

國立中央大學數學系

專題演講

主 講 人：林蔚安博士 (國立清華大學統計與數據科學研究所)

演講題目：Emulators for the computer experiments with both qualitative and quantitative factors

演講茶會：2025年02月27日(星期四) 3:30 p.m. ~ 4:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2025年02月27日(星期四) 4:00 p.m. ~ 5:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

This study addresses a cooling system design problem reformulated as a black-box optimization task, where the objective function is unknown and evaluated only via a numerical simulator. The main challenge lies in building a surrogate model to approximate the objective function. Gaussian processes (GPs) are commonly used for this due to their flexibility and uncertainty quantification, but they struggle with datasets involving both qualitative and quantitative variables, especially when managing many categorical combinations. To tackle this, we propose a tree-based GP method called the category tree GP (ctGP), designed for models with qualitative factors having numerous categories. It uses a tree structure to split qualitative categories, with GP or mixed-input GP models at the leaf nodes. The splitting is guided by category cross-correlations, which improve prediction accuracy, while a cross-validation-based pruning step refines the model. Results from numerical experiments and the cooling system design case show that ctGP enhances computational efficiency, prediction accuracy, and insights into the cooling system via the tree structure.

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