Agent-based models are a bizarre mix of science and art: while often used in scientific discourse, they are complex and challenging to build, test, and articulate. This course uses an intensive workshop format to provide significant experience with building, testing, and articulating agent-based models in order prepare students to use and critique these models in their own work.

This skills-based course in the modeling of social-ecological systems, focuses on providing students all the conceptual and computational tools they need to design, modify, test and build agent-based models of socio-ecological systems. It draws inspiration and theoretical perspectives from research on common pool resource dynamics, human cooperation, evolutionary game theory, and complex adaptive systems. Students will use the free, cross-platform modeling system called NetLogo to explore the dynamics of models, critique these models, modify and extend them. The semester’s work will be cumulative, and build toward student-authored socio-ecological systems models. Students will be encouraged to connect their models to either local socio-ecological systems or to socio-ecological research conducted on campus.

Learning Objectives:

I intend to prepare you to:

- Define, explain and defend a socio-ecological research question of your choice
- Draft, develop and debug an agent-based model addressing your question
- Explain and critique an agent-based model from the literature (without code)
- Analyze and test an existing agent-based model (with code)
- Read and write NetLogo code
- Analyze and critique classmates models
- Test, analyze and present your own model
- Document your code and your model using a standard documentation system
### Assignments

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Assignment</th>
<th>Details</th>
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<tbody>
<tr>
<td>40%</td>
<td><strong>ABM Project</strong></td>
<td>The course is focused on creating an agent based model relevant to your</td>
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<td>graduate studies. It will include a paper write up (max 15p single spaced) as well as the model itself. Proposal 5%, Draft model 10%, Draft paper %5, Final model &amp; paper 20%.</td>
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<tr>
<td>20%</td>
<td><strong>Modeling Exercises</strong></td>
<td>Four cumulative modeling exercises, 5% each, or any combination of 2%-8% that suits you and sums to 20%.</td>
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<tr>
<td>10%</td>
<td><strong>Paper Critique</strong></td>
<td>Choose, present and critique an agent-based modeling paper from a literature of your choice.</td>
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<tr>
<td>10%</td>
<td><strong>ABM Peer Review</strong></td>
<td>Analyze and critique a classmates ABM.</td>
</tr>
<tr>
<td>10%</td>
<td><strong>Model Analysis</strong></td>
<td>Choose, test and analyze an agent-based model in written in NetLogo.</td>
</tr>
<tr>
<td>10%</td>
<td><strong>Participation</strong></td>
<td>This will be a very interactive and hands-on class. I request your help to keep it lively and interesting.</td>
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</table>

### Technical Stuff

Models and Papers will be turned in electronically, and directly to my desktop. We will use the free SugarSync service to accomplish this. I will send you a SugarSync invitation, followed by a link to a shared assignments folder that you should sync to your machine. You may get readings this way, too.

### Expectations and Guidelines

As graduate students, I expect to be able to treat you as intellectual peers, with all of the independence, commitment and responsibility that status entails. Below are some of the things that I try to train undergraduates on. I expect these will not be a problem for you, as a professional-grade student.

- **Attendance** - please plan to attend all classes, on time or early.
- **Deadlines** - please have all assignments completed on the due date.
- **Participation** - read the readings, participate in discussions, kill cell phones, etc.
- **Originality** - please make sure that all submitted work is entirely your own.
- **Respect** - treat fellow students and the teacher with respect.
- **Support** - the University of Maine offers several great support services for students. Among them are the drop-in UMaine Writing Center, the School of Economics Laboratory & Advising Center, 305 Stevens Hall, my own office hours, and the Services for Students with Disabilities Onward Program, 121 East Annex, 581-2319.
Readings

Course Book

Week 3 - ABM Methodology

Week 4 - ABM Methodology

Week 5 – ABMs and Emergence

Week 6 – Complexity Theory
**Week 7 - Ecological Dynamics**
14. TBA - McGill

**Week 8 – Rationality and Human Behavior**

**Week 9 – Evolution and Human Behavior**

**Week 10 – Evolution, Cooperation and Culture**
Week 11 – Cooperation and Evolutionary Transitions

Week 12 – Coupled Natural-Human Systems and ABM

Week 13 - Model Analysis Methods
Related Books

Some Motivation for Modeling Coupled Systems