Department of Biomedical Engineering
UNIVERSITY OF WISCONSIN–MADISON

Fall 2023 Seminar Series

Simulation-Based Inference: The Intersection of Mechanistic Models and Inverse Problems

Kyle Cranmer, PhD
Director of the UW-Madison Data Science Institute
Professor, Department of Physics
University of Wisconsin–Madison

Simulators are the modern manifestation of scientific theories. They implement mechanistic models of the underlying natural phenomena of interest as well as models for the instruments used to observe those phenomena. Complex, high-fidelity simulations have become critical research tools for predicting how systems will behave across many areas of science and engineering. Despite their predictive power, these simulators are poorly suited for statistical inference, which is a core aspect of data-intensive science. I will describe how machine learning is enabling simulation-based inference, an emerging set of techniques for solving these challenging inverse problems.

ABOUT the SPEAKER

Kyle Cranmer is the David R. Anderson Director of the UW-Madison Data Science Institute and a Professor of Physics with appointments in Statistics and Computer Science. He is also the Editor in Chief of the journal Machine Learning Science and Technology. Professor Cranmer obtained his Ph.D. in Physics from the University of Wisconsin-Madison in 2005. He was awarded the Presidential Early Career Award for Science and Engineering in 2007, the National Science Foundation's Career Award in 2009, and became a Fellow of the American Physical Society in 2021 for his work at the Large Hadron Collider. Professor Cranmer developed a framework that enables collaborative statistical modeling, which was used extensively for the discovery of the Higgs boson in 2012. His current interests are at the intersection of physics, statistics, and machine learning.

Monday, November 20 at Noon
1003 Engineering Centers (Tong Auditorium)