Network Science and Agent-Based Models: what cooperation?

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Abstract

Social life could not be conceived without social interactions. Concepts and techniques to describe the empirical patterns, and the temporal changes, of these interactions exist and now constitute a thriving research field, today often referred to as network science as opposed to traditional social network analysis (Brandes et al. 2013). Patterns of social interactions can also themselves be regarded as an emergent property of interacting actions and, on the other hand, they are likely to shape social dynamics at a higher level of aggregation. Advanced statistical models for network data attempt to grasp the complex dynamic interplay between actions and interactions, for example Exponential Random Graph Models (Lusher et al. 2013), Stochastic Actor-Oriented Models (Snijders et al. 2010), and relational events models (Butts 2008). They tend to reach their limit however when more fine-grained chains of events want to be modeled and macroscopic consequences of network dynamics are the focus of the investigation.

Computational agent-based models constitute an attractive alternative for these tasks. From within the network camp, some have argued for seeking more fine-grained, object-oriented modelling techniques (Hummon & Fararo 1995; Monge & Contractor 2003; Padgett & Powell 2012: ch. 1). Others have shown that, conceptually, some statistical models for network dynamics can be conceived in terms of agent-based models (Snijders & Steglich 2015). On the other hand, computational modelers frequently attempt to generate statistical features of observed social networks from the bottom-up (Pujol et al. 2005). Fruitful exchanges between network and AB modelers start to exist in the field of strategic networks (Buskens et al. 2014: 673-677). In addition, in many agent-based models, specifying network topologies is a crucial step of the analysis (Axtell 2001). Sources of tension also exist among the two approaches, in particular because a different emphasis is placed over statistical estimation and causal inference (Snijders & Steglich 2015). Although social network science and computational agent-based models promise to capture overlapping aspects of social life and obviously knowledge cumulativity may gain from a synergy between the two approaches, dialogue is still limited and several unsolved issues remain. What are the specific limitations of the two families of approaches? How can they be combined in specific pieces of research? These are the questions this session has the ambition to address.

While we are open from a thematic point of view, submissions should engage with a confrontation between network science techniques and computational agent-based models. We

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seek papers built on a real exchange, possibly a mutual cooperation, between the two approaches. This could be at a foundational level, epistemologically and/or technically, or in terms of applications, showing for instance concrete examples of agent-based models empirically calibrated with real-world network data, or results from statistical network models generated through explicit, theoretically-oriented agent-based models.

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