

# EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

## Two Projects for Advancing Scientific Reliability in Complex Computational and Human Systems

In this talk I present two new projects that aim to respond to increasing complexity in computationally and data-enabled research systems. The first is a recently funded collaborative planning proposal entitled “Performance Scalability, Trust, and Reproducibility: A Community Roadmap to Robust Science in High-throughput Applications” (NSF award 2028881). It focuses scientific discovery pipelines that combine multiple components into increasingly complex multi-modal workflows (e.g. data generation; data collection and merging; data pre-processing and feature extraction; data analysis and modelling; and verification, validation, and visualization) that are executed in concert on large-scale heterogeneous systems including high performance computing, multi-task computing, and cloud platforms. These increasing complexities hinder the ability of scientists to create robust and reliable science. I will present how we aim to explore how robust science can be achieved by enhancing performance scalability, trust, and reproducibility through a community driven process to build a roadmap of research priorities. The second project seeks to understand how the recommendations from the 2019 National Academies of Science, Engineering and Medicine (NASEM) consensus report “Reproducibility and Replication in Science” map to the evolving computational infrastructure ecosystem that supports data and computationally enabled scientific discovery pipelines. I present some preliminary findings from investigating the costs and benefits of implementing these recommendations in exploratory use cases. These investigations inform the articulation of avenues for future research at the intersection of reproducibility and computational infrastructure (NSF award 1941443). This is joint work with Michela Taufer (UTK), Ewa Deelman (USC), Trilce Estrada (UNM), Rafael Ferreira da Silva (USC), Mary Hall (Utah), and Loïc Pottier (USC).



### Dr. Victoria Stodden

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**SPEAKER BIO** – Victoria Stodden is a visiting Associate Professor in the Industrial Systems Engineering Department at the University of Southern California, and an Associate Professor in the School of Information Sciences at the University of Illinois at Urbana Champaign, with affiliate appointments in the School of Law, the National Center for Supercomputer Applications, and the Departments of Computer Science and Statistics. Stodden studies improving the reliability of scientific results in the face of increasingly sophisticated computational approaches to research: understanding when and how inferences from data are valid and reproducible, what it means to have replicated a result, the effect of big data and computation on scientific inference, the design and implementation of scientific validation systems, standards of openness and transparency for data and code sharing, and resolving legal and policy barriers to disseminating reproducible research. In 2009 she won the Access to Knowledge Kultura prize for her publication on legal issues in reproducible research and scientific innovation. She has served on the National Academies of Science, Engineering, and Medicine committees: “Reproducibility and Replication in Science” and “Fostering Research Integrity.” She co-chaired the National Science Foundation Advisory Committee for Cyberinfrastructure and was a member of the National Science Foundation Directorate for Computer and Information Science and Engineering (CISE) Advisory Committee. She testified on scientific reproducibility before the Congressional House Committee on Science, Space and Technology for the March 5, 2013 hearing on Scientific Integrity & Transparency.

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**3:30 PM – 4:50 PM**

ZOOM/ONLINE \*PLEASE EMAIL [OWH@USC.EDU](mailto:OWH@USC.EDU) FOR PASSWORD\*