

Spring 2016 Syllabus

Agent-Based Modelling of Social Systems

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Lecture: Thursday, 13:15-15:00, HG E 1.2

Exercise: Thursday, 17:15-18:00, HG E 33.3

Exercises will be completed by using the programming language Python. During the exercise classes, assistants will help the students with implementation issues and answer their questions, to help them reach the solution by themselves. During the second half of the semester the students will work in groups on a project: formulating, implementing and analyzing an Agent Based Model.

1 Introduction

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Lecture 1 – Introduction, Motivation *25.02.2016*

- overview and motivation
- ABM framework: modelling techniques and tools – Python

Exercise: Learning about Python/NumPy, installation (due: 03.03.2016)

2 Models with Boolean Agents

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Lecture 2 – Opinion Dynamics I *03.03.2016*

- cellular automata: Conway's Game of Life
- voter models and social impact theory

Exercise: Running two sample models in Python – game-of-life and voter model (due: 10.03.2016)

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Lecture 3 – Opinion Dynamics II *10.03.2016*

- path dependence and lock-in effects
- majority and minority games

Exercise: Implementation of linear and non-linear Polya models (due: 17.03.2016)

*Lecture 4 – ABM in Game Theory**17.03.2016*

- prisoner's dilemma
- social herding and cooperation

Exercise: Implementation of prisoner's dilemma game (due: 07.04.2016)

*Lecture 5 – ABM of Systemic Risk**24.03.2016*

- models of fragility
- models of cascading failure

Exercise: no class, Easter break (due: n/a)

3 Models with Brownian Agents

*Lecture 6 – Opinion Dynamics III**07.04.2016*

- bounded confidence models
- how groups can foster consensus

Exercise: Implementation of bounded confidence model (due: 14.04.2016)

*Lecture 7 – Reputation and Competition**14.04.2016*

- reputation in social network
- reputation model with emergent hierarchy

Exercise: Course project – introduction, topics overview (due: 21.04.2016)

*Lecture 8 – Strategic Interactions**21.04.2016*

- efficiency of a system versus local stability
- strategic interactions

Exercise: Course project – the model formulation (due: 28.04.2016)

*Lecture 9 – Collective Emotions**28.04.2016*

- emotions and opinions
- emotional influence: communication as nonlinear interaction

Exercise: Course project – the model formulation (due: 12.05.2016)

4 Models with Spatial Interactions

*Lecture 10 – Migration**12.05.2016*

- Schelling's segregation model
- prisoner's dilemma with migration

Exercise: Course project – implementation (due: 19.05.2016)

*Lecture 11 – Collective Motion**19.05.2016*

- collective animal behaviour
- swarming in simple systems

Exercise: Course project – implementation (due: 26.05.2016)

*Lecture 12 – Spatial Brownian Models and Competition in Space**26.05.2016*

- interacting brownian agents
- spatial reputation model and sugarscape model

Exercise: Course project – analysis (due: 02.06.2016)

*Lecture 13 – Summary**02.06.2016*

- conclusions and wrap-up of the course
- Q&A

Exercise: Course project presentations (due: 02.06.2016)