Department of Geography
University of California Santa Barbara Spring 2026

GEOG 281A - GIScience Research

Lecture Time: W 9:30-11:50
Lab Time: —
Lecture Location: Ellison Hall 4824

Instructor: Peter Kedron
Office: Ellison Hall 5818
Office Hours: By appointment

Course Description:
GEOG 281A is designed to help students design rigorous geographic research by connecting the development and use of core spatial methods to their theoretical foundations in geographic information science (GIScience). Readings and activities in the course are sequenced to help students enhance their spatial thinking skills and prepare to apply those skills to research problems using geographic information systems (GIS). Students explore fundamental topics including ontology and spatial representation, uncertainty, spatial modeling and inference, and validation through open science practices. This course teaches students to think critically about the nature of spatial processes, their representation as spatial data, and their analysis using spatial methods. The goals is to prepare students to engage in deep geographic scholarship rather than simply apply GIS tools in specific domains.

Readings:
Course readings are provided through the course website.

Additional Readings
Lecture materials will draw selectively from the additional readings posted on the course website. Suggested readings are identified on that site. Some materials are simply provided for those wishing to delve deeper into a particular topic.

Online Resources:
This class will be accompanied by an online reader that synthesizes some of the content covered

Student Evaluation:
Evaluation will be based on participation (30%), weekly questions (15%), activities (15%), and a literature critique (40%).

Class Participation: Students are expected to come to class prepared and participate in class discussions and activities. Because this course asks you to develop and refine your spatial thinking through dialogue, participation is essential to the learning process. Participation will be evaluated throughout the course using the following scale:

- 30% — Fully Engaged Contributor. Student comes to class prepared and contributes regularly without dominating. Contributions advance the conversation in substantive ways. For example, by connecting ideas across readings, raising productive complications, offering concrete examples from their own research domain, or helping the group work through a difficult concept. Shows genuine interest in and respect for others' perspectives. Actively participates in

all group activities, including taking on different roles (e.g., facilitating, questioning, synthesizing) rather than defaulting to the same mode each time.
- ~20% — Consistent Participant. Student comes to class prepared and makes thoughtful contributions that reflect engagement with the material. Shows interest in and respect for others' views. Participates actively in small group work. Contributions are sound but tend to stay within the frame the readings or instructor have already established, rather than extending or challenging it.
- ~15% — Present but Passive. Student comes to class prepared and follows the discussion but contributes only minimally — for example, only when called upon or only in small group settings. Does not disrupt but does not help move the intellectual work of the class forward. May be absorbing ideas but is not yet making them visible to others.
- ~5% — Underprepared. Student comes to class only partially prepared and contributes rarely. When contributions are made, they suggest limited engagement with the readings or activities. Participation in group work is inconsistent.

Questions: Conducting research in any field is largely about asking questions. Students are required to submit two questions by 9am Tuesday of each week about the readings for that week. These questions will be reviewed prior to class, and selected questions will be integrated into class activities for the week. Questions are the one activity where you are NOT ALLOWED to use AI. The point of the questions requirement is to have you engage with the materials and practice your critical and creative thinking skills. If you use AI to generate your questions, you will receive a zero for all your questions for the entire course.

Questions will be graded using the following criteria.

- 5 - Exceptional. The question identifies a tension, gap, or unstated assumption in the reading and connects it to a broader issue in GIScience or the student's own research. It could not be asked without having carefully read and reflected on the material. It opens a line of inquiry that would productively drive class discussion.
- 4 - Strong. The question demonstrates genuine engagement with the reading's argument or methods and goes beyond what the text explicitly states — for example, by questioning an author's framing, proposing a counterexample, or drawing a connection across readings. Minor refinement in specificity or depth would elevate it further.
- 3 - Adequate. The question shows that the student read the material and understood its main points, but stays close to the surface. It may ask about something the reading already addresses, seek clarification on a concept without pushing further, or be too broad to anchor a productive discussion.
- 2 - Superficial. The question is vaguely related to the topic but could have been written from the abstract or introduction alone. It does not engage with the reading's core argument, methods, or evidence, and suggests only minimal engagement with the material.
- 1 - Insufficient. The question is generic enough to apply to almost any reading (e.g., "Why is this important?"), is factual in a way that a quick search would resolve, or reflects a fundamental misreading that suggests the material was not read.

Activities: Students will be asked to participate in activities throughout the course. Activities are intended to serve as practice and checks on student knowledge.You are welcome and encouraged to work with your classmates on these exercises. Most will be done entirely in class. However, you are responsible for submitting your own individual solution report for each activity when requested.

Literature Critique: Over the course of the quarter, you will develop a sustained critique of a body of published literature in GIScience or a related domain. Early in the quarter, you will identify a subset of the literature and progressively deepen your analysis of it as new course concepts are introduced during the course.

Your critique should evaluate the literature through the lens of the frameworks we cover in class: How do the studies handle ontological commitments and spatial representation? Where does uncertainty enter? Are the spatial models and inferential claims well justified? There will be structured check-ins throughout the quarter where you will share your progress, receive feedback, and refine your analysis. The final critique is due at the end of the quarter.

This assignment is designed to mirror how scholars actually engage with literature. The goals is not to summarize individual papers, but developing an original evaluative argument about how a community of researchers is approaching a spatial problem and where that approach could be strengthened.

Grading Scheme: Grades in this course will be assigned using the scheme presented below.

A+	95%	B+	86.7-89.9%	C+	76.7-79.9%	D+	66.7-69.9%
A	92.5-94.9%	B	83.4-86.6%	C	73.4-76.6%	D	63.4-66.6%
A-	90.0-92.4%	B-	80.0-83.3%	C-	70.0-73.3%	D-	60.0-63.3%
						F	<60.0%

Topic and Reading Schedule

Readings will be provided as .pdf via the course website.

Week	Day	Date	Topic
1	W	4/1	Spatial Thinking
2	W	4/8	Defining and Re-defining GIScience and Geography
3	W	4/15	The Nature of Space
4	W	4/22	The Representation of Spatial Processes and Objects as Spatial Data
5	W	4/29	Cartography and Geovisualization
6	W	5/6	Scale and Projection
7	W	5/13	Spatial Relationships
8	W	5/20	Spatial Analyses
9	W	5/27	The Forking Paths of Uncertainty
10	W	6/3	GIScience and Society

Course and University Policies

Use of Artificial Intelligence Language Models:

Artificial intelligence (AI) language models, such as ChatGPT, may be used for code construction and refinement with appropriate citation, but not for the writing of assignments or projects. If you are in doubt as to whether you are using AI language models appropriately in this course, I encourage you to discuss your situation with me. You are responsible for fact checking the code and statements composed by AI language models and the integrity of the content they generate - they have many strengths and many flaws.

At present, there are no universal guidelines for citing ChatGPT or other generative AI. If you use generative AI in this course, you must include (1) a statement that you did so, (2) provide a clear description of the content that was created with prompts (you may also include prompts and responses in an appendix), and (3) a citation to the model with name of the model or tool and version. Please see the example statement below:

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> ChatGPT (OpenAI 2023) was used to develop the code and conduct the analysis presented in this assignment. Specifically, ChatGPT was used to create R code to begin the development of the linear regression model using RStan. The prompts used are included below. A complete record of the code and text generated by ChatGPT is available in Appendix A.
>
> Prompt 1: Generate R code to create a linear regression model using the package RStan
> Prompt 2: Generate R code to test for spatial autocorrelation in the residuals of a linear regression model
>
> OpenAI. (2023). ChatGPT (Version 4.0) [Large language model]. OpenAI. (Last accessed November 11, 2023). https://www.openai.com/chatgpt

It is your responsibility to ensure that your work meets the standards of this course, the UCSB Student Code of Conduct https://www.sa.ucsb.edu/regulations/student-conduct-code/student-conduct-code), and the wider scientific community.

Copyright:

All course materials (class lectures and discussions, handouts, examinations, web materials) and the intellectual content of the course itself are protected by United States Federal Copyright Law, the California Civil Code. The UC Policy 102.23 expressly prohibits students (and all other persons) from

recording lectures or discussions and from distributing or selling lectures notes and all other course materials without the prior written permission of the instructor. Students are permitted to make notes solely for their own private educational use. Exceptions to accommodate students with disabilities may be granted with appropriate documentation. To be clear, in this class students are forbidden from completing study guides and selling them to any person or organization. The text has been approved by UC General Counsel. See http://policy.ucop.edu/doc/2710530/PACAOS-100.

Critical Student Support Services

(1) Responsible scholarship Honesty and integrity in all academic work is essential for a valuable educational experience. The Office of Judicial Affairs has policies, tips, and resources for proper citation use, recognizing actions considered to be cheating or other forms of academic theft, and students' responsibilities, available on their website at: http://judicialaffairs.sa.ucsb.edu. Students are responsible for educating themselves on the policies and to abide by them.

(2) Furthermore, for general academic support, students are encouraged to visit Campus Learning Assistance Services (CLAS) early and often. CLAS offers instructional groups, drop-in tutoring, writing and ESL services, skills workshops and one-on-one consultations. CLAS is located on the third floor of the Student Resource Building, or visit http://clas.sa.ucsb.edu.

(3) Managing stress / Supporting Distressed Students Personal concerns such as stress, anxiety, relationships, depression, cultural differences, can interfere with the ability of students to succeed and thrive. For helpful resources, please contact UCSB Counseling & Psychological Services (CAPS) at 805-893-4411 or visit http://counseling.sa.ucsb.edu/. If you encounter a student in distress, please contact 805-893-3030 immediately and/or consult the Responding to Distressed Student Protocol at http://www.sa.ucsb.edu/distressedstudentsguide or phone 893-3030.

(4) Disabled Students Program: accommodations for exams Students with disabilities may request academic accommodations for exams online through the UCSB Disabled Students Program at http://dsp.sa.ucsb.edu/. Please make your requests for exam accommodations through the online system as early in the quarter as possible to ensure proper arrangement.

(5) Sexual harassment. UCSB does not tolerate sexual harassment/sexual violence, which is prohibited by University policy and state and federal law. The Title IX Compliance and Sexual Harassment Policy Compliance Office (TIX/SHPC) provides assistance in preventing and resolving and investigating complaints of sexual harassment/sexual violence and gender discrimination. UCSB's Title IX office handles all issues surround sexual harassment: https://titleix.ucsb.edu/

(6) Mandatory reporting. It is an instructor's responsibility to help create a safe learning environment on our campus. Students should be informed that instructors have a mandatory reporting responsibility related to their role as a professor. The instructor is *required* to share information regarding sexual misconduct or information about a crime that may have occurred on UCSB's campus or in the community. A result of the mandated report will be that students will receive outreach and resources from the campus Title IX office. Students may speak to someone confidentially by contacting CARE, Campus Advocacy, Resources & Education at the 24/7 advocacy line at (805) 893-4613 or visit them in person at the Student Resource Building.