GGS 632: Spatial Modeling for Public Health (3 credits)
**Syllabus is subject to change

Spring 2025

Instructor: Taylor Anderson
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Course type: In-person
Meeting hours: Wednesday 4:30-7:10
Location: EXPL 2312
Office hours: TBD
Course website: Blackboard
Final Exam: None

Course Description:

Models are critical to explain and predict the spread of diseases in and between human and ecological systems. Furthermore, these models can be used to better understand and predict health outcomes and prescribe the most optimal policy actions that mitigate negative impacts. This course offers a combination of theory, techniques, and practical considerations related to spatial agent-based models of infectious diseases. Topics include foundations in spatial epidemiology, agent-based models, complexity, synthetic populations, health behaviors, mobility and movement, model evaluation, and application of models. Although we briefly touch on a range of different modeling approaches and disease applications, our focus is on the agent-based approach in the context of infectious human diseases. Students will develop hands on experience in developing a spatially explicit model of diseases.

Prior Experience

There are no prerequisites for GGS 632, although GGS 553 is recommended. Prior experience with programming languages or simulation platforms and software is not required. Prior experience with geographic information systems and/or spatial data will be recommended.

Difference between GGS 432 and 632

The learning objectives are different between the two levels, where GGS 432 will focus on learning key concepts in spatial epidemiology and simulation modeling and GGS 632 will focus on applying and thinking critically about these concepts. Beyond GGS 432, the students in GGS 632 will read and present a paper that uses models to investigate spatial processes driving disease spread. GGS 432 students will benefit from watching and discussing the presentations. While both GGS 432 and 632 have the opportunity to develop their own model, GGS 632 will go beyond simply describing their model using part of the ODD protocol to write a full academic paper with a literature review, methods, results and discussion.

Blackboard Login Instructions

Access to MyMason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. Check the IT Support Center website. Navigate to the Student Support page for help and information about Blackboard. In the menu bar to the left you will find all the tools you need to become familiar with for this course. Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

Readings

Some recommended texts:

1. Railsback, Steven F., and Volker Grimm (2012). *Agent-Based and Individual-Based Modeling: a Practical Introduction.* Princeton University Press.
2. Vynnycky, E., & White, R. (2010). *An introduction to infectious disease modelling.* OUP Oxford.
3. Crooks, A., Malleson, N., Manley, E., & Heppenstall, A. (2018). *Agent-based modelling and geographical information systems: a practical primer*. Sage.

Course Learning Outcomes

Upon completion of this course, students will be able to:

1. Build upon and apply foundational concepts in spatial epidemiology
2. Compare and evaluate different disease modeling approaches
3. Develop and implement a spatially explicit model of disease spread
4. Generate insights from the model that could support decision and policy making

Technology Requirements

Hardware: You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience. For the amount of Hard Disk Space required taking a distance education course, consider and allow for:

1. the storage amount needed to install any additional software and
2. space to store work that you will do for the course.

If you consider the purchase of a new computer, please go to Patriot Tech http://itservices.gmu.edu/services/view-service.cfm?customel_dataPageID_4609=6233to see recommendations.

Software: Many courses use Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers and operating systems. Log in to myMason to access your registered courses. Some courses may use other learning management systems. Check the syllabus or contact the instructor for details. Online courses typically use Acrobat Reader, Flash, Java, and Windows Media Player, QuickTime and/or Real Media Player. Your computer should be capable of running current versions of those applications. Also, make sure your computer is protected from viruses by downloading the latest version of Symantec Endpoint Protection/Anti-Virus software for free here.

Students owning Macs or Linux should be aware that some courses may use software that only runs on Windows. You can set up a Mac computer with Boot Camp or virtualization software so Windows will also run on it. Watch this video about using Windows on a Mac. Computers running Linux can also be configured with virtualization software or configured to dual boot with Windows.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

Course-specific Hardware/Software: This course uses a range of open-source software including NetLogo and proprietary software like ArcGIS Pro.

Course Schedule **Full details can be found on Blackboard and is subject to change. **Note that the weeks are organized from Wednesday (class) to Tuesday (most items due).**

WEEK (W-Tu)		MEETING (Wednesday @4:30-7:10)	Topic	Journal Prompt (JP) (following Tuesday @11:59pm)	Quiz	Project
1	Jan 22-28	Jan 22	Introduction to Infectious Disease Spread	JP1		
2	Jan 29-Feb 4	Jan 29	Introduction to Compartmental Modeling	JP2		
3	Feb 5-11	Feb 5	Complexity	JP3		
4	Feb 12-18	Feb 12	Agent-Based Modeling I	JP4		
5	Feb 19-25	Feb 19	Agent-Based Modeling II	JP5 (Pre-Proposal)		
6	Feb 26-March 4	Feb 26	Synthetically Generated Populations			Proposal Due March 4 @11:59pm
7	March 5-7	March 5	Spatial ABM		Quiz 1	
		March Break				
8	March 19-25	March 19	Mobility and Movement	JP6		
9	March 26-April 1	March 26	Networks	JP7		
10	April 2-8	April 2	Health Behavior	JP8		
11	April 9-15	April 9	Model Evaluation	JP9		
12	April 16-22	April 16	Applications and Future			
13	April 23-29	Apr 23	Project Work		Quiz 2	

WEEK (W-Tu)		MEETING (Wednesday @4:30-7:10)	Topic	Journal Prompt (JP) (following Tuesday @11:59pm)	Quiz	Project
14	April 30-May 5	Apr 30	Project Presentations			Project Presentations Due Apr 24 in class. Final Paper Due Apr 29 @11:50pm

Assignments Description

DELIVERABLE	% OF FINAL GRADE
Journal Prompts	**35**
Paper Presentation	**10**
Quizzes	**10**
Project	**45**

Journal Prompts

Throughout the course of the semester, you will complete responses to 10 journal prompts (each worth 5% of your final grade). Think of each response as a progress update on both your understanding of the conceptual and technical material as well as your progress on model development. You will receive the prompt at the beginning of the week (on Wednesday) and are encouraged to reflect on it throughout the week. Your responses to each journal prompt are due at the end of each week (the following Tuesday).

Presentation Discussions

Typically, publications You will select and read a journal article that uses an ABM to explore the role of one of the following spatial processes on disease dynamics: population composition, mobility and movement, contact or social networks, health behavior, or policy interventions. Depending on your presentation topic, you will schedule your in-class presentation. For example, if the topic of

your presentation is contact or social networks, you will present in Week 9. You will create a 10-minute in-class presentation with visual media (e.g. power point presentation, model demo) to describe the model and the findings.

Project

You will have the opportunity to either find and modify an existing ABM or develop your own ABM of disease spread (either individually or in a group of graduate students). The project component is composed of a project proposal, a presentation, and a final academic style paper.

Course Policies

Late Assignments:

One Extension Policy: Any student may propose a reasonable deadline extension for any course deliverable, subject to my approval, once during the semester. Students must justify in writing why they need this extension and provide a plan for how they will complete the work prior to the submission deadline.

One Revision Policy: Any student may revise and resubmit one major project deliverable within two weeks, after it is graded, either for a new grade or for up to a 15% increase on their prior grade provided the revisions are significant (not just error corrections).

Late Assignment Deduction Policy: Any late deliverable will earn a flat 10% grade deduction as long as the deliverable is completed within 7 days of the deadline. If it is not completed within 7 days of the deadline, the student will receive a 0.

Instructor-Student Communication: I will respond to your emails within 48 hours. If I will be away from email for more than one day, I will post an announcement in the Blackboard course folder. Before sending an email, please check the following (available on your Blackboard course menu) unless the email is of a personal nature:

1. Syllabus
2. Ask the Instructor Blackboard Discussion
3. On-demand Blackboard videos on how to use Blackboard features, and Technical Requirements.

Feel free to respond to other students in the Ask Professor forum if you know the answer.

Campus Closure: If the campus closes or class is canceled due to weather or other concern, students should check Blackboard for announcements.

Grading Scale

GRADE	PERCENTAGE
A+	**96 to 100**
A	**93 to 95.9**
A-	**90 to 92.9**
B+	**86 to 89.9**
B	**83 to 85.9**
B-	**80 to 82.9**
C	**70 to 79.9**
F	**< 70**

University Policies and Resources: Please see the Common Policies Addendum

Common Policies Affecting All Courses at George Mason University

Updated August 2024

These four policies affect students in all courses at George Mason University. This Course Policy Addendum must be made available to students in all courses (see Catalog Policy AP.2.5).

Additional policies affecting this course, and additional resources or guidance regarding these policies, may be provided to students by the instructor.

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone ***confidentially***, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.