

SSCI 135g, Maps in the Digital World

Syllabus

Units: 4

Term Day Time: Fall 2023, MWF 10:00 – 11:20 am

Location: CPA 256

Instructor: Leilei Duan, Ph.D.

Office: AHF B55A

Office Hours: Monday and Wednesday 1:00 - 2:00 pm PT,
and by appointment via email.

Contact Info: leileidu@usc.edu, 213-740-6532 (office), see
contact page on Blackboard for Zoom Room

Library Help: Andy Rutkowski

Office: VKC 36B

Office Hours: Thu 10 am-12 pm

Contact Info: arutkows@usc.edu, see contact page on
Blackboard for Zoom Room

IT Help: Myron Medalla

Office: AHF B56B

Office: By appointment via email

Contact Info: spatial_support@usc.edu, 213-740-4415

Course Scope and Purpose

This course explores all the ways in which maps are being used to compile, build, and share knowledge of the world around us. The first maps appeared long ago and today maps are used extensively across the physical, life, and social sciences as well as the humanities. Numbers and quantitative data feature prominently in the preparation of most maps. The overarching intent of this course is to examine some of the ways in which formal reasoning, abstract representation, and empirical analysis are used to construct the maps that you see and use in a given field of study and in everyday life. The topics covered in this course will range from geodetic principles (the way location is measured on the Earth's surface) to the various ways in which information is captured and represented on maps, the role of scale and map projections, and the ways in which various hierarchies and classifications can be combined and used with empirical analysis to add meaning to maps

This course is a Quantitative Reasoning General Education course. Maps are used to engage you in the analysis and manipulation of data and information related to quantifiable objects, symbolic elements, and logic to help navigate the complexity and sophistication of the modern world. The lectures and accompanying homework assignments will focus on the role of maps in modern life and how numbers are used to construct maps of the world around us. The assignments and final project will increase your capacity to evaluate chains of formal reasoning (the use of formal logic and mathematics), abstract representation (the use of symbolic and diagrammatic representations), and empirical analysis (the use of statistical inference) in building and interpreting various kinds of maps.

Learning Outcomes

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

- Describe and interpret the complexity and sophistication of maps and mapping in the modern world.
- Use a set of formal tools, including logical and statistical inference, probability and mathematical analysis, to pose and evaluate hypotheses, claims, questions, or problems with a variety of maps.
- Distinguish between the assumptions and implications for the logical structures embedded in various kinds of maps.
- Identify both useful and specific applications of various kinds of maps.

Prerequisite(s): None

Co-Requisite(s): None

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)

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 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.

Technological and Communication Requirements

ArcGIS is provided online via the SSI Server; hence, you do not need to install it on your own computer. Instead, every student must have 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.

- An up-to-date web browser to access the Server

If a student does not have access to any of these, please speak with the instructor at the start of the semester. Also, see the USC ITS Student Toolkit here:

<https://keepteaching.usc.edu/students/student-toolkit/>

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 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 72 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.

Required Readings and Supplementary Materials

The required textbook for this course is:

- Arlinghaus, Sandra L and Joseph Kerski. 2014. *Spatial Mathematics: Theory and Practice through Mapping*. Boca Raton, FL: CRC Press.

The supplementary readings are:

- de Smith, Michael J., Michael F. Goodchild and Paul A. Longley. 2018. *Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools*, 6th Edition. Winchelsea, UK: The Winchelsea Press. Available in both print and a (free!) web version at www.spatialanalysisonline.com.
- MacEachern, Alan M. 1995. *How Maps Work*. New York: Guilford Press.
- Mason, Betsy and Miller, Greg. 2018. *All Over the Map: A Cartographic Odyssey*. Washington, DC: National Geographic.
- Monmonier, Mark. 2018. *How to Lie with Maps*, 3rd Edition. Chicago, IL: University of Chicago Press.
- Unwin, David J. 2010. "Numbers Aren't Nasty: A Workbook of Spatial Concepts." *Spatial Literacy in Teaching*, Chapter 3. Available at http://teachspatial.org/wp-content/uploads/Unwin-Spatial-Workbook_Chapter3_0.pdf

Description and Assessment of Assignments

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

Homework Assignments – 10 worth a total of 50 points. In addition to lectures and in-class discussions, there are a series of homework assignments that are designed to introduce the tools of quantitative reasoning and provide practical experience in implementing these tools to explore various problems within the framework of the scientific method.

These assignments are linked to the lectures and class discussions, but do not duplicate the classroom experience. Home assignments will be graded and returned, and the mid-term and final exams will have a home assignment component to them. In other words, the home assignments are an important and integral part of the course as a whole. Some of the home assignment options available – and there may be more – include:

- Mental Maps
- Routes, Coordinates, Precision and Accuracy
- Measuring the Circumference of the Earth
- Measuring Positions on the Earth's Surface
- Transformations and Raster/Vector Analysis
- Role of Color and Image Interpretation
- Role of Scale and Dot Density Maps
- Classification and Normalization of Data
- Role of Traditional and Hexagonal Hierarchies
- Examining the Distribution of Tornado Data
- Calculating Mean Centers and Standard Derivational Ellipses
- Comparing Map Projections
- Network Analysis

Note that more than 10 home assignments may be required. If this is the case, only the 10 highest scores will be counted toward your final grade.

Mid-term Examination – 1 worth 13 points. The mid-term examination will consist of multiple-choice, short answer, and essay questions. Students will be expected to take the exam at the indicated time.

Final Project – 1 worth 10 points. The final project is an individual capstone report for this course. Students will be expected to draw upon course lectures, discussions, readings, and outside sources to organize and deliver a self-directed study on a topic of interest. The report is limited to 10 pages (with 12-point font, 1-inch margins, single-spacing for text) and will include one or more maps, tables, and other diagrams as well as a list of references.

Final Examination – 1 worth 25 points. The final examination will consist of multiple-choice, short answer, and essay questions. Students will be expected to take the exam at the indicated time.

Assignment Submission and other Policies

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

Strict penalties apply for late assignments as follows:

- Assignments up to four-day late will receive 2-point deduction. No assignments submitted after four days later than deadlines will be accepted or graded.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of classes.
- **Absences from class sessions** must be requested by sending an email to the instructor. Excused absences from class sessions will be granted only for valid reasons; please notify me of the reason for your absence in your email.

Grading Breakdown

Assessment	Number	Points Each	Total Points
Home Assignments (HA)	10	5	50
Mid-term Examination	1	14	14
Final Project	1	14	14
Final Examination	1	22	22
Total	13	-	100 points

Course Schedule

Week	Topic	Readings and Assignments	Deliverables/Due Dates
Module 1: Guiding Principles			
Week 1	MON – Welcome/Introduction		
(8/21 - 25)	WED – Mental Maps	HA # 1	
	FRI – Maps in the Social Sciences		
Module 2: Geometry of the Sphere			
Week 2	MON – Earth Coordinate Systems	Arlinghaus & Kerski, Chapter 1 HA # 2	
(8/28 – 9/1)	WED – Introduction to Homework #2		HA # 1 - Due 8/30 at 10 AM PT
	FRI – Earth Systems; Precision of Latitude and Longitude		
Module 3: Location, Trigonometry, and Measurement of the Sphere			
Week	Topic	Readings and Assignments	Deliverables/Due Dates

Week 3*	MON* – university holiday	Arlinghaus & Kerski, Chapter 2	
(9/4 – 9/8)	WED – Location/ Measurement and Shape of the Earth	HA #3	HA #2 - Due 9/6 at 10 AM PT
	FRI – Measuring the Earth and Other Common Coordinate Systems and Introduction to Homework #3		
Week 4	MON – Trigonometry		
(9/11 – 9/15)	WED – Partitions: Point–Line–Area Transformations	Arlinghaus & Kerski, Chapter 3	HA #3 - Due 9/13 at 10 AM PT
	FRI – Raster and Vector Mapping & Homework Assignment #4	HA # 4	
Module 4: Transformations: Analysis and Raster/Vector Formats			
Week 5	MON – Cartography and Geovisualization – Part 1		
(9/18 – 9/22)	WED - Cartography and Geovisualization – Part 2	Arlinghaus & Kerski, Chapter 4	HA #4 - Due 9/20 at 10 AM PT
	FRI – Cartography and Geovisualization – Homework Assignment #5	HA # 5	
Module 5: Replication of Results: Color and Number			
Week 6	MON - Color Straws, Voxels & Ramps		
(9/25 – 9/29)	WED – Scale and Scale change	Arlinghaus & Kerski, Part of Chapter 5	HA #5 - Due 9/27 at 10 AM PT
	FRI – Dot Density – Part 1		
Module 6: Partitioning of Data: Classification and Analysis			
Week 7	MON - Dot Density – Part 2		
(10/2 – 10/6)	WED – Mid-term Review	Arlinghaus & Kerski, Chapter 6	
	FRI – Mid-term Exam		

Week	Topic	Readings and Assignments	Deliverables/Due Dates
Module 7: Visualizing Hierarchies			
Week 8*	MON – Isolines / Contour Lines and Final Project		
(10/9 – 10/13)	WED – Traditional Hierarchies & Intro to Homework Assignment # 6	Arlinghaus & Kerski, Chapter 7	
	FRI* – university holiday	HA # 6	
Module 8: Map Projections (2 weeks – Week 9 and 10)			
Week 9	MON – Looking at Projections		
(10/16 – 10/20)	WED – Sampling Projection Distortion & Intro to Homework Assignment #7	Arlinghaus & Kerski, Chapter 9	HA #6 – Due 10/18 at 10 AM PT
	FRI – Self working session	HA # 7	
Week 10	MON – Case Studies		
(10/23 – 10/27)	WED – Introduction to Homework #8		HA #7 – Due 10/25 at 10 AM PT
	FRI – Modern Projections 2		
Module 9: Distribution of Data / More Cartography			
Week 11	MON – Modern Projections 3	Arlinghaus & Kerski, Chapter 8	
(10/30 – 11/3)	WED – Introduction to Homework #9		HA #8 – Due 11/1 at 10 AM PT
	FRI – Projection Class Discussions	HA # 8	
Module 10: Past, Present, and Future Approaches			
Week 12*	MON – Ann Arbor Tornado Siren Project		
(11/6 – 11/10)	WED – Introduction to Homework #9	Arlinghaus & Kerski, Chapter 10	HA #9 – Due 11/8 at 10 AM PT
	FRI* – university holiday	HA # 9	
Week 13	MON – More Cartography		
(11/13 – 11/17)	WED – From Classics to Modern	Readings are posted on Blackboard	HA #9 – Due 11/15 at 10 AM PT

	FRI – A non-Euclidean Future? & Homework #10	HA # 10	
<i>Finishing the Drill</i>			
Week 14*	MON – Class Discussions	Readings are posted on Blackboard	HA #10 – Due 11/20 at 10 AM PT
(11/20 – 11/24)	WED* – university holiday		
	FRI* – university holiday		
Week 15	MON – Project Presentation		
(11/27 – 12/1)	WED – Project Presentation		
	FRI – Wrap Up & Final Exam Review		
Final Exam	Closed book exam (Monday December 11, 8 – 10 a.m. PT)		

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](#).

Last Revised in March 2023.

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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.

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[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.