



THE OHIO STATE UNIVERSITY

GEOG 6226

Spatial Simulation and Modeling in GIS

(24838)

Autumn 2026

Syllabus - Graduate Instructor Information

Name: Chayanika Singh, GISP

Professional Qualifications

- PhD, Geographic information Sciences, Texas State University, USA
- Graduate Certificate in Geographic Information Systems, University of Wisconsin - Milwaukee, USA
- Masters in Urban Planning, School of Planning & Architecture, New Delhi, India
- Bachelors in Architecture, School of Planning & Architecture, New Delhi, India

Syllabus - Required or Recommended Readings

Textbooks:

Required

- [SS] O'Sullivan, D. and Perry, G. (2013) Spatial Simulation: Exploring Pattern and Process, Wiley.
- This will be the primary text referred in this course
- The Digital book should be available on CarmenBooks

Recommended/ Optional

- [ABM] Crooks et al. (2022) Agent Based Modelling and Geographic Information Systems: A Practical Primer, Sage publication.
- Relevant Chapters will be available in pdf format on Carmen website

Topic Readings:

Other additional topic readings will be posted at the Canvas course website.

Syllabus - Course Schedule

Module	Topic
1 (week 1,2)	Course overview and Modeling Basics
2 (week 3,4)	Patterns & Processes
3 (week 5,6)	Aggregation & Segregation
4 (week 7,8)	Random walk & Mobile Entities
5 (week 9,10)	Percolation & Growth
6 (week 11,12)	Human Behaviour
7 (week 13,14)	Networks, Space & Time
8 (week 15,16)	Project Work

Course Details - Instructor Contact Details

Email: singh.1883@osu.edu

My preferred method of communication for questions is email. Please have the email subject as “**Geog 6226_.....**”, to make sure it gets my attention.

My class-wide communications will be sent through the Announcements tool in Carmen Canvas.

Office location: 1123 Derby Hall

- (if you need to schedule an in-person meeting, please send an email to set up the appointment only for Thursday between 1 pm - 3pm)

Course Details - Office Hours

Office hours: Zoom by appointment

Course Details - Class Meeting Details

Class Meeting Details: TBA - Online -

All the course content will be delivered Online Asynchronously.

Course Details - Course Description

Fundamental modeling and simulation techniques in GIS, including cellular automata, diffusion models, and agent-based models, and their applications in social, environmental, and natural resources research. Prereq: Not open to students with credit for 5221 or 5226.

Prerequisite(s) / Corequisites: Prereq: Not open to students with credit for 5221 or 5226.

Course Details - More About This Course

This course is about the use of computational techniques to simulate the evolution of complex spatial systems such as ecosystems, transportation, weather/climate, cities, economies, societies and landscapes. These and other complex systems have a multitude of relatively simple parts interacting over space and time to create surprising, emergent behaviors. Powerful computational techniques, often linked with GIS software, allow the simulation of realistically large systems at a finer level of granularity, providing new insights that were unavailable through traditional modeling techniques.

We will explore various major types of “building-blocks” at the core of many dynamic spatial models: i) spatial aggregation and segregation processes; ii) random walks and mobile entities, and iii) percolation and growth processes. We will also discuss issues such as the role of spatial simulation in GIS and its representation of space and time, in network models and how to build more complete models of human, physical and linked human-physical dynamic spatial processes.

Course Details - Course Learning Outcomes

By the end of this course, students should successfully be able to:

- Think like a spatial scientist: The ability to conceptualize real-world phenomena as comprised of fundamental spatio-temporal processes occurring in specific geographic contexts
- Understand spatial simulation as a tool for scientific investigation: The ability to translate theory into simulation models and design experiments for investigating theory; an understanding of the strengths and weaknesses of this approach to scientific investigation.
- Understand common spatial simulation techniques: A basic understanding of techniques that are especially well-suited for simulating physical and human geographic processes.
- Design and use of spatial simulation techniques: The ability to design a spatial simulation based on a real-world process and experiment with the model to understand that process.
- Develop spatial simulation software skills: The ability to program and conduct experiments within the NetLogo software environment.

Course Details - Detailed Course Schedule

Geog 6226: Spatial Simulation & Modelling in GIS						
Online						
Week	Day	Date	Module	Topics	Assignments Due in this module	% points
w1	T	25-Aug-26	Module 1	Course Overview		
				Lab 1: Netlogo basics	Self Intro	0.5
	M	31-Aug-26			syllabus quiz	0.5
w2	T	1-Sep-26		Agent Based Modellings Basics	Lab 1	7
				Lab 2: World and Agents		
	M	7-Sep-26			Exam 1	3
w3	T	8-Sep-26	Module 2	Pattern & Processes	Lab 2	7
				Lab 3: Programming		
	M	14-Sep-26			Exam 2	3
w4	T	15-Sep-26		Readings #1		
	M	21-Sep-26			Reading #1	3
w5	T	22-Sep-26	Module 3	Aggregation & Segregation	Lab 3	7
				Lab 4: variables & breeds		
	M	28-Sep-26			Exam 3	3
w6	T	29-Sep-26		Readings #2		
	M	5-Oct-26			Reading #2	3
w7	T	6-Oct-26	Module 4	Random walk & Mobile Entities	Lab 4	7
				Lab 5: Using GIS data		
	M	12-Oct-26			Exam 4	3
w8	T	13-Oct-26		Readings #3		
				(Autumn Break)		
	M	19-Oct-26			Reading #3	3
w9	T	20-Oct-26	Module 5	Percolation & Growth		
				Project overview		
	M	26-Oct-26			Exam 5	3
w10	T	27-Oct-26		Readings #4		
	M	2-Nov-26			Reading #4	3
w11	T	3-Nov-26	Module 6	Human Behaviour	Lab 5	7
				Lab 6: Behavioural Space Model		
	M	9-Nov-26			Exam 6	3
w12	T	10-Nov-26		Project work		
	M	16-Nov-26			Project Proposal	2
w13	T	17-Nov-26	Module 7	Networks, Space & Time		
				Bonus task*		3
	M	23-Nov-26			Exam 7	3
w14	T	24-Nov-26		Readings #5	Lab 6	7
				(Thanksgiving Break)		
	M	30-Nov-26			Reading #5	3

Course Details - Grading Policy

Your Grades will be calculated based on the following assignment weightage.

Assignment Category	Points
Syllabus quiz	1%
Labs (6)	42%
Reading Discussions (5)	15%
Exams (7)	21%
Project	21%
Total	100%
Extra credit bonus assignment	3%

The course is divided into 8 Modules. Module 1 to 7 provide learning material, conduct hands on lab exercises, topic-based reading discussions and an Exam for each module. Module 8 is dedicated to work on your term Project. See below the overview of major course assignments. Details will be provided in course carmen page.

- **Labs:** There will be multiple labs associated with lecture content. You will be provided with data and step-by-step instructions for each lab, but keep in mind that the process of completing any given lab may not go as smoothly as planned. Unexpected challenges may arise, so set a goal to submit each lab in advance of the deadline.
 - If you have any questions on lab contents and/or grades (can't finish specific steps, tools are not working, etc.), please contact your instructor via email at least 24 hours before the due date.
- **Reading Discussions:** There will be several assigned readings for different topics covered in the lecture content. For each Reading Discussion assignment, you will need to pick at least one of the readings and submit a short summary/reflection and must participate in the discussion.
- **Exams:** There will be multiple (mini) Exams to cover different topics/modules from the lecture.

- Exams must be taken within the scheduled week unless you have informed your instructor before the exam with valid reasons and documents and got approved by the instructor. Please contact your instructor in advance to re-schedule a make-up exam, except in the case of emergency. Make-up exams for excused absences will not be penalized. Make-up exams for unexcused absences will be penalized 15%.
- **Project:** Each student will work on a final project using the techniques learned in this class. The student is responsible for collecting data and implementing the project idea. Each project has a few deadlines for required deliverables, including a short proposal that describes the project idea, an early release of a working prototype, and the final product that include a final project report and a 10-minute video presentation of the project. Each project will also be peer reviewed by at least two students.

Late Assignment Policy

Please refer to Carmen course website for due dates of each assignment. Assignments will be penalized **10% for each late day**. Thus, assignments submitted 10 days after the deadline will be graded 0.

- Extensions will not be granted due to lost work; be sure you back up and keep all your work. In case of unavoidable emergencies (for ex: health concerns or conference attendance) you must notify your instructor and request for permission to submit a late assignment.

Course Details - Grading Scale

Letter Grade	Percentage Range
A	100% to 93%
A-	< 93% to 90%
B+	< 90% to 87%

Letter Grade	Percentage Range
B	< 87% to 83%
B-	< 83% to 80%
C+	< 80% to 77%
C	< 77% to 73%
C-	< 73% to 70%
D+	< 70% to 67%
D	< 67% to 60%
E	< 60% to 0%

Course Details - Instructor Policies

Instructor Feedback and Response Time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call 614-688-HELP at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within 7 days after the assignment is closed.
- **Email:** I will reply to emails within 48 hours on days on school days. Feel free to send follow up email after 2 days of no response.
- **Discussion board:** I will check and reply to messages in the discussion boards Twice a week on school days. I highly recommend using this option to post your questions and reply to fellow student's questions, related to topic wise course content.

Course Details - Course Policies

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While participating in class discussions, although you are not writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Course Details - AI Use Policy

GenAI can fabricate information (for example, creating citations to sources that do not exist) or omit key information. You are ultimately responsible for the accuracy and integrity of your submitted work. Unless explicitly permitted below, representing AI-generated content as your own work is a violation of the Code of Student Conduct. Please check with your instructor if you have questions.

These levels may apply to the entire course or specific assignments, as indicated by the instructor:

- **Permitted:** You must personally author the entire initial draft without AI assistance. Then you may use GenAI to critique your logic, improve grammar, clarity, etc.
- **Prohibited:** The materials in this course may be subject to copyright protection. Do not input or allow AI to access external or instructor-created course materials (e.g., assigned readings, slides) without explicit instructor permission. When seeking feedback, students may not use AI to generate new content, rewrite whole sections, fill in missing analysis

or evidence, or create thesis statements or conclusions.

- **Requirement:** The core ideas and original text/work must remain yours. You are responsible for the accuracy and appropriateness of any AI-suggested revisions and ensuring that AI does not obscure your individual learning or voice. You should document and critically evaluate AI suggestions before accepting them.

Given that the learning goals of this class include getting yourself familiar with Web and tools available on web, in this course, students are welcome to explore innovative tools and technologies including generative artificial intelligence (GenAI). Students are permitted to use GenAI tools for most course assignments, **except for the final project assignments and reading reflections**. Your written assignments, including discussion posts or essays, should be your own original work.

If I suspect that you have used GenAI on an assignment for which it is prohibited, I will ask you to explain your process for completing the assignment in question. Submission of GenAI-generated content as your own original work is considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. The unauthorized use of GenAI tools will result in referral to the Committee on Academic Misconduct.

Syllabus - University Policies

Office of Undergraduate Education - Standard Syllabus Statements

- [Academic Misconduct](#)
- [Religious Accommodations](#)
- [Accommodations for Disability and Illness](#)
- [Intellectual Diversity](#)
- [Grievances and Solving Problems](#)
- [Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct](#)
- [Copyrights](#)
- [Content Warnings](#)

- [Mental Health Support](#)
- [Resources for Military-Connected Students](#)
- [Campus-wide Class Cancellations](#)