北京理工大學

数学与统计学院学术报告

Desgin and modeling for order-of-addition factorial experiments with interaction effects

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摘要：

In scientific research and industrial engineering, the response of an experiment is often determined by both the levels of factors and their order of addition. Such experiments are referred to as order-of-addition factorial (OofAF) experiments. The interactions between factor levels and their order of addition frequently have a substantial impact on the response. For instance, in automotive manufacturing, painting components prior to welding may result in heat-induced damage due to welding temperatures, thereby increasing the defect rate. To address these interactions in OofAF experiments, we introduce a class of conditional main effects (CMEs) to capture interaction effects by measuring the conditional effect of a pairwise ordering factor at a fixed level of another factor. Leveraging these CMEs, we propose a statistically interpretable model, called the conditional main effects pairwise ordering model, for analyzing OofAF experiments. Under this model, we develop a systematic construction method to generate a D-optimal fractional OofAF design, which reduces experimental costs while enabling efficient estimation of main effects and CMEs. Comparative case studies are presented to illustrate that this proposed model outperforms existing approaches in predictive accuracy when analyzing OofAF experiments with significant interaction effects.

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主办单位：北京理工大学数学与统计学院

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