Seminar

Title：Active Learning for a Recursive Non-Additive Emulator for Multi-Fidelity Computer Experiments

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Time：10:30 ~ 12:00, Thursday, November 2, 2023

Place：Auditorium, B1F, Institute of Statistical Science

Abstract

Computer simulations have become essential for analyzing complex systems, but high-fidelity simulations often come with significant computational costs. To tackle this challenge, multi-fidelity computer experiments have emerged as a promising approach that leverages both low-fidelity and high-fidelity simulations, enhancing both the accuracy and efficiency of the analysis. In this paper, we introduce a new and flexible statistical model, the Recursive Non-Additive (RNA) emulator, that integrates the data from multi-fidelity computer experiments. Unlike conventional multi-fidelity emulation approaches that rely on an additive auto-regressive structure, the proposed RNA emulator recursively captures the relationships between multi-fidelity data using Gaussian process priors without making the additive assumption, allowing the model to accommodate more complex data patterns. Importantly, we derive the posterior predictive mean and variance of the emulator, which can be efficiently computed in a closed-form manner, leading to significant improvements in computational efficiency. Additionally, based on this emulator, we introduce three active learning strategies that optimize the balance between accuracy and simulation costs to guide the selection of the fidelity level and input locations for the next simulation run. We demonstrate the effectiveness of the proposed approach in a suite of synthetic examples and a real-world problem. An R package for the proposed methodology is provided in an open repository.

※**Online live streaming through Cisco Webex will be available.**

※ **The tea reception will be held at 10:10.**