A Nonlinear Preconditioner for Experimental Design Problems

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Abstract: Optimal experimental design is the task of finding, given an experimental budget, a setup that reduces as much as possible the uncertainty in the estimates of a set of parameters associated with a model. Due to their ill conditioning, these optimization problems are challenging to solve numerically, in particular when they are large, which is often the case when partial differential equation models are involved. In this talk we show how to solve these problems efficiently using sequential quadratic programming (SQP) methods with quasi-Newton updates. To this end we derive, after studying some theoretical aspects of the problem, a nonlinear preconditioner that drastically reduces the number of needed iterations. We present numerical experiments and discuss some applications.

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