

SSCI 584, Spatial Modeling

Syllabus

Units: 4

Term- Day-Time: Summer, 2015, Online

Location: Online

Instructor: Dr. Su Jin Lee

Office: AHF B55K

Office Hours: Mondays and Wednesdays, 9-10 a.m. PT, and by appointment at other times. I am always available asynchronously via email. I am also available for synchronous chats via phone or Skype or IM text, audio or video most days and times by prior arrangement via email. Or we can meet in my Adobe Connect room. Just get in touch!

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Course Description

This course will take you beyond the basic understanding of spatial analysis tools you learned in SSCI 583 Spatial Analysis.

Why should you take this course? This course will provide you with an understanding of a range of spatial modeling concepts, approaches and applications, as well as methods for determining the suitability of a particular modeling approach for a given task. Designed as an online version of an advanced studio course and graduate seminar, you will work individually and in groups to explore, learn, and teach about several different solutions to geospatial modeling challenges.

Expectations in the workplace for today's GIS professionals include the ability to learn continuously, work with many different kinds of data and tools, and with other professionals in other disciplines, domains, and agencies. There are many unique and deep skill sets needed in today's world. However, they do not stand alone; the ability to collaborate, to learn from others and to expand opportunities jointly are essential. The collaborative component of this course is essential.

Learning Objectives

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

- Explain how complex spatial models can be used to help solve and understand environmental and social problems and management challenges.
- Describe the range of tools and techniques that fall within the collection of spatial analytical models.
- Represent spatially and temporally dynamic social and environmental processes using spatial modeling tools.
- Assess the validity, uncertainty and sensitivity of model results, both in the research literature and in your own work.
- Use and integrate with ArcGIS, alternative modeling solutions including open source GIS options and external software applications.
- Solve GIS tasks of moderate complexity independently with the help of various online resources.
- Collaborate with others to develop team expertise in advanced modeling tools.
- Working with domain experts, outline possible modeling solutions for their loosely specified spatial problems.
- Convey complex technical information and modeling results to a non-technical audience through presentations, reports and graphics.
- Describe how different GIS, modeling, mathematical, and statistical software packages can be integrated to produce results that none of these systems in isolation is able to produce.

Prerequisite(s): None

Co-Requisite (s): None

Concurrent Enrollment: None

Recommended Preparation: SSCI 583

Course Structure

The main theoretical concepts will be provided through text readings and self-directed research you will do in the published literature and on the web and through hands-on experimentation with various tools and technologies.

The course will generally unfold on a biweekly basis. Each pair of weeks, called modules, will be focused on a particular aspect of spatial modeling. In order to make sure you are exposed to as broad a range of material as possible, for some modules, the class will be divided into small groups, each of which will be charged with learning about a different modeling solution or environment. Group members will support each other as you learn your assigned topic, completing some intermediate assignments. At the end of these group work modules, each group will present what they have learned to the remainder of the class in a brief lesson (written or on-line). In this way you will learn some of the material deeply while also learning a little about related topics. You will finish the course by completing a spatial modeling project on a topic of your choice either on your own or in a self-identified group.

Workload – This is a four credit, one semester course. Students should expect to spend 10-15 hours per week completing the work in this course.

Technological and Communication Requirements

ArcGIS is provided online via the GIST Server; hence, you do not need to install it on your own computer. Instead, every student must meet the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone for use whenever a presentation or meeting is scheduled.
- A current web browser, Firefox recommended, to access the GIST Server

GIST Server and Tech Support – This course will utilize the SSI GIST Server which is a virtual desktop. You access the GIST Server at <https://gistonline.usc.edu>. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to GIST Tech Support at gistsupport@dornsife.usc.edu, making sure to copy (cc) me on the email. GIST Tech Support is available Monday through Friday, 9 a.m. to 5 p.m. PT.

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. 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.

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. Do not ignore course email until the day before assignments are due. Also double check to be sure that email sent from the USC blackboard account 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 48 hours delay. In the rare case when I expect to be off-line for more than 72 hours, I will post an announcement on the Blackboard site.

Discussion boards – On the Blackboard site, I will post a series of discussion threads relevant to various sections of the course. Discussions provide a key means for student-to-student discussion and collaboration that can replicate the face-to-face contact you may have experienced in traditional classrooms. Here students can provide support to each other while working on your assignments, sharing hints and helpful tips, as you would in a classroom laboratory. Please post your questions about assignments there, as you would ask them publically in the classroom. I monitor the discussion threads and offer comments when necessary, but more importantly, consider the discussion board a key way to connect with your classmates and share your discoveries.

Required Readings and Supplementary Materials

The required textbooks for this course are:

- O’Sullivan, David, and George L. W. Perry. 2013. *Spatial Simulation: Exploring Pattern and Process*. Hoboken, NJ, Wiley-Blackwell.
- Mitchell, Andy. 2012. *The Esri Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement, and Interaction*. Redlands, CA, Esri Press.
- Zuur, Alain F., Elena N. Leno, and Erik Meesters. 2009. *A Beginner's Guide to R*. New York, Springer. Available online at USC Library.

Additional readings that focus on topics relevant to course themes selected by students will be identified as part of the literature search components of each course section.

Description and Assessment of Assignments

There are several different kinds of assignments with at least one due weekly. These are described in the Weekly Folders on Blackboard. Due dates are shown in the summary that follows.

Resume Assignment (2%): We require all current students to post and maintain a public resume, short biography and recent photo on our shared GIST Student Community Blackboard site. With your permission, your resume will be included in the GIST Resume Book. The latter is compiled annually and, along with our web presence, used to promote our programs and more importantly, your skills, experience, and professional aspirations.

Blogs/Wikis (20%): Throughout the semester the class will explore a variety of topics through graded blogs and wikis. These tasks are designed to engage you in the material and to expand your research results beyond what you are personally able to *uncover*. Requirements for participation by way of comments and responses will be provided in detail in the assignment instructions.

Modeling Assignments (20%): The modeling assignments will give you hands-on experience with several different modeling tools and environments (including ArcGIS, NetLogo, and R).

Lesson Presentations (20%): Two of the modules will end with the presentation of a brief lesson through which you will teach your classmates what you have learned (teaching is the best way to learn).

Final Project (32%): To integrate your learning of all the material covered in the course, you will design, undertake and report on an individually chosen spatial modeling project. The Final Project will have four components including a brief topic statement so that we can discuss your idea (2%), a proposal with theoretical context and model conceptualization (10%), a public presentation (5%) made online via Adobe Connect and a fully annotated and illustrated project report on your model implementation (15%).

Responses to postings (6%): In order to ensure that everyone learns from everyone else, each student is required to be active in responding to the wiki and blog postings and lesson presentations from other students. Responses must be substantial, informative or probing. Six of the assignments require such responses.

Grading Breakdown

Assessment	Number	Points Per Assignment	% of Grade
Resume Assignment	1	2	2
Blogs and Wikis	4	5	20
Modeling Assignments	4	5	20
Lesson Presentations	2	10	20
Responses	6	-	6
Final Project			
Topic Statement	1	2	2
Proposal	1	10	10
Presentation	1	5	5
Report	1	15	15
Totals	17	-	100

Assignment Submission Policy

Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below.

Additional Policies

Students are expected to complete and upload all assignments no later than 11:59 p.m. PT on the deadlines detailed in the Course Schedule. Late work will be assessed a penalty of 10% per day and zero grades will be assigned for work that is more than 7 days late.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Assignments	Deliverables/Due Dates
Week 1 5/20	Modeling Foundations: Introductions and some introductory materials to help you get oriented to this course. It is important to establish some conceptual foundations so that we have a common language to describe our modeling practices. Digging into the modeling literature, we will develop a wiki of key terms and concepts.	O'Sullivan & Perry, Ch. 1 Mitchell, Ch. 1 Resume Assignment Intro Blog Response to Intro Blog	No deliverables.
Week 2 5/26		O'Sullivan & Perry, Ch. 2 and 6 Modeling Wiki 1 Response to Modeling Wiki 1	Resume Assignment: Tuesday, 5/26 Intro Blog: Tuesday, 5/26 Response to Intro Blog: Thursday, 5/28

Week 3 6/1	Modeling with ArcGIS: In this first modeling module we'll work in familiar territory by using the modeling tools available in ArcGIS.	Mitchell, Ch. 4-6 ArcGIS Assignment	Modeling Wiki 1: Monday, 6/1 Response to Modeling Wiki 1: Thursday, 6/4
Week 4 6/8		From Library Research Lesson (ArcGIS) Response to Lesson (ArcGIS)	ArcGIS Assignment: Monday, 6/8
Week 5 6/15	Agent-based Models: A new tool and a completely new way of thinking about spatial models and spatial modeling.	O'Sullivan & Perry, Ch. 3-5 Modeling Wiki 2 Response to Modeling Wiki 2	Lesson (ArcGIS): Monday, 6/15 Response to Lesson (ArcGIS): Thursday, 6/18
Week 6 6/22		From Library Research NetLogo Assignment	Modeling Wiki 2: Monday, 6/22 Response to Modeling Wiki 2: Friday, 6/26
Week 7 6/29	External Models: This module will give you an opportunity to look at a lot of very different kinds of models, and begin to make some decisions about what you'll do in your project.	From Web Research Modeling Wiki 3 Response to Modeling Wiki 3	NetLogo Assignment: Monday, 6/29
Week 8 7/6		From Library Research Lesson (External) Response to Lesson (External)	Modeling Wiki 3: Monday, 7/6 Response to Modeling Wiki 3: Thursday, 7/9
Week 9 7/13	Documenting Models: Now you will begin on your project by preparing a proposal of your intended model. This week's assignment is intended to get you started in the difficult task of designing and documenting models.	O'Sullivan & Perry, Ch. 7-9 Topic Statement Individual Meeting Project Proposal	Lesson (External): Monday, 7/13 Response to Lesson (External): Thursday, 7/16 Topic Statements: Tuesday, 7/14 Individual meeting: Wednesday, 7/15
Week 10 7/20	Modeling with R: Modeling language R provides infinite opportunities for spatial modeling. Your challenge is to get your feet wet in the leading programming language for statistical and scientific modeling, R, without having to learn much about programming!	R tutorial R Assignment 1	Project Proposal: Tuesday, 7/21
Week 11 7/27		Zuur, Ieno, and Meesters, Ch.1-4, & 9 R Assignment 2	R Assignment 1: Monday, 7/27
Week 12 8/3	Final Project: These final weeks are devoted to completing, presenting and reporting on your final project.	Project Presentation Project Report	R Assignment 2: Monday, 8/3 Project Presentation: Monday, 8/7
Week 13 8/10			Project Report: No later than 05:00 p.m. PT on Tuesday, 8/11

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism—presenting someone else’s ideas as your own, either verbatim or recast in your own words—is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/b/11-00-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC’s schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Resources for On-line Students

Our course Blackboard site provides links to several different resources that you may need. In particular, you will be making frequent use of the on-line USC Library that is available to all registered students through the link <http://www.usc.edu/libraries>. Once on this site, you can find additional resources for distance students under the link “Library Services”. Many other resources and links to key people you may need to contact are also listed on the Blackboard site under Other Resources and Contacts.