

Interim Design Analysis Using Bayes Factor Forecasts

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A fundamental part of experimental design is to determine the sample size of a study. However, sparse information about population parameters and effect sizes before data collection renders effective sample size planning challenging. Specifically, sparse information may lead research designs to be based on inaccurate a-priori assumptions, causing studies to use resources inefficiently or to produce inconclusive results. Despite its deleterious impact on sample size planning, many prominent methods for experimental design fail to adequately address the challenge of sparse a-priori information. Here we propose a Bayesian Monte Carlo methodology for interim design analyses that allows researchers to analyze and adapt their sampling plans throughout the course of a study. At any point in time, the methodology uses the best available knowledge about parameters to make projections about expected evidence trajectories. Two simulated application examples demonstrate how interim design analyses can be integrated into common designs to inform sampling plans on the fly. The proposed methodology addresses the problem of sample size planning with sparse a-priori information and yields research designs that are efficient, informative, and flexible.