis, report and a public presentation (made on-line via *Adobe Connect*). More details on the project will be provided soon.

Bonus points for social networking – up to 5% additional. This semester, we are going to try some social media techniques. For each tutorial, I always create a Discussion Thread on which students can post questions and requests for help. To encourage YOU to help out as soon as you see someone's call for help, I will give bonus points for participation in these Tutorial discussion forums. Within Blackboard discussions, it is possible to set user ratings on, so you will see a 5-start rating option to use for suggestions and hints that you find to be helpful. *Those who create those extra helpful posts will be eligible for bonus points.* I'll remind you to use this rating option as we go along.

I will also give bonus points for any interesting, informative non-required activity on Discussion Boards, including thought-provoking questions. Bonus points for thought-provoking responses, too! One bonus point for each unique contribution on different topics.

Requirements

Technology – There are several technology requirements:

- ArcGIS is provided on-line via the GIST Server, you do not need to install it on your own computer.
- Every student must have a computer with a fast Internet connection (DSL at a minimum). Since we now serve the key software from the Server, you can use either a Mac or a PC.
- Every student MUST have a functional webcam and audio input (either phone or computer) for use whenever a presentation or face-to-face meeting is scheduled.

Communications – This is a distance learning course, so most of our interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via Blackboard. We will have at least one assigned on-line bulletin board discussion and I will create and monitor BB forums through which we can discuss issues and comments on the course assignments, exercises and project as the need arises.

I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard or from me. Also double check to be sure that mail sent from both the USC blackboard accounts and my private domain (sujinlee@usc.edu) does not go into your junk mail!

While I am usually on-line all day and will probably respond to emails from students very quickly, I will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 36 hours delay. In the rare case when I expect to be off-line for more than 24 hours, I will post an announcement on the Blackboard site.

Your responsibility: It is each student's responsibility to stay informed about what is going on in our course. In addition to email about time-sensitive topics, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

Workload – This is a four credit, one semester course. Students should expect to spend 10-12 hours per week completing the work in this course.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to an instructor as early in the semester as possible. DSP is located in STU 301 and is open from 8:30 a.m. to 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://web-app.usc.edu/scampus/wp-content/uploads/2009/08/appendix_a.pdf . Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Important Administrative Dates*

1/13:	Spring semester classes begin.
1/20:	Martin Luther King's Birthday, university holiday
1/31:	Last day to register & add classes, change enrollment option to Pass/No Pass or Audit, purchase or waive tuition refund insurance or drop a class without a mark of "W," except for Monday-only classes and receive a 100% refund
2/4:	Last day to drop a class without a grade of "W"
2/17:	Presidents' Day, university holiday
3/17-22:	Spring Recess
4/11:	Last day to drop a class with a grade of "W"
5/2:	Classes End
5/7:	Final Projects due for this class
5/16:	Commencement

*http://academics.usc.edu/calendar/2013-2014/

Course Schedule (next page)

Course Schedule (TENTATIVE)

Week	Starts	Ass'nt due Monday, 9:00 am PT	Theme	Readings		Hands-on	Project components due
				O'Sullivan & Unwin	Miller		
1	13-Jan		Introduction	Various		T1- Introduction (CR)	
2	20-Jan	T1	Intro to GI analysis	Ch 1+2	I Ch 1, 2		
3	27-Jan	R1	Spatial data			T2 - MAUP (G)	
4	3-Feb	T2	Maps for spatial analysis	Ch 3+4	I Ch 3	T3 - ModelBuilder, Coordinate Systems (CR)	
5	10-Feb	R2	Spatial processes				
6	17-Feb	T3	Point pattern analysis	Ch 5, 6	I Ch 4		
7	24-Feb	R3			II Ch 1, 2	T4 - Point pattern (CR)	
8	3-Mar	T4	Spatial autocorrelation	Ch 7,8,9	I Ch 6		
9	10-Mar	R4			II Ch 3, 4	T5 - Comparing distributions (CR)	Topic discuss
	17-Mar	Spring Recess	Spatial interpolation				
10	24-Mar	T5		Readings	III Ch 5		
11	31-Mar	R5				T6 - Interpolation (CR)	Proposal
12	7-Apr	T6	Overlay	Ch 11	I Ch 5		
13	14-Apr	R6			III Ch 2,3	T7 - Overlay (CR)	Data Report
14	21-Apr	T7	Time, change and 3D	Readings	I Ch 7	Project	
15	28-Apr	R7		Ch 12			Presentation
	5-May					Project reports due 5/7	Report
		T = Tutorial				CR = credit only	
		R = Reading				G = graded	