A systematic design construction and analysis for cost-efficient order-of-addition experiment

Jing-Wen Huang[1] and <u>Frederick Kin Hing Phoa</u>[2]

[1]Institute of Statistics, National Tsing Hua University, Hsinchu, Taiwan

[2]Institute of Statistical Science, Academia Sinica, Taipei, Taiwan

Abstract

In this work, we propose a systematic design construction method for cost-efficient order-of-addition (OofA) experiments, and its corresponding statistical models for analyzing experimental results. In specific, our designs take the effects of two successive treatments into consideration. Each pair of level settings from two different factors in our design matrix appears exactly once to achieve cost-efficiency. Compared to designs in recent studies of OofA experiments, our design is capable of conducting experiments of one or more factors, so practitioners can insert a placebo, or choose different doses as level settings when our design is used as their experimental plans. We show an experimental analysis based on our design results in better performance than those based on the minimal-point design and Bayesian D-optimal design with the pairwise-order modeling in terms of identifying the optimal order.