New Directions in Causal Inference

Chair: Lawrence McCandless (Simon Fraser University)

Organizers: Lawrence McCandless (Simon Fraser University) and Russell Steele (McGill University)

PETER AUSTIN, University of Toronto

The Performance of Different Propensity Score Methods for Estimating Marginal Hazard Ratios

The propensity score is a popular statistical method to remove the effects of observed confounding when estimating the effect of treatments, interventions and exposures when using observational data. Most research on propensity score methods has been in the context of continuous or binary outcomes. We examine the performance of four different propensity score methods (matching, weighting, stratification, and covariate adjustment) to estimate hazard ratios for survival outcomes.

MIREILLE SCHNITZER, Université de Montréal

Nonparametric Causal Inference through Targeted Maximum Likelihood Estimation: Options for Using Machine Learning in Causal Inference

Unbiased causal estimation inevitably relies on data-specific assumptions. In addition to these 'causal assumptions', the consistency of some estimators relies on the parametric specification of a full likelihood or of nuisance models. Researchers have sought to minimize model-dependence through the usage of nonparametric methods. Targeted Maximum Likelihood Estimation (TMLE) is a statistical framework that allows for nonparametric estimation of a causal effect using flexible modelling of the nuisance models, opening the door for machine learning and prediction methods. I will present the fundamentals of TMLE and demonstrate how inference can be consistently improved with machine learning. I will also describe some of the challenges in causal variable selection and how machine learning methods should and should not be used.

DAVE STEPHENS, McGill University

Discussion of New Directions in Causal Inference

It is 40 years since the publication of Rubin's seminal paper 'Estimating Causal Effects of Treatments in Randomized and Nonrandomized Studies', which launched modern statisticians' interest in causal inference problems. In this talk I will discuss several recent developments, including those described in the previous talks, and also new methodology for longitudinal studies, and the potential for a return of causal inference to its explicitly model-based, Bayesian roots.