USC Dornsife
Dana and David Dornsife
College of Letters, Arts and Sciences
Spatial Sciences Institute

SSCI 587 (Section 35715), Spatial Data Acquisition

Syllabus

Units: 4

Term- Day-Time: Fall, 2015, Online

Location: Online, via Blackboard

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!

Contact Info:
Email: sujinlee@usc.edu
Blue Jeans: www.bluejeans.com/sujinlee
Adobe Connect: https://usccollege.adobeconnect.com/sujinlee/
Skype: sujinlee93
Office: 213-740-2845

GIS Library Help: Katharin Peter
Office: VKC B40a
Office Hours: By appointment
Contact Info:
Email: kpeter@usc.edu
Office: 213-740-1700

IT Help: Richard Tsung
Office: AHF B57B
Hours of Service: Mondays to Fridays, 9-5 p.m. PT
Contact Info:
Email: GISTsupport@usc.edu
Office: 213-821-4415

Course Scope and Purpose

This course is a required course for both the GIST M.S. and Graduate Certificate programs and provides students with the requisite knowledge and practical skills to source and evaluate, against recognized quality standards, data for use in GIS-based projects and assess the quality of information output from those projects. We will cover several topics, such as:

Data Needs and Types – We start by focusing on the data challenge, defining data needs, and the role of conceptualization, entitation, and quantification in scientific research and management, and an introduction to some of the ways in which spatial and attribute data can be gathered and used to serve specific needs.

Remotely Sensed Data – We discuss the various ways in which data can be captured and collected remotely using various platforms. We focus on Global Navigation Satellite Systems (GNSS) as well as other aerial and satellite systems as valuable sources of spatial data.

Data Capture and Estimation – We discuss the various ways legacy digital data can be sourced, evaluated and used in specific projects, as well as ways to interpolate attribute values at unsampled locations and/or times (i.e. grid cells or specific locations) and features (i.e. regions, polygons, lines, points, etc.).

Data Quality – We discuss data standards and how they are used to promote and/or preserve data quality. We also examine the various types and sources of error that we may encounter as a part of the data stream that might be used for a specific project. Here we consider the various ways in which we can check for errors and cope with uncertainty when using GIS to help inform the decisions and actions we may take to achieve one or more specific outcomes in the real world.

GIS and GPS Skills – We explore the ways in which the Esri and Trimble software ecosystems can be used to support spatial data acquisition, analysis and visualization. This part of the course includes two sets of tutorials – the first focused on GPS and the second on GIS – and a field project on Catalina Island where students design, conduct, and present the results of their own GPS-based data collection projects. Please note that in addition to the regular tuition cost, there is a room and board fee of approximately $320 for the week-long field trip to the Philip K. Wrigley Marine Science Center on Catalina Island.

Master's Thesis Prospectus – GIST M.S. and GIST Graduate Certificate students planning to transition to the GIST M.S. Program will utilize the concepts and ideas gleaned from *SSCI 581: Concepts for Spatial Thinking* and this course to prepare an abstract, extended abstract and prospectus for their master's thesis projects. The thesis represents the capstone project for the GIST M.S. degree and various project elements will be interspersed throughout the required and elective courses leading to *SSCI 594ab: Master's Thesis.*

This course will utilize faculty members from the USC Writing Program in selected assignments because we know that successful spatial scientists need great

communication as well as cutting-edge spatial skills to prosper in today's fast-moving and rapidly evolving world.

Learning Objectives
When you have completed this course, you will be able to:

- Design and implement a strategy for capturing or sourcing geospatial data and any accompanying metadata;
- Assess the impact of national and international data standards on the sourcing and availability of geospatial data;
- Critically evaluate the potential impacts of data quality on spatial analysis and decision making;
- Specify fitness for purpose (i.e. use) criteria and apply them to the evaluation of geospatial data for specific applications; and
- Master the basic elements of Trimble's GPS field mapping and Esri's ArcGIS spatial analysis and mapping ecosystems so you can acquire, organize, store, analyze, model, visualize, and share your own spatial data.

Prerequisite(s): None
Co-Requisite (s): None
Concurrent Enrollment: None
Recommended Preparation: SSCI 581

Course Formats
This is a graduate level course, so you should expect this class to be both academically robust and intellectually challenging. As graduate students you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in our reading materials and with one another. As in any graduate-level class, the instructor's role is that of a guide who keeps you on this path of discovery and you will find that you will learn much from your fellow classmates. This is especially the case within the milieu of "online learning".

All course materials will be organized through Blackboard. The main theoretical concepts will be provided through course notes and assigned readings. Hands-on practical exercises will use various software products accessible over the Internet. Assignments will give students an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments require student interaction; all will benefit from it.

We have several technologies that will facilitate our course work and our interactions, despite our dispersed locations. These include:

Blackboard: All course materials and correspondence will be posted on the course Blackboard site. As a registered student, you will find this course will show up in your available courses no later than 12:00 p.m. PT on the first day of classes. It is here that the day-to-day flow of the course will be recorded.

Discussion boards: On the Blackboard site, we will post a number of discussion threads relevant to various sections of the course. These threads are very important in terms of providing support to each other while working on class exercises to share hints and helpful tips, as you would in a classroom laboratory. I will check the discussion threads periodically and offer occasional comments. Please send me an email directly if you have a question or concern that requires my immediate attention.

Live meetings and presentations: We will use a browser-based service called Adobe Connect to create synchronous, interactive sessions. With voice and webcam capabilities Adobe Connect can be used to share presentations and even our desktops between two or more people.

Individual meetings: While Adobe Connect can be used for one-on-one meetings, we generally find it is easier to use the free VOIP and chat technology, Blue Jeans (http://www.bluejeans.com) or Skype (http://www.skype.com) for individual chats.

GIST server and tech support: This course will utilize the GIST Server which is a virtual desktop. You can 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 to GIST Tech Support at gistsupport@dornsife.usc.edu and make sure to copy (cc) me on the email. GIST Tech Support is available Monday through Friday, 9 a.m.-5 p.m. PT.

Technological Proficiency and Hardware/Software Required

The geospatial software and data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute.

ArcGIS is provided online via the GIST Server and we will provide laptops with Esri and Trimble software and a variety of GPS and related data capture devices for the Catalina field component. You must satisfy the following technology requirements:

- Every student MUST have a computer with a fast Internet connection.
- Every student MUST have a functional webcam and a microphone for use whenever a presentation or 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 the Blackboard Assessment link. I will also create Blackboard discussion forums throughout the semester that we will use for the aforementioned assignments and so we can discuss issues and comments on the course assignments, exercises, and projects as the need arises.

In addition, I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all e-mail sent from Blackboard or from

me. Check now to make 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 online and will probably respond to emails from students relatively 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 offline for more than 72 hours, I will post an announcement on the Blackboard site.

That said, 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 graduate level course. Students should expect to spend 10-15 hours per week completing the work in this course.

Required Readings and Supplementary Materials

Textbooks – There are three required texts for this course. They are available from the USC Bookstore or online outlets such as Amazon. We encourage you to purchase these books immediately since you will need these materials from the opening day of class. The Wilson and Fotheringham book is available through USC Libraries as an e-Book.

- Bolstad, Paul. 2012. *GIS Fundamentals: A First Text on Geographic Information Systems,* 4th edition. White Bear Lake, MN, Elder Press (available at http://www.AtlasBooks.com).
- Wilson, John P, and A. Stewart Fotheringham (editors). 2008. *The Handbook of Geographic Information Science.* Oxford, Blackwell.
- Price, Maribeth. 2016. *Mastering ArcGIS,* 7th edition. New York, McGraw-Hill.

You will recognize that all three books are also required for *SSCI 581: Concepts for Spatial Thinking*. These textbooks will be supplemented with Course Notes and a mixture of readings from academic journals, professional reports, and authoritative websites.

Readings – The following journal articles will be posted to Blackboard under Weekly Assignments:

- Chrisman, Nicholas R. 1984. The Role of Quality Information in the Long-Term Functioning of A Geographic Information System. *Cartographica* 21: 79-87.
- Johnson, Chris E, and Christopher C Barton. 2004. Where in the World Are My Field Plots? Using GPS Effectively in Environmental Field Studies. *Frontiers in Ecology and the Environment* 2: 475-482.
- Walter, Brittany S, and John J. Schultz. 2013. Mapping Simulated Scenes with Skeletal Remains using Differential GPS in Open Environments: An Assessment of Accuracy and Practicality. *Forensic Science International* 228: e-33-e46.
- Patino, Jorge E, and Juan C. Duque. 2013. A Review of Regional Science

Applications of Satellite Remote Sensing in Urban Settings. *Computers, Environment and Urban Systems* 37: 1-17.

- Goodchild, Michael F. 2011. Scale in GIS: An Overview. *Geomorphology* 130: 5-9.
- Goldberg, Daniel W, and Myles G. Cockburn. 2010. Improving Geocoding Accuracy with Candidate Selection Criteria. *Transactions in GIS* 14: 149-176.
- Fisher, Peter, Alexis Comber, and Richard Wadsworth. 2010. What's in A Name? Semantics, Standards, and Data Quality. In *Spatial Data Quality: From Process to Decisions,* edited by Rodolphe Devillers and Helen Goodchild, 3-16. Boca Raton, FL, CRC Press.
- De Genst, William, Frank Canters, and Hubert Gulinck. 2001. Uncertainty Modeling in Buffer Operations Applied to Connectivity Analysis. *Transactions in GIS* 5: 305-326.
- Li, Peng, Chuang Shi, Zhenhong Li, Jan-Peter Muller, Jane Drummond, Xiuyang Li, Tao Li, Yingbing Li, and Jingnan Liu. 2013. Evaluation of ASTER GDEM using GPS Benchmarks and SRTM in China. *International Journal of Remote Sensing* 34: 1744-1771.
- Onsrud, Harlan J. 2010. Liability for Spatial Data Quality. In *Spatial Data Quality: From Process to Decisions,* edited by Rodolphe Devillers and Helen Goodchild, 187-196. Boca Raton, FL, CRC Press.

Description and Assessment of Assignments

Your grade in this class will be determined on the basis of several different assessment tools:

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. Unless you opt out, your photo and biographical profile will be posted to the Spatial Sciences Institute website and your resume will be included in the GIST Resume Book. The latter is compiled annually and along with our web presence, is used to promote our programs and more importantly, your skills, experience, and professional aspirations.

Reading Assignments (10%): Each student is required to complete five reading assignments for this class. The reading assignments will focus on the theory portion of the course as presented in the weekly readings. The 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 and some will be individual efforts. The first reading assignment is required and from there, you are free to choose any five of the 10 subsequent assignments. However, you must complete and submit them for grading in the weeks specified in the Tentative Schedule at the end of this syllabus. If you complete more than five reading assignments, I will use your five highest scores to calculate your course grade.

GPS Tutorials (6%): The "hands-on" GPS assignments will require you to work through various GPS skill development activities. To demonstrate that you have completed the

steps comprising each of these assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises, such as a map.

ArcGIS Tutorials (12%): The "hands-on" ArcGIS assignments will require you to walk through various GIS skill development activities that build on those completed in *SSCI 581: Concepts for Spatial Thinking.* To demonstrate that you have completed the steps comprising each of these assignments, you will submit a Word document containing digital output and/or brief text answers from parts of the exercises.

Discussion Forums (6%): These will focus on varying combinations of theory and practice and anticipate that you will post a minimum of three new messages (i.e. one per forum) and six replies (i.e. two per forum) to messages posted by your classmates at designated times throughout the semester.

Exercises (9%): To demonstrate your understanding of the basic concepts and skills learned in the class, you will complete three exercises that will integrate key concepts and ideas and take some independent thought. The final two exercises will take one or other of two forms depending on your student status. Students enrolled in the GIST M.S. Program will start work on their thesis prospectus and the remainder of the students will tackle a pair of exercises focused on fundamental geospatial information management challenges.

Catalina Field Component (25%): For this part of the class, you will be divided into small teams and each team will deliver two oral presentations (one at the start of the week on what they plan to do and one at the end of the week summarizing their results and what did and did not work for them) along with a poster presentation summarizing their project and the accompanying results. The posters must be submitted for grading (in electronic form) before leaving the island.

Research Reports (30%): The first report (10 points) will provide you with an opportunity to describe the data capture options and challenges for a project of your choice from a list of projects spanning a variety of application domains. The second report (20 points) will take one or other of two forms depending on your student status. Students enrolled in the GIST M.S. Program will prepare a prospectus for a thesis project and outline some of the methods and geospatial data sources that could be used in such a project. The remainder of the students would be afforded the opportunity to integrate all that they have learned in the semester in a specific application that I will designate when the guidelines for the final reports are distributed.

Careful planning and a serious, consistent commitment will be required for you to successfully navigate the various deliverables in this and other GIST courses. The table on the next page summarizes the SSCI 587 course assignments and their point distribution.

Grading Breakdown

Assignments	Number	Points Per Assignment	% of Grade
Resume Assignment	1	2	2
Reading Assignments	5	2	10
GPS Tutorials	2	3	6
ArcGIS Tutorials	4	3	12
Discussion Forums	3	2	6
Exercises	3	3	9
First Presentation	1	5	5
Second Presentation	1	10	10
Poster	1	10	10
Research Reports:			
First Report	1	10	10
Second Report	1	20	20
Totals	**23**	**-**	**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 attend and participate in every class session and 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 seven days late.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Assignments	Deliverables/Due Dates
Week 1 8/24	**Introduction to Class** Brief introductions coupled with a discussion of class goals, projects, technology, and reading assignments.	Wilson & Fotheringham, Ch. 1 Resume Assignment Discussion Forum 1	No deliverables.
Week 2 8/31	**Data Needs and Types** Data itself is a problem. A discussion of GIS data and its needs and types.	Course Notes Reading Assignment 1: Chrisman (1984)	Resume Assignment: Monday, 8/31 Discussion Forum 1: Monday, 8/31
Week 3 9/8	**Maps, Data Entry, Editing, and Output** A discussion of the traditional data production process that starts with maps and moves through data entry and editing on the path to output(s).	Bolstad, Ch. 4 Reading Assignment 2: Johnson & Barton (2004) ArcGIS Tutorial 1: Price, Ch. 7	Reading Assignment 1: Tuesday, 9/8

Week 4 9/14	**Global Navigation Satellite Systems** A discussion of the various approaches and techniques used in global navigation satellite systems and surveying.	Bolstad, Ch. 5 Reading Assignment 3: Walter & Schultz (2013) GPS Tutorial 1	Reading Assignment 2: Monday, 9/14 ArcGIS Tutorial 1: Monday, 9/14
Week 5 9/21	**Aerial and Satellite Images** A discussion of the role of aerial and satellite images in modern geoprocessing workflows.	Bolstad, Ch. 6 Reading Assignment 4: Patino & Duque (2013) Exercise 1 Discussion Forum 2	Reading Assignment 3: Monday, 9/21 GPS Tutorial 1: Monday, 9/21
Week 6 9/28		Wilson & Fotheringham, Ch. 3 Report 1 GPS Tutorial 2	Reading Assignment 4: Monday, 9/28 Exercise 1: Monday, 9/28 Discussion Forum 2: Monday, 9/28
Week 7 **10/5**	**Catalina Field Component** Gain hands-on experience with primary data collection utilizing Trimble hardware and software systems while spending the week at the USC Wrigley Institute at Santa Catalina Island.	Course notes Proposal Presentation Final Presentation Poster	Report 1: Sunday, 10/4 GPS Tutorial 2: Sunday, 10/4 Proposal Presentation: Wednesday, 10/6 Final Presentation: Sunday, 10/11 Poster: Sunday, 10/11
Week 8 10/12	**Scale** Understanding maps at different scales.	Reading Assignment 5: Goodchild (2011)	
Week 9 10/19	**Geocoding** Understanding the geocoding process.	Course Notes Reading Assignment 6: Goldberg & Cockburn (2010)	Reading Assignment 5: Monday, 10/19 Exercise 2: Monday, 10/19
Week 10 10/26	**Digital Data** A discussion of the various kinds of existing digital data that can be used to support modern geoprocessing workflows.	Bolstad, Ch. 7 Exercise 3 ArcGIS Tutorial 2: Price, Ch. 12	Reading Assignment 6: Monday, 10/26
Week 11 11/2		Wilson and Fotheringham, Ch. 2 and 4 Reading Assignment 7: Fisher et al. (2010)	Exercise 3: Monday, 11/2 ArcGIS Tutorial 2: Monday, 11/2
Week 12 11/9	**Spatial Estimation** An introduction to some of the opportunities of estimating values at locations where they have not been measured by way of spatial prediction.	Bolstad, Ch. 12 Reading Assignment 8: De Genst et al. (2001) Discussion Forum 3	Reading Assignment 7: Monday, 11/9

Week 13 11/16	**Data Standards and Data Quality** Discuss the various data standards that have been implemented and how they are used to simultaneously promote data quality on the one hand and support modern geospatial workflows on the other hand.	Bolstad, Ch. 14 Reading Assignment 9: Li et al. (2013) ArcGIS Tutorial 3: Price, Ch. 14	Reading Assignment 8: Monday, 11/16 Discussion Forum 3: Monday, 11/16
Week 14 11/23	**Types and Sources of Error** Explore types and sources of error.	Wilson & Fotheringham, Ch. 12 Reading Assignment 10: Onsrud (2010) Report 2	Reading Assignment 9: Sunday, 11/23 ArcGIS Tutorial 3: Sunday, 11/23
Week 15 11/30	**Data Quality and Management** Discuss the types of error that may be present in an operational GIS environment.	Goodchild (2009, p.15-24) ArcGIS Tutorial 4: Esri Training (Data QC with ArcGIS: Automating Validation)	Reading Assignment 10: Monday, 11/30 ArcGIS Tutorial 4: No later than 05:00 p.m. PT on Friday, 12/4 Report 2: No later than 05:00 p.m. PT on Friday, 12/4

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/1100-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 of the 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 http://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* https://dsp.usc.edu/ 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.