***Computational Modeling of Social Systems***

David Garcia, summer semester 2025

**Type of the course:** seminar

**Module:** Social Science Applications

**Maximum number of participants:** 20

**Date & Time**

lecture: Tuesday, 10.00 - 11.30, D301

exercise: Thursday, 10.00 – 11.30, G227a

**ECTS:** 6 ECTS; 2 semester hours and 2 tutorial hours

**Contents**

This introductory course on computational modelling will introduce the students to the question of explaining human behavior across levels of analysis. Following a complexity science approach, the course will illustrate the basics of computational modelling with models that explain various kinds of human behavior.

The course will cover the following computational approaches to the modelling of social systems:

* Agent-based modelling: segregation and cultures
* Opinion dynamics: voter models bounded confidence
* Generative models on and of social networks
* Integration between language modelling and agent-based modelling

The course takes the form of a seminar in two phases:

1. Lectures on basics of computational modelling
2. Student presentations on selected readings in computational modelling

Students select a published article from a set of readings to reproduce and present in the second part and to write a short review of the article. The course grade is based on the student presentation (50%), participation in discussions after each presentation (20%), and on the report (30%).

The course contains a practical part of exercises connected to the lectures. It is highly recommended to participate in this exercise part because it will help to acquire the skills that are applied in the final project. The exercises will not be graded.

**Objectives**

Upon the completion of this course, students will be familiar with the following:

* Various approaches to model social interactions to bring the micro-macro gap
* General principles of agent-based modelling and network modelling
* The analytical approach to formalization, simulation, and analysis of computational models
* The role of empirical data in the calibration and validation of computational models
* The limitations and applications of computational modelling in the social sciences

**Recommended prerequisites**

This course does not have specific pre-requisites but is especially indicated for students beyond the first semester of their master studies, especially the SEDS programme.

**Literature**

Given the variety of modeling approaches covered by the course, there is no single reading source for the course. Each lecture will have one or two recommended readings as preparation and a more extensive readings list will be provided at the beginning of the course for students to choose a paper to present.