

國立中央大學數學系

專題演講

主 講 人：陳瑞彬教授 (國立成功大學統計系)

演講題目：Tree-based Gaussian Process for Computer

Experiments with Many-Category Qualitative

Factors and Application to Cooling System Design

演講茶會：2022年04月07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：2022年04月07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：

In computer experiments, Gaussian process models are commonly used for emulation. However, when both qualitative and quantitative factors are in the experiments, emulation using Gaussian process models becomes challenging. In particular, when the qualitative factors contain many categories in the experiments, existing methods in the literature become cumbersome due to curse of dimensionality. Motivated by the computer experiments for the design of a cooling system, a new tree-based Gaussian process for emulating computer experiments with many-category qualitative factors is proposed. The proposed method incorporates a tree structure to split the categories in the qualitative factors, and Gaussian process models are employed for modeling the simulation outputs in the leaf nodes. The splitting rule takes into account the cross-correlations between the categories of the qualitative factors, which have been shown by a recent theoretical study to be a crucial element for improving the prediction accuracy, and then there is a pruning procedure via the cross validation error to identify a proper tree structure. The application to the design of a cooling system indicates that the proposed method not only enjoys marked computational advantages and produces accurate predictions, but also provides valuable insights into the cooling system by discovering the tree structure.

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