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

SSCI 589, Cartography and Visualization

Syllabus

Units: 4

Term—Day—Time: Spring, 2023, TBD

Location: TBD and DEN@Dornsife

Instructor: Guoping Huang, D.Des.
Office: AHF B57B
Regular Office Hours: TBD. Also available by appointment via email.
Contact Info: guopingh@usc.edu, (213) 740-5192

Library Help: Andy Rutkowski
Office: LIPA B40-A
Office Hours: Thursdays 10 a.m.-12 p.m. PT or by appointment
Contact Info: arutkows@usc.edu see contact page on D2L for Zoom Room

IT Help: Dornsife Technology Services
Office: SHS 260
Contact Info: spatial_support@usc.edu, 213-740-2775

Course Scope and Purpose

This course covers visual perception, spatial cognition, and cartographic design, and their contributions to the maps, animations, virtual reality, and multimedia displays produced with modern GIS. There are three critical components of mapping: (1) the understanding of how to best design a map to communicate the map's objectives, (2) acquiring the technical skills required to create visualizations, and (3) creating clear maps which recognize the needs of the map's audience. By understanding these three principles and how they work together, students will leave with a highly marketable skill set applicable to a number of research areas. This course will improve a student's ability to communicate their understanding and research in all other courses they take at the Spatial Sciences Institute.

At its core, cartography is about the visual representation of space and place, and subsequently cartographers must make a number of carefully considered choices. In addition, contemporary mapmakers have a greater variety and a much greater volume of data to leverage. Further, the possibilities for mapmaking have expanded considerably alongside advancements in digital mapping. Because maps are tools for communication, cartographers must be able to assess spatial data, determine its relevance to a map's objective, and decide upon the best way to showcase that information. Furthermore, visual design skills are essential to displaying the appropriate information in a user-friendly manner and to make the information easily understood by viewers.

This course will introduce students to the principles of cartography, including the history of the field and the fundamental principles of cartographic design. These include data classification, projection choice, symbolization, generalization, color, and labeling. While many of these principles are timeless, this course will emphasize the present and future of mapping, including mapping terrain in 3D, fly-through and stop-motion animation, virtual reality, cybercartography, mobile mapping, and geo-visualization.

Maps will be explored as an interactive tool for decision-making. Ultimately, students will complete the course with the technical and conceptual skills needed to create clear, communicative maps that are tailored to a defined task and audience.

This a graduate level course, so students should expect this class to be both academically robust and intellectually challenging. Graduate students are expected to engage with and to explore the ideas, opinions, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in reading materials and through collaboration. As in any graduate-level class, the instructor's role is that of a guide who keeps students on a path of discovery, and students will find that they learn much from their fellow classmates.

Learning Outcomes

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

- Design and develop cartographic and other data visualizations for a multimedia, internet-enabled world
- Understand the history of mapmaking and cartographic design, and how this history influences contemporary design decision making
- Understand the principles of exemplary cartographic design, including projections, symbology, scale, fonts/typography, etc.
- Become familiar with different types of maps and their appropriateness to different types of questions and data (choropleth, proportional symbol, isarithmic, dot density, etc.).
- Apply ones understanding of cartographic design principles to evaluating maps
- Become well-versed in selecting, transforming, projecting, and visualizing data within ArcGIS and other platforms
- Understand human psychology as it applies to map interpretation; optimize the way in which users interact with web-based maps
- Create finished maps according to industry-standard design principles

Students may vary in their competency levels on these abilities. Students can expect to acquire these abilities only if you honor all course policies, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.

Prerequisite(s): None

Co-requisite(s): None

Concurrent Enrollment: None

Recommended Preparation: SSCI 581

Class Conduct

Harassment, sexual misconduct, interpersonal violence, and stalking are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations you may contact the Title IX Coordinator directly (titleix@usc.edu or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours)

COVID-19 policy – Students are expected to comply with all aspects of USC's COVID-19 policy including, but not limited to, vaccination, indoor mask mandate, and daily TrojanCheck. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards. Students are recommended to keep safe physical distancing, whenever possible, to prevent any possible transmission. Please contact your instructor if you have any safety concerns.

Diversity and Inclusion – It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful to everyone, and you are also expected to respect of others regardless of their race, ethnicity, gender identity and expressions, cultural beliefs, religion, sexual orientation, national origin, age, abilities, ideas and perspectives, or socioeconomic status. Your suggestions are encouraged and appreciated. Feel free to let me know ways to improve the effectiveness of the course for you personally or for other students.

Course Structure

The main theoretical concepts are provided through a directed reading of the text, *Designing better Maps: A Guide for GIS users*. Additional readings will regularly be assigned to expand on the text. When possible, assignments will be given in advance, but they will typically be posted on or before Sunday.

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.

Technology and Communication Requirements

ArcGIS is provided online via the GIST Server; hence, you do not need to install it on your own computer. In addition, we will provide laptops with image processing software and a variety of GPS and related data capture devices for the Catalina field component. At their home workspaces, every student must have the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone.
- An up-to date web browser to access the SSI server.

If a student does not have access to any of these, please speak with the instructors at the start of the semester. And see the USC ITS Student Toolkit here:
https://keepteaching.usc.edu/students/student-toolkit/

Desire2Learn (D2L) – This course will utilize the Desire2Learn (D2L) learning management system which allows students to access course content, upload assignments, participate in discussion forms, among other learning experiences. The D2L platform provides flexibility in the learning

experience where students can participate in the course residentially or remotely, synchronously (meeting together at the same time) or asynchronously (accessing videos and course content outside of class).

SSI Server and Tech Support – This course utilizes the SSI Server which is a virtual desktop giving access to many different professional software. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to SSI Tech Support at spatial_support@usc.edu, making sure to copy (cc) me on the email.

Communications – All assignments given and all materials to be handed in will be submitted via D2L. The instructor will also create and monitor discussion forums through which students can discuss issues and assignments as needed. Students should read all email sent from D2L or from course instructor(s) as soon as possible. Also, students who do not regularly use their USC email accounts should double-check to be sure that mail sent from both the D2L accounts and the instructor's account (noted above) to your USC account is forwarded to an address used regularly and does not go into junk mail. The instructor will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case that an instructor is off-line for an extended periodof time, an announcement will be posted to the class D2L site. Due to the synchronous and asynchronous nature of this course, it is each student's responsibility to stay informed and connected with others in our course. In addition to email, students are expectedto login to D2L regularly to check for announcements.

Discussion forums – Discussion forums 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 publicly 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 textbook for this course is:

- Brewer, Cynthia. 2016. *Designing better Maps: A Guide for GIS users*, (2nd Edition. Redlands, CA: Esri Press.

Supplementary readings will be assigned from various sources including:

- Battersby, S.E., Goldsberry, K.P. 2010. "Considerations in design of transition behaviors for dynamic thematic maps." Cartographic Perspectives 65: 16-32.
- Hegarty, M., Smallman, H.S., Stull, A.T., Canham, M.S. 2009. "Naïve Cartography: How intuitions about display configuration can hurt performance." Cartographica: The International Journal for Geographic Information and Geovisualization 44, no. 3: 171-186.

- Hruby, F., Ressl, R., de la Borbolla Del Valle, G. 2019. “Geovisualization with immersive virtual environments in theory and practice.” International Journal of Digital Earth 12, no. 2: 123-136.
- Johnson, S. 2006. The Ghost Map: The story of London's most terrifying epidemic and how it changed science, cities, and the modern world. Penguin Press.
- Misra, R.P, Ramesh, A. 1989. Fundamentals of Cartography. Concept Publishing Company.
- Monmonier, Mark. How to Lie with Maps. University of Chicago Press.
- Rao, J., Qiao, Y., Ren, F., Wang, J, Du, Q. 2017. “A mobile outdoor augmented reality method combining deep learning object detection and spatial relationships for geovisualization.” Sensors 17, no. 9: 1951.
- Robinson, A. 2017. Geovisual analytics. The Geographic Information Science & Technology Body of Knowledge, edited by John Wilson. UCGIS. https://doi. org/10.22224/gistbok/2017.3 6 (2017).
- Taylor, D.R., Anonby, E., and Murasugi, K., eds. 2019. Further Developments in the Theory and Practice of Cybercartography: International Dimensions and Language Mapping. Elsevier.
- Tufte, E.R., Goeler, N.H, Benson, R. 1990. Envisioning information. Cheshire, CT: Graphics press.
- Wilmott, C. 2020. Mobile Mapping: Space, Cartography and the Digital. Amsterdam University Press.
- Wright, D.J. 2017. “Here Be Monsters.” Oceanography. 30 (2).
- Yan, Y., Feng, C., Huang, W., Fan, H., Wang, Y., Zipf, A. 2020. “Volunteered geographic information research in the first decade: a narrative review of selected journal articles in GIScience.” International Journal of Geographical Information Science. 1 (27).

Description and Assessment of Assignments

This course includes a diversity of assessments that allow students to gain knowledge and experience and to show their mastery of the material in a variety of ways. The different types of assessments are described below and their overall point values are summarized in the following Grading Breakdown section.

Resume Assignment - 1 worth 2 points. We require all current students to post and maintain a public resume, short biography, and recent photo on our shared SSI Student Community Blackboard site. Please prepare your resume in the SSI template which will be provided to you. Unless you opt out, your resume will be included in the Spatial Sciences Institute Graduate Programs Resume Book. This resume book is compiled annually and, along with our web presence, is used to promote our programs, and more importantly, your skills, experience and professional aspirations.

Projects - 5 worth a total of 50 points. These assignments will require students to develop a

cartographic workflow, evaluate sources of error, decide on projections, and generalize their data. They will cover the principles of color, symbolization, and labeling. Differences in map output will be discussed, with an emphasis on web and mobile technologies and publishing across multiple platforms. Three-dimensional rendering and animation will be covered. Each project will result in map (print, web, mobile, or multi-platform) that can be included in one's portfolio.

Reading and Research Discussions - 3 worth a total of 15 points. These assignments will consist of a combination of academic articles, book excerpts, and the critical evaluation of existing maps. Students will be expected to engage in discussions about these materials.

Quizzes – 5 worth a total of 15 points. Each module will conclude with a quiz covering the main principles of the unit. The quiz will be timed and administered on D2L.

Final Exam - 1 worth 18 points. The final exam will cover material learned throughout the duration of the semester. It may be mixed format and may consist of multiple choice, short answer, and simple problem questions. Students are expected to take the exam within an indicated time window.

Grading Breakdown

Assessment	Number	Points Each	Total Points
Weekly assignments			
Resume Assignment	1	2	2
Projects	5	10	50
Reading and Research Assignments	3	5	15
Quizzes	5	3	15
Final Exam	1	18	18
Total	15	-	100 points

Assignment Submission Policy

Assignments must be submitted via D2L by the due dates specified in the Course Schedule. Attention to on-time assignment submission is essential. The instructor will aim to return feedback before the next assignment is due.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points up to four days late. No points will be given for submissions more than four days late.

- Additionally, no written work will be accepted for grading after 5 p.m. PT on the last day of classes.

Course Schedule

Week	Topic	Assignments	Deliverables: Due Dates
Module 1 | The Fundamentals of Map-making I			
Week 1 1/9	Introduction to course; Conceptual and critical cartography; Overview of the principles of contemporary cartographic design	Resume Assignment Reading & Research Discussion (RRD) 1	Resume Assignment
Week 2 1/16* *Monday, 1/16 is university holiday		RRD1 – Discussion RRD2 Project 1 is assigned	RRD1 – Assignment and 1st discussion post RRD1 – Discussion: Response to classmates
Week 3 1/23		RRD2 – Discussion	RRD2 – Assignment and 1st discussion post RRD2 – Discussion: Response to classmates
Module 2 | The Fundamentals of Map-making II			
Week 4: 1/30	Data management and classification; Map Typologies I: Choropleth, Proportional symbol Map Typologies II: Isoline, Isarithmic, dot density	RRD3 - Choice of case study RRD3 - Discussion	Project 1 Module 1 Quiz
Week 5: 2/6		RRD4 - Choice of case study Project 2 is assigned	RRD3- Assignment and 1st discussion post RRD3 - Discussion: Response to classmates
Week 6: 2/13		RRD4 - Discussion	RRD4 - Assignment and 1st discussion post RRD4 - Response to classmates

Week	Topic	Assignments	Deliverables: Due Dates
Module 3 | Visualization and Cognition			
Week 7: 2/20* *Monday, 2/20 is university holiday	Use of colorization schemes, contrast, and patterns; Map animation and temporal scales; Human perception, cognition, and behavior	RRD5 - Choice of case study	Module 2 Quiz RRD5 - Assignment and 1st discussion post RRD5 - Response to classmates due
Week 8: 2/27		RRD5 - Discussion RRD6 - Choice of case study	Project 2
Week 9: 3/6		RRD6 - Discussion RRD7 - Choice of case study Project 3 is assigned	RRD6 - Assignment and 1st discussion post RRD6 - Response to classmates
3/13 *3/12-3/19 is Spring Recess			
Module 4 | Data Exploration and Interactivity			
Week 10 3/20	User Interface design (UI); Volunteered Geographic Information (VGI)	RRD7 - Discussion Project 4 is assigned	RRD7- Assignment and 1st discussion post RRD7 - Response to classmates Module 3 Quiz
Week 11 3/27		RRD8 - Choice of case study RRD8 – Discussion	Project 3
Module 5 | The Future of Cartography			
Week 12 4/3	Virtual reality/3D and the future of	Project 5 is assigned	RRD8 - Assignment and 1st discussion post RRD8 – Discussion Project 4 Module 4 Quiz

Week 13 4/10	maps	RRD9 - Choice of case study RRD9 – Discussion	RRD9 - Assignment and 1st discussion post RRD9 - Discussion
Week 14 4/17		RRD – 10 Choice of Case Study and Discussion	RRD10 - Assignment and 1st discussion post RRD10 – Slides and class presentations
Week 15 4/24 Friday, 4/28 is the last day of class			Module 5 Quiz & Project 5
Final Exam TBD			

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.