

SSCI 593, Geospatial Data Integration

Syllabus (Provisional)

Units: 4

Term — Day — Time: Summer, 2016, Online

Location: Online

Instructor: Katsuhiko “Kirk” Oda

Office: AHF B55J

Office Hours: Mondays 12-1 p.m. (PT), and Wednesdays 9-10 a.m., or by appointment

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GIS Librarian Help: Katharin Peter

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Course Description

Data integration is key to the successful application of GIS to help address today's environmental and social challenges. Data integration is the process of combining data residing in different sources and providing users with a unified view of these data. This process becomes significant in a variety of situations, which include both the commercial (i.e., companies needing to merge their databases) and scientific (i.e., combining research results from different repositories) domains. Data integration has come into play increasingly as the volume and need to share existing data continue to expand exponentially. In fact, the easy access to very advanced data sources and spatial tools in today's GIS is deceptive as it is fairly simple to walk through wizards and push buttons to perform a data extraction or analysis, but it is much more difficult to choose among similar data from different sources and to determine their correct use in GIS-based environments. This course builds on SSCI 587: Spatial Data Acquisition by considering several additional data streams and the impacts of data quality and related issues on data integration. Students will explore and use various kinds of data such as Volunteered Geographic Information (VGI) or crowdsourced data, and other forms of geospatial data available through public spatial data infrastructures and web portals. The tools and concepts we will cover apply to medium to advanced data integration and analysis tasks in GIS-based environments. Students will explore these concepts using both proprietary and open source platforms.

This course is a graduate level course, so you should expect this class to be 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 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." It will provide you with an understanding of public domain data types and resources from both the social and scientific domains. It will also teach you how to access public data types, and to explore, assess, pre-process and use them in various integration approaches for GIS-based analysis and applications in real-world settings. Helping you to become an informed data integration analyst is the goal of this course.

The workplace expectations for today's GIS professionals include the ability to learn continuously, work with many different kinds of data and with 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 required in today's workplace and mean that the collaborative component of this course is essential.

Learning Objectives

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

- Develop strategies to capture geospatial data and any accompanying metadata from various sources.
- Identify, download and format vector and raster spatial data from an online spatial data portal.
- Identify spatial data from associated metadata files.
- Integrate multiple geospatial data sources in one or more GIS-based environments.
- Analyze spatial data in one or more GIS-based analysis environments.
- Assess and solve moderate to complex real-world geospatial problems.
- Evaluate the impacts of data quality on the outcomes of spatial analysis and decision making.
- Critically evaluate different methodologies for GIS-based integration and analysis and their impact on open distribution.
- Collaborate with others to contribute in an original GIS-based integration project relevant to real-world geospatial problems using Esri's ArcGIS and other GIS tools.
- Evaluate the impact of the emerging cloud computing platforms on geospatial analysis and modeling.

Prerequisite(s): None

Co-Requisite (s): None

Concurrent Enrollment: None

Recommended Preparation: SSCI 587: Spatial Data Acquisition

Technological Proficiency and Hardware/Software Required

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 classes no later than 12:00 noon 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 related to various course topics. 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 do in a classroom setting. I will check the discussion threads periodically and offer occasional comments. Please send your course instructor an email directly if you have a question or concern that requires my immediate attention.

Individual meetings –We will use Bluejeans for group as well as one-on-one meetings. For those near the Los Angeles area, we encourage you to meet in person at the Spatial Sciences Institute.

GIST server and tech support – This course will utilize the GIST Servers to provide you with your own virtual desktop. You can access the GIST Server at: <http://gis-gateway.usc.edu>. If you are unable to connect to the server or experience technical issues, send an email to GIST Tech Support at gistsupport@dornsife.usc.edu and make sure to copy (cc) me on the email. ArcGIS is provided online via the GIST Server; hence, you do not need to install it on your own computer. Instead, every student must satisfy 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 modern web browser, Firefox recommended, to access the GIST Server.

Required Readings and Supplementary Materials

Textbooks –There are two texts for this course. Both of the texts are available through the USC Libraries as an e-Book.

- Elwood, S., Goodchild, M. F. and Sui, D. (editors). 2013, *Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice*, New York, NY: Springer.
- Kerski, J. J., and Clark, J. 2012. *The GIS Guide to Public Domain Data*, Redlands, CA: Esri Press. Mental Maps Section

Readings – Additional readings that focus on topics relevant to course themes will be provided through Blackboard.

- Bennett, J. 2010. *OpenStreetMap: Be Your Own Cartographer*, Birmingham, Packt Publishing (Chapter 1: Making a Free, Editable Map of the World)
- Connors, P., Lei, S., and Kelly, M. 2012, Citizen Science in the Age of Neogeography: Utilizing Volunteered Geographic Information for Environmental Monitoring, *Annals of the Association of American Geographers*, 102(6), 1267-1289.

- Croitoru, A., Crooks, A.T., Radzikowski, J., Stefanidis, A., Vatsavai, R. R. and Wayant, N. 2014, Geoinformatics and Social Media: A New Big Data Challenge, in Karimi, H. (ed.), *Big Data Techniques and Technologies in Geoinformatics*. Boca Raton, FL: CRC Press. pp. 207-232.
- Elwood, S., Goodchild, M., and Sui, D. 2012, Researching Volunteered Geographic Information: Spatial Data, Geographic Research, and New Social Practice. *Annals of the Association of American Geographers*, 102(3), 571-590.
- Goodchild, M. F. 2007. Citizens as Sensors: the World of Volunteered Geography. *GeoJournal*, 69(4), 211–221.
- Goodchild, M. and Li, L. 2012, Assuring the quality of volunteered geographic information, *Spatial Statistics*, 1, 110-120.
- Rice, M., Paez, F., Mulhollen, A., Shore, B. and Caldwell, D. 2012, *Crowdsourced Geospatial Data: A Report on the Emerging Phenomena of Crowdsourced and User-generated Geospatial Data*, Alexandria, VA: U.S. Army Topographic Engineering Center
- Sester, M., Arsanjani, J., Klammer, R., Burghardt, D., and Haunert, J. 2014, “Chapter 5: Integrating and Generalising Volunteered Geographic Information” in Burghardt, D., Duchene, C., and Mackaness, W. (eds.) *Abstracting Geographic Information in a Data Rich World: Methodologies and Applications of Map Generalization*. New York, NY: Springer.
- Sui, D. and Goodchild, M. F. 2011. The Convergence of GIS and Social Media: Challenges for GIScience. *International Journal of Geographical Information Science*, 25(11), 1737–1748.
- The Coalition of Geospatial Organizations (COGO). 2015. Report Card on the U.S. National Spatial Data Infrastructure (NSDI).

Description and Assessment of Assignments

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

Resume Assignment (2%) – 1 for a total of 2 points. The GIST Programs 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 resume will be posted to the Spatial Sciences Institute website and your resume will be included in the Spatial Sciences Institute Graduate Programs 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.

Discussion Forums (36%) – 12 for a total of 36 points. Weekly we will explore topics through graded discussion forums, blogs and/or wikis. These tasks are based on provided readings and are designed to engage you in the material and to expand your research results beyond what you are personally able to uncover.

Data Integration Exercises (24%) – 4 for a total of 24 points. These will be hands-on activities that will allow you to explore the real-world application scenarios of data integration using a variety of different data sources, data analysis and integration strategies.

Final Project (38%) – 4 components for a total of 38 points. The Final Project provides a group work opportunity to integrate all that you have learned in the semester. More details about the project will be provided as the course develops. However, the final project will be broken up into four distinct components with their own points and deadlines as follows: (1) a written proposal for your project and a group meeting for you to present and discuss your proposal and the various ways you might modify it (6 points); (2) a data report documenting the quality of data you have identified and acquired for your project (10 points); (3) a web app that show the results of your data integration (10 points); and (4) a final report will describe the problem or scenario that your will attempt to address, the data and technologies that you will choose for the project, the method that you will implement, the outcomes that you will obtain, and any implications and suggestions that you will conclude (12 points).

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 below summarizes the SSCI 593 course assignments and their point distribution:

Grading Breakdown

Assignment	Number	% of Grade
Data Integration Exercises	4	24
Discussion Forums	12	36
Final Project	4	38
Resume Assignment	1	2
TOTALS	21	100

Assignment Submission Policy

Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below. And finally, it is important to note from the outset that: (1) late postings and assignments will be docked one letter grade and no grade will be given

for postings or assignments turned in more than one week late; and (2) no written work will be accepted for grading after 5:00 p.m. PT on the last day of classes (see the Course Schedule).

Additional Policies

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. I will also create Blackboard discussion forums throughout the semester that we will use for the aforementioned assignments and so we can discuss comments and issues related to 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 email sent from Blackboard or from me. Check now to make sure that mail sent from both the USC blackboard accounts and my private domain (katsuhio@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 course. Students should expect to spend 10-15 hours per week completing the work in this course.

Course Schedule: A Weekly Breakdown (Tentative)

	Topics/Daily Activities	Readings and Homework	Deliverables/Due Dates
Week 1 5/18* *Class starts on Wednesday, 5/18	Introduction: Public Domain Data	Kerski & Clark (2012) <i>The GIS Guide to Public Domain Data</i>. Redlands, CA: Esri Press. (Ch. 1 Spatial Data and the Public Domain) Resume Assignment Discussion Forum 1 Data Integration Exercise 1	No deliverables.

Week 2 5/23	Introduction: VGI and Crowdsourcing	<p>Kerski & Clark (2012) <i>The GIS Guide to Public Domain Data</i>. Redlands, CA: Esri Press. (Ch. 8 The Data User as Data Provider)</p> <p>Elwood, Goodchild & Sui eds. (2013) <i>Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice</i>. New York, NY: Springer (Ch. 1: VGI, the Exaflood, and the Growing Digital Divide)</p> <p>Goodchild, M. F. (2007) Citizens as Sensors: the World of Volunteered Geography. <i>GeoJournal</i>, 69(4), 211–221.</p> <p>Discussion Forum 2</p>	<p>Submit Resume Assignment and Discussion Forum 1 no later than 5:00 p.m. on Monday, 5/23.</p> <p>Submit your response to Discussion Forum 1 no later than 5 p.m. on Wednesday, 5/25.</p>
Week 3 5/30* *Monday, 5/30 is a university holiday.	Introduction: GIS and Social Media	<p>Croitoru, A., Crooks, A.T., Radzikowski, J., Stefanidis, A., Vatsavai, R. R. and Wayant, N. (2014) Geoinformatics and Social Media: A New Big Data Challenge, in Karimi, H. (ed.), <i>Big Data Techniques and Technologies in Geoinformatics</i>. Boca Raton, FL: CRC Press. pp. 207-232.</p> <p>Sui, D. and Goodchild, M. F. (2011) The Convergence of GIS and Social Media: Challenges for GIScience. <i>International Journal of Geographical Information Science</i>, 25(11), 1737–1748.</p> <p>Discussion Forum 3 Data Integration Exercise 2</p>	<p>Submit Discussion Forum 2 and Data Integration Exercise 1 no later than 5:00 p.m. on Tuesday, 5/31.</p> <p>Submit your response to Discussion Forum 2 and Data Integration Exercise 1 no later than 5 p.m. on Thursday, 6/2.</p>
Week 4 6/6	Public Domain Data: Issues and Metadata	<p>Kerski & Clark (2012) <i>The GIS Guide to Public Domain Data</i>. Redlands, CA: Esri Press. (Ch. 2 Spatial Data Models, Vector Data, Data Quality and Ch. 3 Raster Data and Privacy Issues, and Ch. 5 National and State Data Portals and Metadata Standards)</p> <p>Discussion Forum 4</p>	<p>Submit Discussion Forum 3 no later than 5:00 p.m. on Monday, 6/6.</p> <p>Submit your response to Discussion Forum 3 no later than 5 p.m. on Wednesday, 6/18.</p>
Week 5 6/13	Public Domain Data: NSDI Framework	<p>The Coalition of Geospatial Organizations (2015) Report Card on the U.S. National Spatial Data Infrastructure.</p> <p>Discussion Forum 5 Data Integration Exercise 3</p>	<p>Submit Discussion Forum 4 and Data Integration Exercise 2 no later than 5:00 p.m. on Monday, 6/13.</p> <p>Submit your response to Discussion Forum 4 and Data Integration Exercise 2 no later than 5 p.m. on Wednesday, 6/15.</p>

<p>Week 6 6/20</p>	<p>VGI Public Participation: Value of VGI</p>	<p>Elwood, Goodchild & Sui eds. (2013) <i>Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice</i>. New York, NY: Springer (Ch. 2: Understanding the value of VGI and Ch. 3: To volunteer or to contribute locational information? Towards truth in labeling for crowd-sourced geographic information) Rice, Paez, Mulhollen, Shore & Caldwell. (2012) <i>Crowdsourced Geospatial Data: A Report on the Emerging Phenomena of Crowdsourced and User-generated Geospatial Data</i> (Ch. 2: Crowdsourced Geospatial Data Production versus Traditional Geospatial Data Production), Alexandria, VA: U.S. Army Topographic Engineering Center</p> <p>Discussion Forum 6</p>	<p>Submit Discussion Forum 5 no later than 5:00 p.m. on Monday, 6/20.</p> <p>Submit your response to Discussion Forum 5 and Written Proposal no later than 5 p.m. on Wednesday, 6/22.</p>
<p>Week 7 6/27</p>	<p>VGI Public Participation: Typology of VGI</p>	<p>Elwood, Goodchild & Sui (2012) <i>Researching Volunteered Geographic Information: Spatial Data, Geographic Research, and New Social Practice</i>. <i>Annals of the Association of American Geographers</i>, 102(3), 571-590. Rice, Paez, Mulhollen, Shore & Caldwell. (2012) <i>Crowdsourced Geospatial Data: A Report on the Emerging Phenomena of Crowdsourced and User-generated Geospatial Data</i> (Ch. 3: Crowdsourced Geospatial Data Case Studies), Alexandria, VA: U.S. Army Topographic Engineering Center</p> <p>Discussion Forum 7 Data Integration Exercise 4 Final Project: Written Proposal</p>	<p>Submit Discussion Forum 6 and Data Integration Exercise 3 no later than 5:00 p.m. on Monday, 6/27.</p> <p>Submit your response to Discussion Forum 6 and Data Integration Exercise 3 no later than 5 p.m. on Wednesday, 6/29.</p>

Week 8 7/4* *Monday, 7/4 is a university holiday	VGI Public Participation: Citizen Science	Connors, Lei, & Kelly (2012) Citizen Science in the Age of Neogeography: Utilizing Volunteered Geographic Information for Environmental Monitoring, <i>Annals of the Association of American Geographers</i> , 102(6), 1267-1289. Elwood, Goodchild & Sui eds. (2013) <i>Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice</i> . New York, NY: Springer (Ch. 6 When Web 2.0 meets public participation GIS (PPGIS): VGI and spaces of participatory mapping in China and Ch. 7 Citizen science and volunteered geographic information: Overview and typology of participation) Discussion Forum 8	Submit Discussion Forum 7 and Final Project Written Proposal no later than 5:00 p.m. on Tuesday, 7/5. Submit your response to Discussion Forum 7 and Final Project Written Proposal no later than 5 p.m. on Thursday, 7/7.
Week 9 7/11	VGI Geographic Knowledge Production: Emerging Applications Each student has a meeting for the Final Project.	Elwood, Goodchild & Sui eds. (2013) <i>Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice</i> . New York, NY: Springer (Part III Emerging Applications and New Challenges, Chs. 14 – 18) Discussion Forum 9 Final Project: Data Assessment Report	Submit Discussion Forum 8 and Data Integration Exercise 4 no later than 5:00 p.m. on Monday, 7/11. Submit your response to Discussion Forum 8 no later than 5 p.m. on Wednesday, 7/13.
Week 10 7/18	VGI Geographic Knowledge Production: Data Quality	Goodchild & Li (2012) Assuring the quality of volunteered geographic information, <i>Spatial Statistics</i> , 1, 110-120. Rice, Paez, Mulhollen, Shore & Caldwell. (2012) <i>Crowdsourced Geospatial Data: A Report on the Emerging Phenomena of Crowdsourced and User-generated Geospatial Data</i> (Ch. 4: Quality and Crowdsourced Geospatial Data and Ch. 5: Evaluating Crowdsourced Geospatial Data), Alexandria, VA: U.S. Army Topographic Engineering Center Discussion Forum 10 Final Project: Web App	Submit Discussion Forum 9 and Final Project Data Assessment Report no later than 5:00 p.m. on Monday, 7/18. Submit your response to Discussion Forum 9 and Final Project Data Assessment Report no later than 5 p.m. on Wednesday, 7/20.

Week 11 7/25	VGI Geographic Knowledge Production: Methods and Visualization	Sester, M., Arsanjani, J., Klammer, R., Burghardt, D., and Haunert, J. (2014) Ch. 5: Integrating and Generalising Volunteered Geographic Information In Burghardt, D., Duchene, C., and Mackaness, W. (eds) Abstracting Geographic Information in a Data Rich World: Methodologies and Applications of Map Generalization. New York, NY: Springer. Discussion Forum 11 Final Project: Final Report	Submit Discussion Forum 10 and Final Project Web App no later than 5:00 p.m. on Monday, 7/25. Submit your response to Discussion Forum 10 and Final Project Web App no later than 5 p.m. on Wednesday, 7/27.
Week 12 8/1	Future Trends: New Challenges in Geospatial Data	Elwood, Goodchild & Sui eds. (2013) <i>Crowdsourcing Geographic Knowledge: Volunteered Geographic Information (VGI) in Theory and Practice</i> . New York, NY: Springer (Ch. 20 The prospects VGI research and the emerging fourth paradigm) Kerski & Clark (2012) <i>The GIS Guide to Public Domain Data</i> . Redlands, CA: Esri Press. (Ch. 9 Public Domain Data on the Cloud and Ch. 10 The Future of Public Domain Data in GIS) Discussion Forum 12	Submit Discussion Forum 11 and Final Project Final Report no later than 5:00 p.m. on Monday, 8/1. Submit Discussion Forum 12 no later than 5 p.m. on Wednesday, 8/3.
Week 13* 8/9 *Friday, 8/12 is the last day of classes	Wrap-up: Summary of GIS Data Integration		Submit Discussion Forum 12 no later than 5:00 p.m. on Monday, 8/8.

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://adminopsnet.usc.edu/departments/departments-public-safety>. 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 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 Online Students

The Course Blackboard page and the GIST Community Blackboard page have many resources available for distance students enrolled in our graduate programs. In addition, all registered students can access electronic library resources through the link <https://libraries.usc.edu/>. Also, the USC Libraries have many important resources available for distance students through the link <http://libguides.usc.edu/distancelearning>. This includes instructional videos, remote access to university resources, and other key contact information for distance students.