Instrumental Variable Approaches To Individualized Treatment Regimes Under A Counterfactual World

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03.05.2022, 14.00 (c.t.)

Department of Statistics, Ludwigstr. 33, Room 144
and online via Zoom
(Meeting-ID: 913-2473-4411; Password: StatsCol22)

There is a fast-growing literature on estimating optimal treatment regimes based on randomized trials or observational studies under a key identifying condition of no unmeasured confounding. Because confounding by unmeasured factors cannot generally be ruled out with certainty in observational studies or randomized trials subject to noncompliance, we propose a robust classification-based instrumental variable approach to learning optimal treatment regimes under endogeneity. Specifically, we establish identification of both value function for a given regime and optimal regimes with the aid of a binary instrumental variable, when no unmeasured confounding fails to hold. We also construct novel multiply robust classification-based estimators. In addition, we propose to identify and estimate optimal treatment regimes among those who would comply to the assigned treatment under a monotonicity assumption. Furthermore, we consider the problem of individualized treatment regimes under sign and partial identification. In the former case, i) we provide a necessary and sufficient identification condition of optimal treatment regimes with an instrumental variable; ii) we establish the somewhat surprising result that complier optimal regimes can be consistently estimated without directly collecting compliance information and therefore without the complier average treatment effect itself being identified. In the latter case, we establish a formal link between individualized decision making under partial identification and classical decision theory under uncertainty through a unified lower bound perspective.

Biography:
Yifan Cui is an Assistant Professor at Department of Statistics & Data Science, National University of Singapore. Before joining NUS, he was a Postdoctoral Researcher at University of Pennsylvania and he obtained his Ph.D. from University of North Carolina at Chapel Hill. His research interests include nonparametric and semiparametric statistics, random forests, causal inference, precision medicine, survival analysis, generalized fiducial inference, and foundations of statistics.