BIOSTATISTICS SEMINAR

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Nonparametric Causal Effects Based on Incremental Propensity Score Interventions

Most work in causal inference considers deterministic interventions that set each unit's treatment to some fixed value. However, under positivity violations these interventions can lead to nonidentification, inefficiency, and effects with little practical relevance. Further, corresponding effects in longitudinal studies are highly sensitive to the curse of dimensionality, resulting in widespread use of unrealistic parametric models. We propose a novel solution to these problems: incremental interventions that shift propensity score values rather than set treatments to fixed values. Incremental interventions have several crucial advantages. First, they avoid positivity assumptions entirely. Second, they require no parametric assumptions and yet still admit a simple characterization of longitudinal effects, independent of the number of timepoints. For example, they allow longitudinal effects to be visualized with a single curve instead of lists of coefficients. After characterizing incremental interventions and giving identifying conditions for corresponding effects, we also develop general efficiency theory, propose efficient nonparametric estimators that can attain fast convergence rates even when incorporating flexible machine learning, and propose a bootstrap-based confidence band and simultaneous test of no treatment effect. Finally, we explore finite-sample performance via simulation, and apply the methods to study time-varying sociological effects of incarceration on entry into marriage.

Thursday October 3, 2019   **3:30 pm - 4:30 pm**
Blue Cross and Blue Shield of North Carolina Foundation Auditorium

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