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A tailored analysis of data from OMARS designs

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Experimental data are often highly structured due to the use of experimental designs. This does not only simplify the analysis, but it allows for tailored methods of analysis that extract more information from the data than generic methods. One group of experimental designs that are suitable for such methods are the orthogonal minimally aliased response surface (OMARS) designs (Núñez Ares and Goos, 2020), where all main effects are orthogonal to each other and to all second order effects. The design based analysis method of Jones and Nachtsheim (2017) has shown significant improvement over existing methods in powers to detect active effects. However, the application of their method is limited to only a small subgroup of OMARS designs that are commonly known as definitive screening designs (DSDs). In our work, we not only improve upon the Jones and Nachtsheim method for DSDs, but we also generalize their analysis framework to the entire family of OMARS designs. Using extensive simulations, we show that our customized method for analyzing data from OMARS designs is highly effective in selecting the true effects when compared to other modern (non-design based) analysis methods, especially in cases where the true model is complex and involves many second order effects.

References:

Jones, Bradley, and Christopher J. Nachtsheim. 2017. "Effective Design-Based Model Selection for Definitive Screening Designs."Technometrics 59(3):319–29.

Núñez Ares, José, and Peter Goos. 2020. "Enumeration and Multicriteria Selection of Orthogonal Minimally Aliased Response Surface Designs."Technometrics 62(1):21–36.

Keywords

Definitive screening designs, Orthogonal minimally aliased response surface designs, Design based model selection

Special/invited session

Primary authors: ISMAIL HAMEED, Mohammed Saif (KU Leuven); NUNEZ ARES, Jose (KU Leuven); Dr GOOS, Peter (KU Leuven (Department of Biosystems), University of Antwerp (Department of Engineering Management))

Presenter: ISMAIL HAMEED, Mohammed Saif (KU Leuven)

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