

Advances in Multi-Fidelity Computer Experiments: Non-Additive Emulation and Active Learning

BIOGRAPHY

Dr. Chih-Li Sung is an Assistant Professor in the Department of Statistics and Probability at Michigan State University. His research focuses on computer experiments, uncertainty quantification, and machine learning, with applications in engineering. He was awarded NSF CAREER Award in 2024, and SPES Award from ASA in 2019. He currently serves as an Associate Editor for Technometrics and CSDA. Dr. Sung earned his Ph.D. from Georgia Tech and holds a B.S. and M.S. from National Tsing Hua University.

ABSTRACT

Multi-fidelity computer experiments have emerged as a powerful framework for integrating low-fidelity and high-fidelity simulations, enhancing both accuracy and computational efficiency. In this talk, I will introduce the Recursive Non-Additive (RNA) emulator, a flexible statistical model designed for multi-fidelity emulation. Unlike conventional approaches that assume an additive auto-regressive structure, the RNA emulator recursively models relationships between fidelity levels using Gaussian process priors, removing the restrictive additive assumption and allowing for greater flexibility in capturing complex data patterns. Building on this emulator, I will also present four active learning strategies designed to optimize the trade-off between accuracy and simulation cost. These strategies provide principled methods for selecting both the fidelity level and input locations of future simulations, ultimately improving the efficiency of multi-fidelity experimentation.

