

## **Confidence in Simulations for Science (SCSC workshop proposal)**

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Modeling and simulation are increasingly used to understand and analyze systems across a range of scientific disciplines including biological, sociological, ecological and economics. This is a highly challenging interdisciplinary endeavor, *requiring practitioners to consider whether their simulation outputs are truly representative of the systems they simulate.*

Systems subject to computer simulation are typically complex; they are often non-linear, and it can be unclear exactly how the emergent system behaviors manifest from component interactions. Further, simulations are typically simplified representations of their target systems in order to render them computationally and conceptually tractable. It can be unclear whether behaviors observed in simulation are implementation artifacts or actual properties of the real-world domain. Constructing simulations requires cross-disciplinary skills, drawing from computer science, engineering, statistics, biology, sociology, ecology and/or politics. Interdisciplinarity can further complicate simulation construction and use, as stakeholders with differing backgrounds, experiences and terminologies collaborate and reach mutual understanding. Where simulation is used to understand or inform the design of real-world systems, and where simulation results have real-world impact, it is important to have confidence that the results are representative of that real-world domain.

This workshop explores the issue of building confidence in scientific simulation results, and draws together the experiences from different domains and applications. The aim is for participants to understand how these issues differ and are addressed across various domains, discuss best practice and recognize outstanding issues. We invite submissions of abstracts detailing methodologies and techniques for the construction and analysis of simulations, including, but not limited to:

- Stakeholder engagement and interaction
- Identifying and managing levels of required confidence
- Guiding simulation development to appropriate levels of abstraction
- Model inference from domain data
- Dealing with a lack of domain data
- Parameterizing simulations
- Calibration to demonstrate how simulations capture their target domains
- Analysis of simulation results
- Examples, and implications, of simulations found to be either high quality or low quality representations of their target systems

### **Submissions:**

We invite participants wishing to present their perspective on any of the above topics to submit an abstract. Abstracts will be selected by the organizers for relevance, but will not be formally published. Accepted presentations will be used to structure the workshop and guide discussions. We hope to collate the outputs from the workshop for a joint journal submission discussing best practice across complex system disciplines.