

# Teaching Undergraduate Sociologists Modeling and Computational Thinking #411



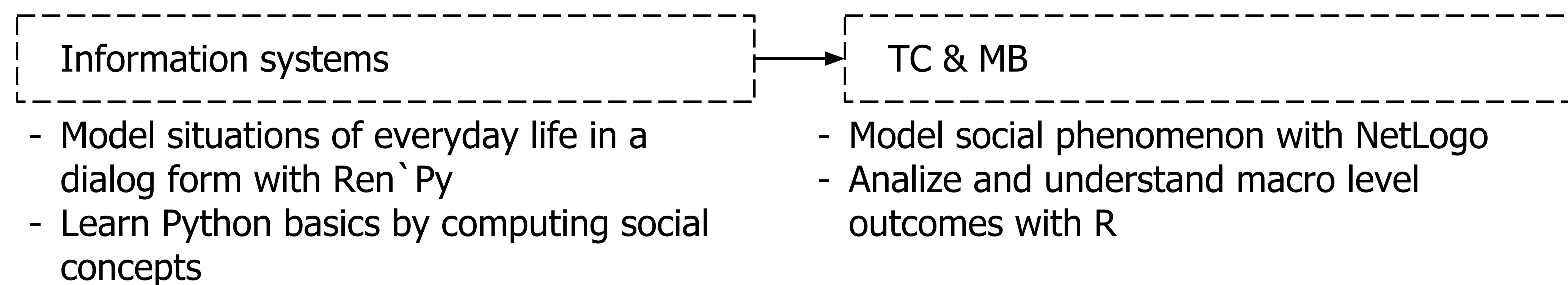
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The introductory agent-based modeling course we are presenting aims to equip second-year sociology students with basic skills which are critical to transforming their research ideas into theories and computational models. Our course follows a general course on theory construction in social science. As one of the first interactions of undergraduate social science students with computer science concepts, the course partially serves as a CS0 course; however, the main focus is on the higher-level skills needed to model social phenomena. This requires the course to maintain multiple foci on computer science and domain skills. In this paper, we present a course design considerations and establish a foundation for the comparison of agent-based models and the computational thinking and CS0 skills required for undergraduate social scientists studying agent-based modeling.

## 0. Before the modeling

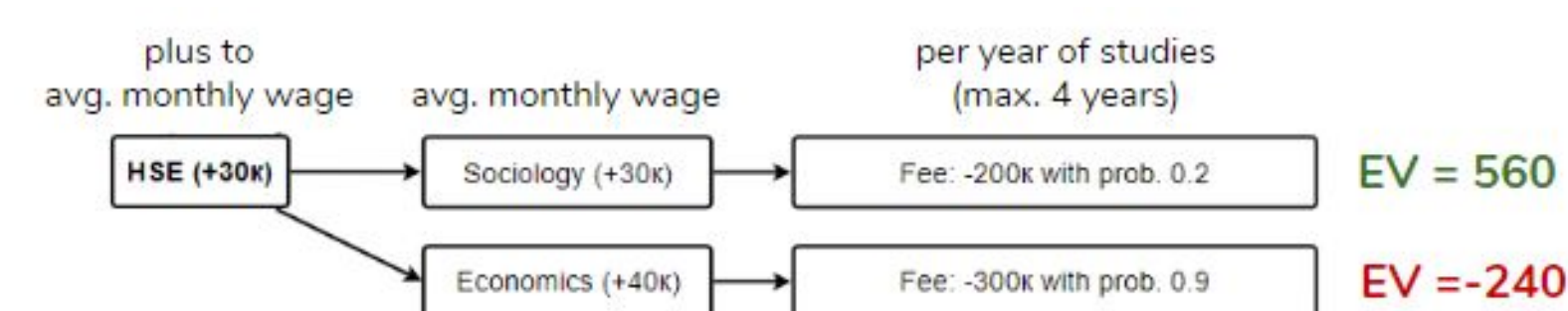
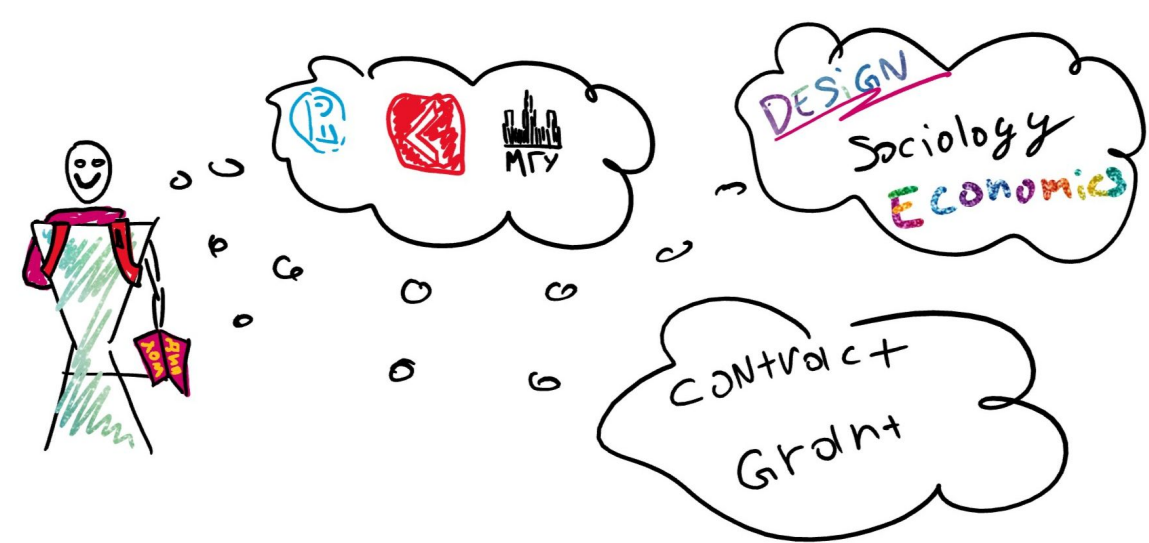
In HSE University St.Petersburg the undergraduate programme in Sociology and Social Informatics starts with an introductory course in Information systems, bridging basic skills of data visualization and CT, and setting the ground for further courses in Databases, Data Science, and Model Building.



## 1. Formalization of Decision Making

Review individual decision making theories. Introduction to optimization and Expected Utility concept. Discussion and coding up basic Rational Choice and Prospect Theory with extensions and alternatives.

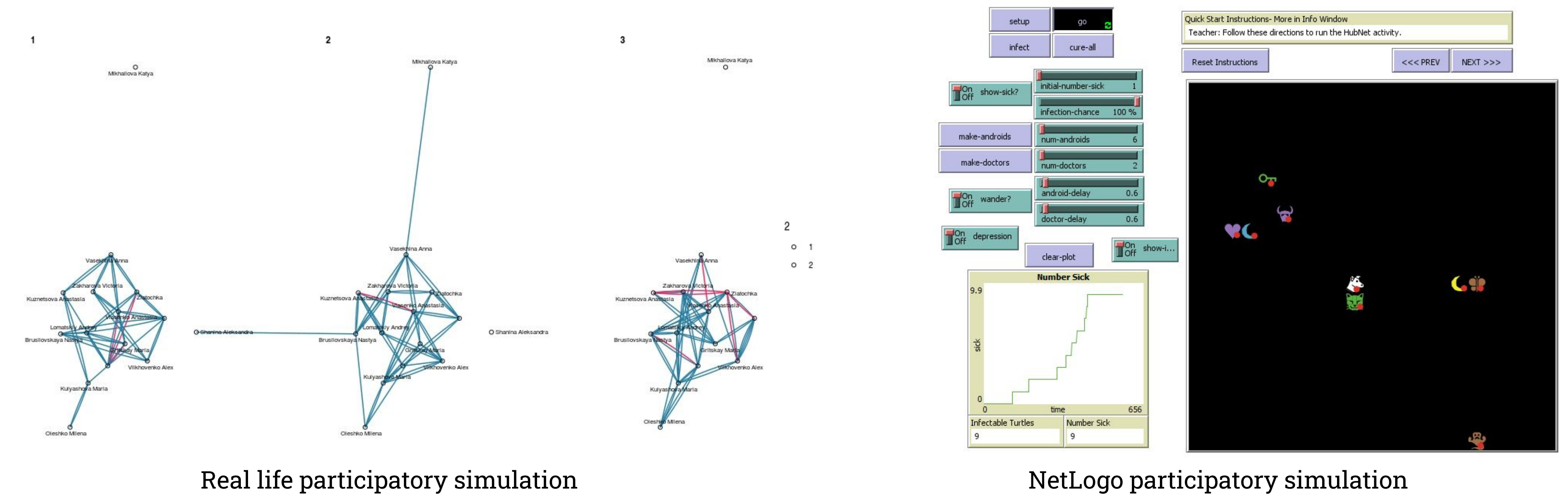
Practical exercises on *expected utility* calculation, *expert systems rules* creation and *byasian networks* manual imputation for situations in familiar context, for example university choice.



## 2. From Mental Models (To Factors) To Actors

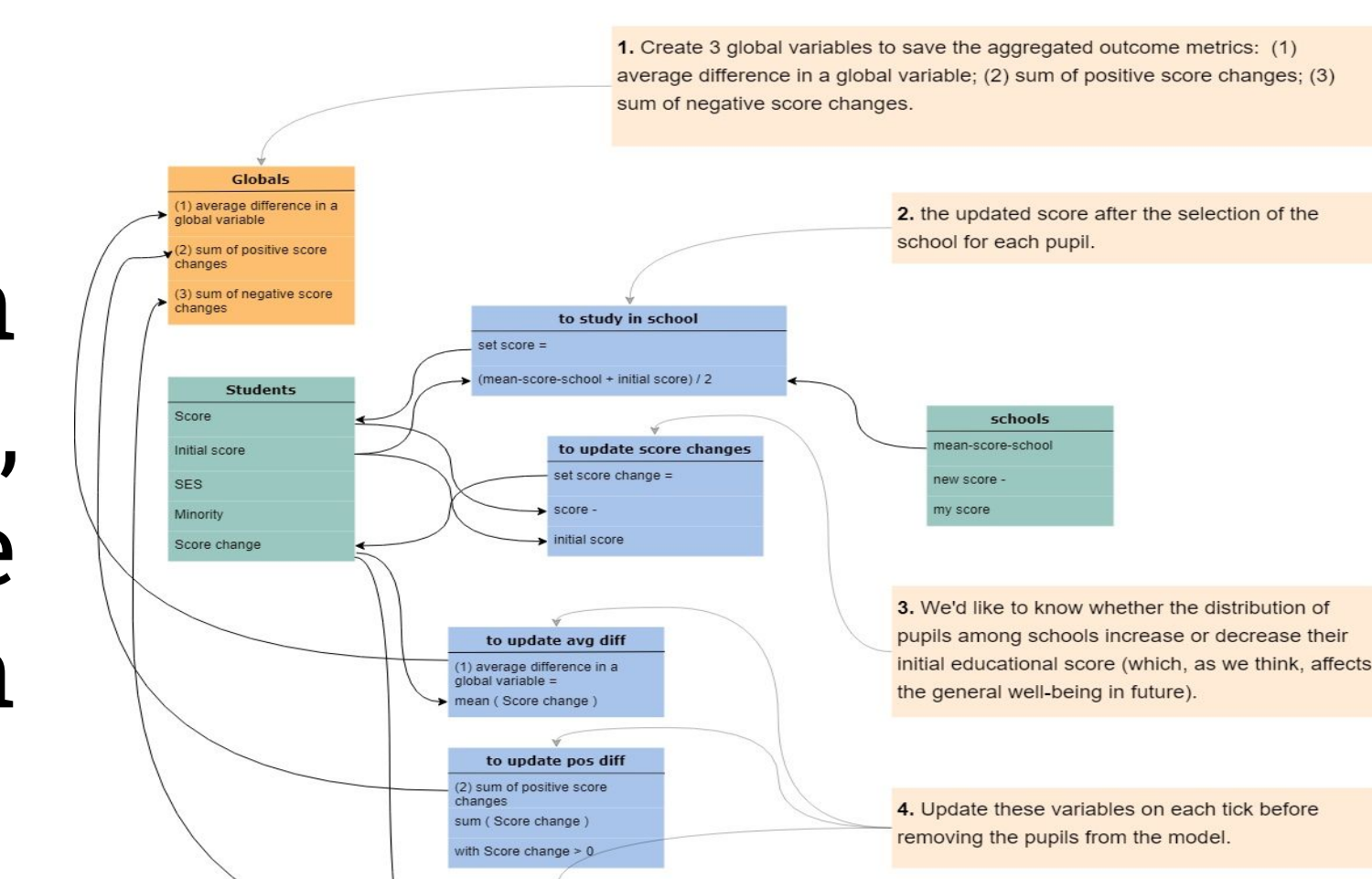
Review of theories relevant to methodological individualism and network structures.

Practical exercises (including gamified ones and participatory simulations) comparing individual actors' strategies, consequences and macro outcomes.



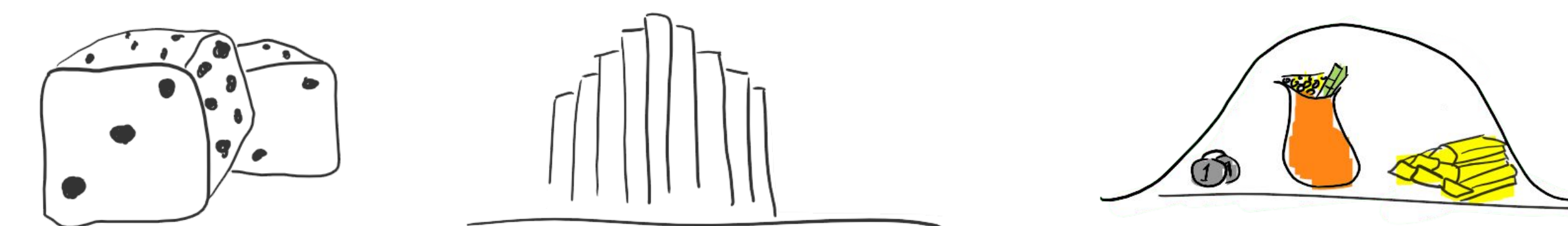
## 3. Concept mapping of models

Exercises to read and draw diagrams reflecting on the model implementation. Sequence Diagrams, Finite-State Machines and Decision Trees on the level of an individual agent. Switching between different levels of abstraction.



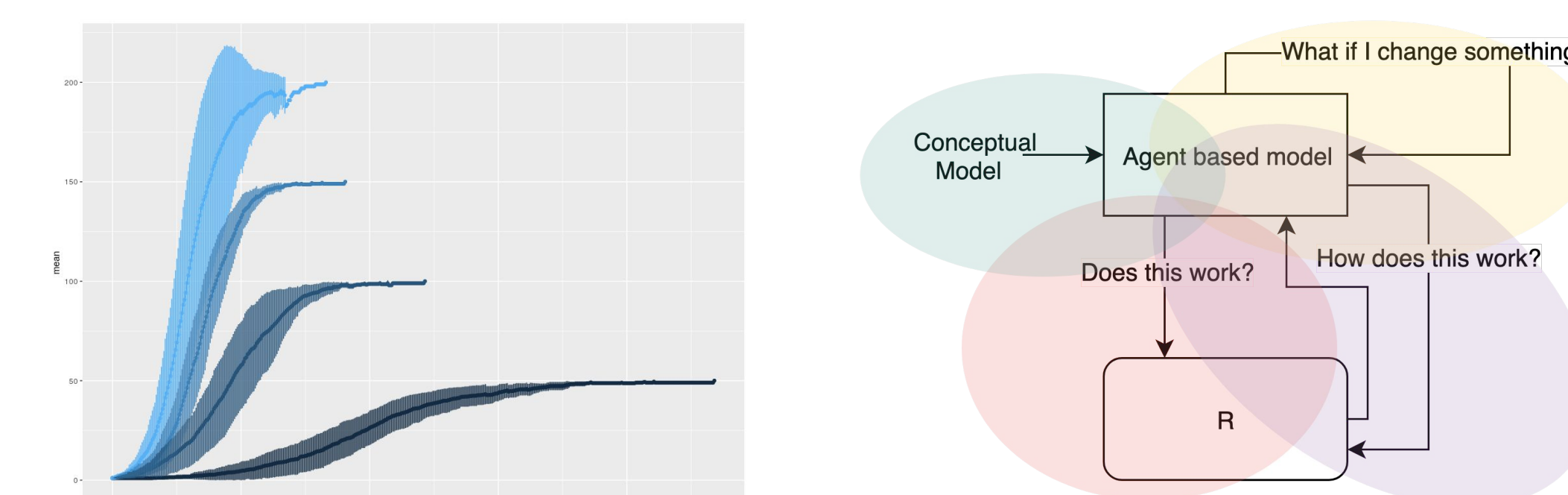
## 4. Operationalization of complex and hidden processes

Practical exercises on analysis of abstraction tricks, used in various fields (e.g. board games). Path from game rules and strategies to model laws and patterns.



## 5. Verification and Validation on real data

Students compare global and individual outcomes in the models with ground truth data as well as with expectations based on theory. They compare models' aggregated outcomes with real-world data.



Project page  
[nosoc.io/projects/abm-course/](https://nosoc.io/projects/abm-course/)

