Optimal designs in multivariate linear models

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Abstract

We study optimality of designs under the multivariate model of the form

$$\mathbf{Y} = \mathbf{A}_{1,d}\,\mathbf{B}_1\mathbf{C}_1 + \mathbf{A}_{2,d}\,\mathbf{B}_2\mathbf{C}_2 + \mathbf{A}_3\,\mathbf{B}_3\mathbf{C}_3 + \mathbf{E}, \quad \mathbf{E} \sim N_{n,q}(\mathbf{0}, \mathbf{\Sigma} \otimes \mathbf{V}),$$

$$\mathcal{R}(\mathbf{C}_1') \subseteq \mathcal{R}(\mathbf{C}_3'), \quad \mathcal{R}(\mathbf{C}_2') \subseteq \mathcal{R}(\mathbf{C}_3'), \quad \mathcal{R}(\mathbf{C}_2') \subseteq \mathcal{R}(\mathbf{C}_1').$$

Additionally, we assume that the dispersion matrix of matrix of random errors is known or partially unknown. When dispersion matrix is known we determine optimal designs using Kiefer optimality. In the case of unknown dispersion matrix optimality is considered with respect to the precision in maximum likelihood estimation.