

Social Simulation: Agent-Based Models and Other Modeling Methods

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Target Group: This short course is aimed at the audience of data analysts, data scientists, and researchers who are interested in learning of the tools available for studying human behaviour and social interactions, making estimates of risks, and understanding qualitative relationships.

Core reading: Steven F. Railsback & Volker Grimm Agent-Based and Individual-Based Modeling: A Practical Introduction <http://www.railsback-grimm-abm-book.com/>

Software (free): Download Netlogo from <http://ccl.northwestern.edu/netlogo/>
Useful reading <http://ccl.northwestern.edu/netlogo/docs/>

Requirements: You are required to bring your own laptop with wireless capability. You will download NETLOGO software for use in class.

Course Objectives : The short course provides an introduction to solving complex problems using systems science approach with the focus on Agent-based models. At the beginning of the course we will discuss and illustrate scientific objectives and the choice of the most appropriate modelling tool to meet the objective. The course will provide an overview of statistical models, Markov models, system dynamics models, and agent-based models. The course will then describe the main components and main steps in agent-based modelling. Laboratory part of the course will focus on actual building of an ABM. It will involve individual and team exercises. We will discuss approaches to model validation so that they are "trustable".

Syllabus

I. Introduction to modeling

1. Why model? Modeling objectives, and type of objectives: predict a number, make a decision, understand a relationship, and estimate the risk
2. Systems science and model types: statistical, Markov, system dynamics, and agent-based
3. Matching a modelling approach to the study objective.

Laboratory exercises

- NetLogo basics.
- Reading and understanding a model.
- Using help, other models as references
- Developing the first model.

II. Agent-based models

4. ODD protocol. ABM objectives and components (agents, rules, environments, networks)
5. Common technical issues to consider

Laboratory exercises

- GUI elements
- Actions, orders of operations, global and local context, model enhancements.
- Adding networks to the models.

6. Model building process using ODD. Common technical issues

7. Simulation scenarios and the analysis of the results

8. Practical issues in proposals.

Laboratory exercises

- Developing a model using ODD protocol.
- External input and output files
- Collaborative vs. individual performance
- Conducting and analysing experiments

9. Why should one trust your model? Uncertainty and validation. Interpretation of the results

10. Model documentation. Presentation of the results.