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Constructing High Index Covering Arrays and Their Application to Design of Experiments

A high index covering array (CA_λ) has the property that the measurements of all t -tuples from any t factors are guaranteed to be repeated at least λ times, where the index $\lambda > 1$ is an adjustable parameter that depends on the experimental resource. We develop a systematic method to construct the (supersaturated) CA_λ of strength $t \leq 3$ with small run sizes under the different number of factors and index. Using a small number of runs compared to the orthogonal arrays, a CA_λ provides the resistance towards outlying measurements which a covering array ($\lambda = 1$) fails to do.