

## **ABM'17: The Usefulness, Uselessness, and Impending Tasks of Agent-Based Models in Social, Human-Environment, and Life Sciences**

**Summary:** We propose to organize a workshop under the **goal** of transforming the science, technology, and application of agent-based models (ABMs, or agent-based modeling—ABM) in the context of social, human-environment, and life sciences. We will assemble a science committee of about 35 exceptional ABM modelers and users (funded by this project) and a number of regular participants (self-funded) with the following **objectives:** 1) summarizing the *status-quo* of ABM, and particularly pinpointing the *strengths* and *weaknesses* of ABM; 2) having in-depth discussions centered around a set of topical subareas (to be identified, but likely including model validation, modeling of human decisions, model transparency and reusability, and developing big data friendly ABM); and 3) identifying unique resources, areas of collaboration, impending tasks, and future directions for the ABM community. Each science committee member will 1) present his/her answers to our carefully designed questions in regard to ABM; 2) discuss issues related to the above goal and objectives; and 3) contribute to subsequent papers or co-edited book. All regular participants will present posters, interact with other researchers, and seek advice about their own ABM related work. The **outcome** of this workshop is expected to include 1) an ABM synthetic paper and several topical papers; 2) a co-edited book; 3) an online ABM repository that shares useful ABM resources; 4) plans to develop 1-2 proposals to tackle ABM grand challenges; and 5) recognition of young ABM scholars (students in particular).

The **intellectual merit** of this workshop project lies in the following aspects. As a major, powerful tool in studying various social systems, coupled human and natural systems (CHANS), life systems, and the like, ABMs have been widely developed and employed in various fields. The power of ABMs lies in their capabilities to represent heterogeneity, nonlinearity, feedback, individual-level activity and decision-making, as well as in integrating data and models across multiple disciplines and scales. However, ABMs were developed in various contexts, with different platforms, languages, or standards, and often with varying levels of model details and sophistication, lacking capacity for model validation, transparency, and reusability. Equally (if not more) important is that the ABM community is in dire need for a systematic, improved understanding about in what instances and how ABM can be used to model human decision making. Also the ABM community faces an increasing need to deal with big data, especially spatially (and temporally) explicit big data. Our workshop will first summarize the *state of the science* about ABM, pointing out the strengths, weaknesses, available resources, and impending tasks to improve the science and application of ABM. Furthermore, we will collectively identify a set of *topical subareas*, paving ways for improved, sharable ABMs (or modules) that address challenges in these subareas. This project will *engage the broader ABM community*, especially junior scholars and students, in advancing ABM through soliciting their input, advising their ABM work, and recognizing their achievements.

The **broader impacts** of this workshop project are multifaceted. First, with input from experts across diverse domains, the expected outcome may provide incentives and directions for many related fields to develop more robust, user-friendly tools based on service-oriented ABM designs and platforms. Secondly, it is likely that the outcome of workshop may attract attention from industry, and commercial companies (e.g., Esri) may expend to advance ABM software and capabilities. Lastly, the broader ABM community, represented by the diversity of invitees, will be inspired, directed, and guided to engage various research fields and valuable resources to those clearly identified, impending areas or subareas. This will end up with advancing other disciplines such as complexity science, computational and data sciences, ecology, sustainability science, land systems science, and CHANS research.