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An algorithm for robust designs against data loss

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Optimal experimental designs are extensively studied in the statistical literature. In this work we focus on the notion of robustness of a design, i.e. the sensitivity of a design to the removal of design points. This notion is particularly important when at the end of the experimental activity the design may be incomplete i.e. response values are not available for all the points of the design itself. We will see that the definition of robustness is also related, but not equivalent, to D-optimality.
The methodology for studying robust designs is based on the circuit basis of the design model matrix. Circuits are minimal dependent sets of the rows of the design model matrix and provide a representation of its kernel with special properties. The circuit basis can be computed through several packages for symbolic computation. We present a simple algorithm for finding robust fractions of a specified size. The basic idea of the algorithm is to improve a given fraction by exchanging, for a certain number of times, the worst point of the fraction with the best point among those which are in the candidate set but not in the fraction. Some practical examples are presented, from classical combinatorial designs to two-level factorial designs including interactions.

Keywords

Algebraic Statistics and combinatorics; Design of Experiments; Robustness

Special/invited session

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