GEOG 5226 Spatial Simulation and Modeling in GIS – Autumn 2019 Syllabus

Meeting Time: MW 02:20pm – 3:40pm, Derby Hall 135

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- Office Hours: Wednesday 11:00am-1:00pm @ 1120 Derby, or by appointment.

Teaching Assistant Name and Email: Rohit Mukherjee, mukherjee.110@osu.edu
- Office Hours: Mondays 12:00pm – 2:00pm @ 1131 Derby, or by appointment.

Course Description: 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 fine-level of granularity, providing new insights that were unavailable through traditional modeling techniques.

We will explore three 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 geographic information science, representation of space and time, how to build more complete models of human, physical and linked human-physical dynamic spatial processes, and how to evaluate model performance and uncertainty.

Materials:
- Textbook (required):
  - O'Sullivan, D. and Perry, G. (2013) *Spatial Simulation: Exploring Pattern and Process,* Wiley. Available at university bookstore; also available in e-book format from Amazon.
- Readings:
  - Additional readings and webpages will be posted at the Canvas course website. These resources will provide additional background material as well as deeper dives into the science behind the models discussed in class.
- Data storage:
  - A portable memory device (with 16GB or larger storage), such as a portable hard drive or flash drive, is required. Please bring it with you to every lab session as all your work needs to be saved to this device.
  - You can also store your data with a cloud drive (Box, Google Drive etc.). Please remember to log out the cloud drive when you finish using a lab PC.

Evaluation:
- Assignments – 40%
  - There will be a series of NetLogo-based lab assignments throughout the semester. All lab assignments will be submitted via the course website and count toward your final grade of the course. Most lab assignments are due one week after each lab session (at 5:00pm of the due day). Lab 4 will be given two weeks to finish.

- o Do not expect to finish all lab work during the scheduled lab time. You will need to work outside of class to complete your labs.
- Exams – 45%
  - o There will be 4 short examinations (20 -25 questions) during the semester. <u>Exam questions will be drawn from the lectures, textbooks and labs</u>. Exams will be online using Carmen, but will occur during normal class times using the computers in our normal classroom.
- Attendance – 15%
  - o Attendance is required and will be recorded at all class meetings. An attendance sheet will be passed around the classroom, and you are responsible for remembering to sign it. If you forget to sign the attendance sheet during the scheduled class time, you will be marked absent (unexcused).
    - o Unexcused Absences:
      - ➢ You may miss 2 classes (including lectures and labs) without penalty. Additional unexcused absences will result in a 1-point deduction from your attendance grade. No more than 15 points can be deducted from attendance.
    - o Excused Absences:
      - ➢ Please email the instructor (or TA if you can't attend a lab) for excused absences (e.g. due to illness, car trouble, conference attendance, required job training, passing away of a loved one, etc.) Proper documentation (e.g. doctor's note, bill from a mechanic, proof of conference registration, email from a supervisor, obituary, etc.) must be provided.
- Grading Scale (OSU standard scale):

A	93-100%	B-	80-82%	D+	67-69%
A-	90-92%	C+	77-79%	D	60-66%
B+	97-89%	C	73-76%	E	0-59%
B	83-86%	C-	70-72%		

  - o Your final grade as seen on the course website will be rounded to the nearest whole number (e.g. an 89.49 is a B+ while an 89.50 is an A) before being submitted to the University Registrar at the end of the semester.

Course Policies:
- Email correspondence policy
  - o You are responsible for all course related emails, so be sure to check your inbox on a daily basis.
  - o When emailing your instructor or TA, please always begin the subject of the email with the course number (GEOG5226) and your name (first name followed by last name). This is important as your instructor and TA teach multiple classes and need to know to which class you are referring. A proper email subject should be like this:
    GEOG5226_John Smith_Schedule a make-up exam
- Course website policy
  - o You are responsible for all announcements, additional readings, assignments and other material posted on the course website. Be sure to check it frequently.
- Lab questions policy
  - o Please send your lab-related questions as least 24 hours before the day/time the lab is due to allow your TA time to respond.
- Late submission policy
  - o Lab assignments will be penalized 10% for each day late.

- o Extensions will not be granted due to lost work. Be sure you back up and keep all your work.
- Exam policy
  - o Exams must be taken at the scheduled time, unless you have informed your instructor before the exam with proper reasons and documents, and got approved by the instructor. Please contact your instructor in advance of the scheduled exam to schedule a make-up exam, except in the case of emergency.
  - o You are expected to arrive to all exams on time. Students who arrive late to the exam will be permitted to begin the exam, until the first student leaves. After a student completes the exam and leaves, students who arrive late will not be permitted to begin the exam, will be asked to leave, and will be considered absent. Your absence will be considered unexcused, except in the case of emergency.
  - o You are expected to finish all exams on time. Exams begin when schedule class time begins, and exams end when the scheduled class time ends. At the end of the scheduled class time, you are to stop working and turn in your exam. You may not continue working on your exam after the scheduled class time.
- Disability services policy
  - o Students with disabilities that have been certified by the Office for Disability Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 098 Baker Hall, 113 W. 12th Ave, Columbus, OH 43210; telephone 614-292-3307; http://slds.osu.edu/.
  - o Registration with SLDS does not grant accommodations automatically. You need to bring the accommodation form provided by SLDS to the instructor to work out a plan for accommodations. Please contact the instructor as soon as you are registered with SLDS for attendance, assignment and/or exam accommodations.
- Academic Misconduct policy
  - o It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct: http://studentlife.osu.edu/pdfs/csc_12-31-07.pdf.
  - o Collaboration for the purposes of troubleshooting is highly encouraged in this course, but everyone is expected to submit their own unique work. For example, asking a classmate how to resolve an unexpected error message is OK, but using another classmate's work (e.g. screen captures, etc.) as your own is NOT ok, regardless of whether or not they provide consent for the use of their materials. (Note: There are many other acceptable/unacceptable actions than those exemplified here.) If you have any questions or concerns about acceptable/unacceptable actions, ask your instructor for clarification/permission.
  - o Do NOT leave any of your work saved on the lab computers, as this presents data security and academic integrity concerns.
    - If you leave your work on the lab computers, another student could access it and use it as their own, resulting in work that is identical or nearly identical (as determined by the instructor). If this happens, both will receive zeros for the assignment, and both will be held responsible for academic misconduct.

- If you discover work that was left on the lab computers by another student, please immediately delete the files from the computer so that they will not be available to anyone else. (You may also delete files who owners cannot be determined.)
    - All open-ended responses to questions, prompts, etc. must be written entirely, nearly entirely, or at least in majority using your own words. Use credible sources, and cite all sources, including those only referenced, those indirectly paraphrased, and those directly quoted, being sure to use quotation marks to identify excerpts from these credible sources. This expectation to cite all of your sources also extends to the textbook, the lab instructions, lecture slides, other course materials, online resources, etc. Please contact Center for the Study and Teaching of Writing (CSTW, https://cstw.osu.edu/writing-center) or the instructor if you have difficulties organizing language for assignments.

Classroom and Computers:
If you need to return to the computer lab outside of class time, please be aware that the building maybe locked at night, over weekends, and on holidays, so be sure to plan accordingly. When you do return to the computer lab outside of class time, there may be a class in session. Please attempt to avoid interrupting classes that are in session, and if there is a class in session, check the computer lab across the hall in Derby 140. It has the same software as Derby 135, and it is usually available.

If you would like to check the schedules for Derby 135 and 140, you can check the Room Matrix:
https://delegated.osu.edu/psp/csosuda_1/EMPLOYEE/CAMP/c/OSR_CUSTOM_MENU.OSR_ROOM_MATRIX.GBL
- Enter DB0135 for Derby 135 or DB0140 for Derby 140.
- Select the date under "Show Week of".
Click "Refresh Calendar".

Software:
- NetLogo
    - It will be available on the computers in our lab. However, since it is free and open source, you can download and install NetLogo on your personal machines: https://ccl.northwestern.edu/netlogo/ *However, note that you are on your own with installations on personal machines; we cannot provide technical support*.
    - The basic NetLogo install is simple, but some of the programs we will look at this semester will use the *gradient* extension. Installing the gradient extension is easy: go to this link, download and unzip the folder called *gradient* containing a single file called *gradient.jar*. Copy the entire folder to the same folder as your NetLogo models, or to the NetLogo *extensions* folder. (Some NetLogo models also require an R extension for data analysis and reporting, but we will not be using these models.) For more details on these extensions, see the textbook authors' website: http://patternandprocess.org/. You can also follow NetLogo on Twitter: https://twitter.com/NetLogo.
- NetLogo models
    - Since it is open source, NetLogo comes with a wealth of freely available models (programs) across a wide range of applications. Models sources include:
        - Models Library - available in the NetLogo software itself; look under "Files" → "Models Library"

- User community: https://ccl.northwestern.edu/netlogo/models/community/
- Models discussed in the textbook
    - The O'Sullivan and Perry text references and discusses a large number of NetLogo models. You should experiment with these models as part of your study *prior to class*. We will also work with some of these models in class.
    - Windows versions of the NetLogo models are available at the Canvas site: unzip the archive and copy the entire directory (including the gradient subdirectory) to your laptop or to a portable storage device for use during class.
    - Other sources for the NetLogo models, including Mac versions, include:
        - The authors' website, **Pattern and Process**: http://patternandprocess.org/.
        - O'Sullivan also maintains the most up-to-date versions of these models at a github repository: https://github.com/DOSull/model-zoo. (Note that the github repository may be incomplete: some models from the textbook may be missing.)