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Optimal Design of Dilution Experiments under Volume Constraints

We develop methods to construct a one-stage design of dilution experiment under the total available volume constraint typical for bio-medical applications. We consider different optimality criteria based on the Fisher information in both non-Bayesian and Bayesian settings. It turns out that the optimal design is one atomic, meaning that all the dilutions should be of the same size. Our proposed approach to solve such optimization problems is a variational analysis of functionals of a measure. The advantage of the measure optimization approach is that additional requirements like a total cost of experiment can be easily incorporated into the goal function.