

# Computational Modeling of Social Behavior

Aarhus University, August 7-11, 2017

## Instructor

Paul Smaldino

Assistant Professor of Cognitive and Information Sciences

University of California, Merced

Email: [paul.smaldino@gmail.com](mailto:paul.smaldino@gmail.com)

Web: <http://smaldino.com/wp>

## Workshop description

In this graduate-level workshop, students will learn about agent-based modeling and how it is applied to study social phenomena in human and animal societies. Agent-based models are widely used to help us understand a wide range of topics, including but not limited to cooperation, social learning, collective problem solving, opinion dynamics and polarization, segregation, the spread of disease, and the emergence of social norms. Students will receive introductions to relevant formal theories in the life and social sciences, and get hands on experience writing and analyzing simulation models using NetLogo, a widely used software package for agent-based modeling.

We will meet as a group for six hours a day, plus a break for lunch, for four days. Each of these days will consist of a mix of lectures and programming activities. On Friday, students will meet individually with the instructor to discuss proposed modeling projects.

## Preparation

Before we begin, you should download NetLogo, a free software tool for running and visualizing agent-based simulations. Available here: <https://ccl.northwestern.edu/netlogo/>

You will also benefit substantially by going through Tutorials #1-3 in the NetLogo User's Manual before the start of the workshop—this is strongly recommended. Going through all three tutorials will probably take you a couple of hours. The manual is bundled with the NetLogo download but also available separately here:

<http://ccl.northwestern.edu/netlogo/docs/NetLogo%20User%20Manual.pdf>

## Suggested Readings

Though not required, the following readings will help to anchor the topics covered in the workshop.

- **Philosophy of Modeling**
  - Smaldino PE (2017) Models are stupid, and we need more of them. In: RR Vallacher, A Nowak, SJ Read (eds), *Computational models in social psychology*. Psychology Press. <http://smaldino.com/wp/wp-content/uploads/2017/01/Smaldino2017-ModelsAreStupid.pdf>

- Epstein JM (1999) Agent-based computational models and generative social science. *Complexity* 4(5): 41–60. <http://www.uvm.edu/~cdanfort/csc-reading-group/epstein-complexity-1999.pdf>
- Kauffman SA (1971) Articulation of parts explanation in biology and the rational search for them. In: *PSA 1970*, ed. R. C. Buck & R. S. Cohen, pp. 257–72. Philosophy of Science Association. [https://link.springer.com/chapter/10.1007%2F978-94-010-3142-4\\_18](https://link.springer.com/chapter/10.1007%2F978-94-010-3142-4_18)
- **Spreading infection**
  - Goodnight C, Rauch E, Sayama H, de Aguiar MAM, Baranger M, Bar-Yam Y (2008) Evolution in spatial predator–prey models and the prudent predator: The inadequacy of steady-state organism fitness and the concept of individual and group selection. *Complexity* 13: 23–44. <http://sites.ifi.unicamp.br/aguiar/files/2014/01/complexity.pdf>
- **Cooperation and model assumptions**
  - Rand DG, Nowak MA (2013) Human cooperation. *Trends in Cognitive Science* 17(8): 413–425. [http://ped.fas.harvard.edu/files/ped/files/trendscognsci13\\_0.pdf](http://ped.fas.harvard.edu/files/ped/files/trendscognsci13_0.pdf)
  - Smaldino PE, Schank JC (2012) Movement patterns, social dynamics, and the evolution of cooperation. *Theoretical Population Biology* 82: 48–58. <http://smaldino.com/docs/SmaldinoSchank2012-MovementPatterns.pdf>
- **Networks**
  - Wang XF, Chen G (2003) Complex networks: Small-world, scale-free and beyond. *IEEE Circuits and Systems Magazine* 3(1): 6–20. <http://rakaposhi.eas.asu.edu/cse494/scalefree.pdf>
- **Model fitting and model complexity**
  - Grimm V, et al. (2005) Pattern-oriented modeling of agent-based complex systems: Lessons from ecology. *Science* 310: 987–991. [http://econ2.econ.iastate.edu/classes/tsc220/hallam/AgentBased%20Complexsystems\\_Science2005.pdf](http://econ2.econ.iastate.edu/classes/tsc220/hallam/AgentBased%20Complexsystems_Science2005.pdf)