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## **Modelling communities and populations: An introduction to computational social science**

**ABSTRACT.** In sociology, interest in modelling has not yet become widespread. However, the methodology has been gaining increased attention in parallel with its growing popularity in economics and other social sciences, notably psychology and political science, and the growing volume of social data being measured and collected. In this paper, we present representative computational methodologies from both data-driven (such as “black box”) and rule-based (such as “per analogy”) approaches. We show how to build simple models, and discuss both the greatest successes and the major limitations of modelling societies. We claim that the end goal of computational tools in sociology is providing meaningful analyses and calculations in order to allow making causal statements in sociological explanation and support decisions of great importance for society.

**KEYWORDS:** computational social science, mathematical modelling, sociophysics, quantitative sociology, computer simulations, agent-based models, social network analysis, natural language processing, linguistics.

### **1. One model of society, but many definitions**

Social reality has been a fascinating area for mathematical description for a long time. Initially, many mathematical models of social phenomena resulted in simplifications of low application value. However, with their growing validity (in part due to constantly increasing computing power allowing for increased multidimensionality), they have slowly begun to be applied in prediction and forecasting (social engineering), given that the most interesting feature of social science research subjects – people, organisations, or societies – is their complexity, usually based on non-linear interactions. Consequently,