

Math 407 Winter 2022
Honors Seminar - Interacting Particle Systems

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Office Hours: MW 10 - 10:50AM, TTh 1 - 1:50PM, and by appointment. Office hours are available either in-person (wear a mask!) or over Zoom.

Prerequisite: No course pre-requisites - just a willingness to do a little bit of programming and the desire to play around with simulations!

Required Text: None! You may want to install the software package NetLogo (free) on your personal computer, if you don't want to depend on the computer lab for out-of-class work. NetLogo is available for download at <https://ccl.northwestern.edu/netlogo/>.

Course Goals: Interacting particle systems and their close relatives, agent-based models, are used in a wide variety of fields where we want to model complex phenomena that involve a large number of interrelated components. Our goal will be to explore interacting particle systems through simulation. Students will build models and explore their properties. One of the goals for the 407 course in general is mathematical communication, so everyone will be either leading a class discussion/activity or completing a final project.

Course Structure: This course is a seminar-style course. This means that you are expected to be present and participating in class every class meeting. It also means that, later in the quarter, some of our discussions and explorations may be led by students. All students will either lead discussion or give a presentation near the end of the quarter (see below).

We're going to start the quarter exploring some simple models and working with NetLogo together, to get everyone started. Then we'll spend a few weeks exploring various models and applications together. You can expect to have some work to do between class sessions. Some weeks, this may be programming; other weeks, it may be exploring a model and making some conjectures. By later in the quarter, we'll be assuming that a large part of your out-of-class time will be spent working on final projects or class discussions.

Evaluation: Because this is a seminar-style course, your attendance and participation are very important! In particular, in order to earn at least a "C" in this course, *you must attend and actively participate in at least 8 full class meetings* out of our 10 meetings (including the final exam period). Your grade will be based on:

- Out-of-class assignments (50%);
- Final project or class discussion (50%).

Final Project Option: If you choose this option, your final project will involve a written report and an oral presentation. You can discuss an interacting particle system/ABM that you have programmed and explored, or explore the uses of interacting particle systems/ABMs in a particular area of application. If you prefer, you can work as part of a

pair, although a higher level of complexity or detail will be expected. Final reports will be due at the final exam period (Thursday, March 17, from 10 - 12). Presentations will be either during the final exam period or during the last regular class meeting (Wednesday, March 9).

Class Discussion Option: If you choose this option, you will be leading class for a day later in the quarter. You can work as part of a pair if you wish. Your class could involve leading the class through the construction and exploration of a model, or exploring an area of applications. The class session should be significantly interactive and involve the full class in explorations. In addition to leading class, you'll need to submit a written plan beforehand describing what you plan to do (along with any handouts, starter code, etc), and a brief written reflection afterwards about how the class went and what you might do differently in the future.

General Course Policies: Come to class. Participate. Do your own work. Hopefully we'll have some fun this quarter!

Face Coverings and Social Distancing: Due to COVID-19, and under the directive and mandate of public health officials and the president of Central Washington University, students must adopt face covering protocol before entering any classroom or building at CWU until further notice. Students must also follow the social distancing placement marks in buildings and classrooms. If you do not have a face covering Central Washington University can provide one for you. If you have not yet received your CWU-supplied facial covering, please go the SURC Information Desk. Please do so prior to the start of your first class. Face coverings must cover both the mouth and nose, fitting snugly against the sides of the face. Your mask protects me; my mask protects you. Masks with one-way valves for exhalation don't have the protective value for others - please don't use them as your face covering for any in-person components. Your mask needs to stay on for the entire duration of class, and needs to stay put (no dropping, gapping, or sagging). Because of this, no eating is permitted in class, unless there is an official medical accommodation through Disability Services. Beverages are permitted ONLY if they are consumed using a straw tucked under your mask. Students not wearing a mask or not wearing one correctly will be asked to put one on; if they refuse, students will be asked to leave the classroom and building. Thank you for helping keep all of us safe!

N95/KN95 masks are strongly recommended because they have been found to be more effective against the spread of the Omicron variant than other facial coverings, according to the U.S. Centers for Disease Control and Prevention (CDC).

COVID Vaccinations and Boosters: CWU is strongly encouraging all students and employees to receive a COVID19 booster shot if it has been six months since your second Pfizer or Moderna shot, or two months since the single-dose Johnson & Johnson shot. Most pharmacies offer booster shots, or there is a free booster clinic in the SURC on Wednesday, Jan. 5 from 11AM - 3PM in SURC 137 (bring your vaccination card).

Written Work: All work handed in for the course must be written neatly, legibly, clearly, using correct mathematical notation, and with sufficient explanation. A good rule of thumb is to write your solution so that a classmate who knows roughly what's going on in the course but doesn't know how to do this particular problem can understand your solution. As a side benefit, this makes it much more likely that you will be able to

understand your work later! The bottom line: for any written work handed in for the course, *you must show your work*.

Submitting Work Electronically: All work for this course will be submitted electronically through Canvas.

- Homework assignments can be submitted in .pdf format ONLY.
- If you are typing homework or assignments, please make sure you know how to produce a PDF document. If you are handwriting, you have a few options for submission:
 - You can scan it to a PDF document using a cell phone camera. Some apps that do this (there are many others if you don't like these): Adobe (free) or CamScanner (free version) for Android phones; the Notes App (built-in) or CamScanner (free version) for iPhone.
 - You can take a well-lit, easy-to-read photograph, insert it into a Microsoft Word or OpenOffice Writer document, make sure that the photo is oriented correctly and easy to read, and then save the document as a .pdf file for upload to Canvas.
 - If your work is multiple pages, please upload it as a SINGLE file.

Whichever method you choose, please double-check that your image is oriented correctly. Images not oriented correctly or images that are not easy to read will lead to the assignment being returned without being graded.

Contingency Planning: In the event that we are unable to meet in person (this could be due to the university shifting entirely to remote coursework, inclement weather or wildfire smoke closures, or because I need to isolate), this course will convert for the necessary time period to a *synchronous* online course using Zoom. This means that you will be expected to continue attending class at the scheduled times, but we will meet using Zoom rather than in-person. In the event that a period of remote learning includes a course assessment, I may change the format of the assessment if necessary.

Illness: If you are feeling unwell for any reason, *please, please, please stay home*. Being vigilant about this will help prevent the spread of COVID-19 (and other bugs!) and allow us to continue in-person classes.

Academic Honesty: Consult university policies (CWUP 5-90-040(22), CWUR 2-90-040(22), and WAC 106-125-020) for student conduct, cheating, plagiarism, and other academic expectations. CWU's policies and recommendations for academic misconduct will be followed, leading to disciplinary action up to and including failing the course.

Inclusivity Statement: As a member of a peer learning community, a high degree of professionalism is necessary. **CWU expects every member of the university community to contribute to an inclusive and respectful classroom culture.**

Classroom Conduct: Students in this class are expected to interact with students and the professor professionally. Instances of disruptive conduct, obstructive conduct, or harassment (see definitions below from the Washington Administrative Code: WAC 106-125-020) will be referred to the Dean of Student Success.

Disability Support Services: Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. Students with disabilities should contact Disability Services to discuss a range of options to removing barriers, including accommodations: Hogue Hall 126, 509.963.2214, DS@cwu.edu

Is my absence excused? Excused absences will not lower your overall grade in this class and are determined on a case-by-case basis. Excused absences include illness, bereavement, and school-related activities. With the exception of illness, documentation is required. Excused absences do not include travel for holiday breaks, work, or non-emergency travel delays.

In compliance with RCW 28B.137.010, Central Washington University makes every effort to deal reasonably and fairly with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Students must present written notice to their instructor within the first two weeks of class listing the specific dates on which accommodations are required. Contact the Dean of Student Success at (509) 963-1515 for further information or questions.

Communication: While we all hope for a smooth quarter, we know that best-laid plans can go awry! Some of us may need to quarantine or isolate in the middle of the quarter. We all may need to shift entirely remote on short notice (and it may be worth thinking in advance about how you would make that work, both in terms of technology and in terms of being able to attend class and complete work remotely). In all things, communication is going to be key. If you have something going on, please let me know (no details you don't feel comfortable sharing, of course, just a general heads-up). As things need to change during the quarter, I will do my best to let you know as soon as I can. In all things, please extend grace to me and your classmates, and I will do my best to do the same.

I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.