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Robustness of optimal designs for correlated random variables

Suppose that $Y = (Y_i)$ is a normal random matrix with mean Xb and covariance $\sigma^2 I_n$, where b is a p-dimensional vector (b_j), $X = (X_{ij})$ is an $n \times p$ matrix with $X_{ij} \in \{-1, 1\}$; this corresponds to a factorial design with $-1, 1$ representing low or high level respectively, or corresponds to a weighing design with $-1, 1$ representing an object j with weight b_j placed on the left and right of a chemical balance respectively. E-optimal designs Z are chosen that are robust in the sense that they remain E-optimal when the covariance of $Y_i, Y_{i'}$ is $\rho > 0$ for $i \neq i'$. Within a smaller class of designs similar results are obtained with respect to a general class of optimality criteria which include the A- and D-criteria.

The talk is based on my three joint papers with Joe Masaro published in 2008 in JSPI and LAA.