University of California, Irvine
Statistics Seminar

Covariate Adjusted Response Adaptive Design with Delayed Outcomes

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Covariate-adjusted response adaptive (CARA) designs have gained widespread adoption for their clear benefits in enhancing experimental efficiency and participant welfare. These designs dynamically adjust treatment allocations during interim analyses based on participant responses and covariates collected during the experiment. However, delayed responses can significantly compromise the effectiveness of CARA designs, as they hinder timely adjustments to treatment assignments when certain participant outcomes are not immediately observed. In this manuscript, we propose a fully forward-looking CARA design that dynamically updates treatment assignments throughout the experiment as response delay mechanisms are progressively estimated. Our design strategy is informed by novel semiparametric efficiency calculations that explicitly account for outcome delays in a multi-stage adaptive experiment. Through both theoretical investigations and simulation studies, we demonstrate that our proposed design offers a robust solution for handling delayed outcomes in CARA designs, yielding significant improvements in both statistical power and participant welfare.