THE UNIVERSITY OF CHICAGO | DEPARTMENT OF STATISTICS

Statistics Colloquium

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"Rerandomization and heterogeneous treatment effects in modern experiments"

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Jones 303, 5747 S. Ellis Avenue

ABSTRACT

Designing interventions and understanding their causal effects are essential aspects of many social and biomedical studies. Randomized experiments (as the gold standard for designing experiments) often suffer from unbalanced covariates for actual treatment assignments, and conventional analyses of them mostly focus on average treatment effects (which lacks the information on treatment effect heterogeneity). In this talk, I will present two lines of work on 1) rerandomization to improve covariate balance in design and 2) inference on distributions of individual treatment effects in analysis. In the first part, we will develop asymptotic theory for rerandomization, a design that rerandomizes the treatment assignment until a prespecified covariate balance criterion is met. We will demonstrate the advantages of rerandomization over complete randomization and further propose an optimal rerandomization that helps reconcile the long-standing controversy between two philosophies for designing experiments: randomization versus optimal designs. In the second part, we will develop methodologies to infer distributions of individual treatment effects, which can characterize how a treatment affects all units and are robust to extreme individual effects. We first show that the Fisher randomization test can be valid for inferring maximum (or minimum) individual effects, and then generalize it to infer all quantiles of the individual effect distribution as well as the proportion of units with effects passing any threshold. We will illustrate the developed theory and methodologies using educational experiments and the HOMEFOOD trial.