

## Soc 880-3 Social Simulation Modeling

Professor: James Moody

Meeting Time: T 1:25 – 3:55

Place: SocPsych 329

### Overview:

Simulation modeling is a rapidly growing approach to developing (and sometimes testing) theory in the social sciences. A key advantage of simulation modeling is that one can do things with simulated populations that are impossible to observe from standard data. In particular, simulations provide a direct way to generate social system level features from individual actions and behaviors – to make the “micro-macro” linkage. The key challenge of simulations is getting them right. Simulations require you to make theoretical assumptions explicit, as that is the only input to the system under consideration. The goal of this class is to give you an opportunity to explore this way of modeling, examine the strengths & challenges and get you started on a simulation project of your own.

### Requirements:

This is a doing class more than a reflection & reading class. We will jump right in and start learning-by-doing, and you will be expected to write and present on your simulation project as it develops over the course. Most classes I’ll present a quick simulation example related to the reading & we’ll reflect on some of the key points there. Then workshop our projects.

The grade in the course is dependent on participation & finishing your simulation paper. The paper is due the end of the semester (though class meetings only go to Oct 1).

### Software:

Simulation obviously requires a programming language, and for this class you can use any language you want. *Note this is not a course in how to program*; we will go over code bits here and there as useful, but you can write simulations in any language (or even use excel if you want!) that you are familiar with. The bulk of the class time will be spent talking about what your simulation elements (usually “agents”) are doing and what elements we need to imbue them with.

If you are not currently fluent or have a strong preference for a particular software; the NetLogo software is a great place to start working with agent based simulation models.

<https://ccl.northwestern.edu/netlogo/>

Netlogo has a simple syntax that is easily adapted from a deep library of earlier models.

### Schedule:

#### Class 0: August 27. Not meeting, background & prep

*Summary:* **We are not meeting this first day** – I’m unfortunately out of town. The task this will is to do some background reading, dig deeply into one paper of your choice, and sketch the project you want to work on for this class.

*Assignments:*

1) Setup Reading. Read (at least) one of the following. Goal here is to get a “big picture” overview of the what/why of simulation models.

- Macy, MW & Rob Willer. 2002. “[From factors to actors: Computational sociology and agent-based modeling](#): *Annual review of sociology*.
- Schelling, Thomas C. 1978. *Micromotives and Macrobehavior*, first chapter.
- Hanneman, Robert A., Randall Collins, and Gabriele Mordt. 1995. “[Discovering Theory Dynamics by Computer Simulation: Experiments on State Legitimacy and Imperialist Capitalism](#)” *Sociological Methodology* 25.
- Axelrod, Robert. “[Advancing the Art of Simulation in the social sciences](#)” 2005.
- Epstein, Joshua and Robert Axtel. 1996. *Growing Artificial Societies*. (intro & first chapter)
- Epstein, Joshua. 2008. “Why Model?” *Journal of Artificial Societies and Social Simulation* <http://jasss.soc.surrey.ac.uk/11/4/12.html>
- Scott Moss and Bruce Edmonds, "Sociology and Simulation: Statistical and Qualitative Cross-Validation," *American Journal of Sociology* 110, no. 4 (January 2005): 1095-1131. <https://doi.org/10.1086/427320>

2) Find a published paper (not on the syllabus below!) in your field that uses simulation modeling; be prepared to present the substance of the model to the class next week. This means knowing what the agents are, what the rules are, etc. etc. I.e. you’ll want to be able to really explain the details of the model so we can pick them apart. **Email me your paper ASAP; we don’t want duplicates...so first person to claim the paper gets it.** This should also not be a paper by me. ☺

3) Start thinking about the simulation you plan to do for the class. Next week (class 1) you will need to present an overview of the problem/setting you want to discuss.

**Class 1. Sept 3. Theoretical Foundations; Planned projects.**

*Summary:* Goal is to discuss the basics of (agent based) simulation models. We will discuss the overview readings from above & each person will present the example paper they found.

*Assignments:*

- 1) *Have done:* Come to class ready to present (a) your example paper, (b) topic & setup of your simulation.
- 2) *To do:* prepare pseudo-code / flowdiagram /etc. for the simplest version of your project. (we will discuss what this means in class)

***The rest of this schedule is fluid; I’ve sketched general topics and readings ... we can adjust as we want depending on interest & how it fits into the work we are doing.***

**Class 2. Sept 10. Micro-Macro Exemplars**

*Summary:* Schelling’s segregation model is the archetype for how individual preferences can aggregate in unexpected ways.

*Reading:*

- Shelling, Schelling, Thomas C. 1978. *Micromotives and Macrobehavior*, Third chapter.
- Bruch, Elizabeth E. and Robert D. Mare. 2006. Neighborhood Choice and Neighborhood Change. *American Journal of Sociology*. 112 (3): 667-706.
- Van de Rijt, Arnout, Siegel, Savid, and Michael Macy. 2009. Neighborhood Chance and Neighborhood Change: A Comment on Bruch and Mare. *American Journal of Sociology*. 114(4): 1166-80.
- Bruch Elizabeth E. and Robert D. Mare, "Preferences and Pathways to Segregation: Reply to Van de Rijt, Siegel, and Macy," *American Journal of Sociology* 114, no. 4 (January 2009): 1181-1198.

- 1) *Have done*: Pseudo-code or flow model for your simulation. Share with class & discuss.
- 2) *To do*: First run of your basic model. Come w. output/results...it probably won't work. That's ok.

### **Class 3. Sept 17. Network Dynamics**

*Summary*: Simulations are particularly useful for network diffusion questions where the data is usually lacking to really to examine directly.

*Reading*:

- Axelrod, Robert. 1997. "The Dissemination of Culture: A Model With Local Convergence and Global Polarization." Chapter 7, From *The Complexity of Cooperation*. Princeton, NJ: Princeton University Press.
- Daniel DellaPosta, Yongren Shi, and Michael Macy, "Why Do Liberals Drink Lattes?," *American Journal of Sociology* 120: 1473-1511.  
<https://doi.org/10.1086/681254>
- Garry Robins, Philippa Pattison, and Jodie Woolcock, "Small and Other Worlds: Global Network Structures from Local Processes," *American Journal of Sociology* 110, no. 4 (January 2005): 894-936.<https://doi.org/10.1086/427322>
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- 1) *Have done*: First run of your basic model.
- 2) *To do*: Correct model per class feedback.

### **Class 4. Sept 24. Data grounded simulation & estimation**

**Mark Orr, Large-scale, data-grounded simulation.**

**Lisa Keister, Extending data using model-based simulations.**

*Summary*: Simulations are profitably used in many fields to extend data and/or to predict outcomes. **Mark Orr** (UVA) has worked extensively on these sorts of projects and will discuss some of his recent work in a DARPA funded social simulation trained to real-life data. **Lisa Keister** has used simulation tools to examine wealth, wealth mobility and stratification.

Reading: Keister: Two chapters from Wealth In America & one new data-extension simulation (will post).

- 1) Have done: Update on your model
- 2) To do: More on your model

**Class 5. October 1. Social Mobility, Collective action, Markets & Inequality.**

*Summary:* So many things we could read...really a potpourri here...idea is to get a sense of style & breadth.

- DiMaggio, Paul and Filiz Garip. 2011. "How Network Externalities Can Exacerbate Intergroup Inequality." *American Journal of Sociology*. 116(6): 1887.
- Rogers, Deborah S., Omar Deshpande and Marcus W. Feldman. "The Spread of Inequality" PLOS One.  
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0024683>
- James H. Fowler and Oleg Smirnov, "Dynamic Parties and Social Turnout: An Agent-Based Model," *American Journal of Sociology* 110, no. 4 (January 2005): 1070-1094. <https://doi.org/10.1086/426554>
- David Strang, Robert J. David, and Saeed Akhlaghpour, "Coevolution in Management Fashion: An Agent-Based Model of Consultant-Driven Innovation," *American Journal of Sociology* 120, no. 1 (July 2014): 226-264.  
<https://doi.org/10.1086/677206>
- Peter Hedström, Rickard Sandell, and Charlotta Stern, "Mesolevel Networks and the Diffusion of Social Movements: The Case of the Swedish Social Democratic Party," *American Journal of Sociology* 106, no. 1 (July 2000): 145-172.  
<https://doi.org/10.1086/303109>
- Joel M. Podolny, "A Status-Based Model of Market Competition," *American Journal of Sociology* 98, no. 4 (Jan., 1993): 829-872.  
<https://doi.org/10.1086/230091>

- 1) Have done: Update on your model
- 2) To do: More on your model

**November 26: Final Paper Due.** You have the rest of the semester to work on your simulation & write the paper. Paper due the last day of graduate classes.