Driving Precision Health Care through Heterogeneous Outcome Analysis

by

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Date: 28 November 2018 (Wednesday)
Time: 3:00 - 4:15 pm
Venue: Room 3005, LSK Business Building

Abstract: This study addresses the challenges of generating patient-centric information about hospital quality and analyzes the impact of information on enabling patients to receive better care. Methodologically, we develop a new Instrumental Variable (IV) tree approach by incorporating an IV into a tree-based method to correct for potential endogeneity issues in heterogeneous treatment effect analysis using observational data. Empirically, we designate hospitals as different treatments and apply the IV tree to study the outcome differences between thirty-five New York hospitals for cardiovascular surgeries. We found that the outcome differences between hospitals are heterogeneous across different patients. By comparing scenarios with patient-centric and population-average information, we show that 80% of patients can benefit from using patient-centric information and their complications can be reduced by 67.4%. We also illustrate how patient-centric information can enhance pay-for-performance programs offered by payers and guide hospitals in targeting quality improvement efforts.

Bio: Guihua is a PhD candidate in Technology & Operations at the Stephen M. Ross School of Business, University of Michigan. His research focuses on the intersection of empirical econometrics and machine learning with application to personalized healthcare. More specifically, he has developed new causal machine learning techniques such as instrumental variable tree for heterogeneous treatment effect analysis using observational healthcare data. His research has been published at M&SOM, POM, and Surgery, and received media coverage by Crain’s Detroit and Medical Xpress. Guihua was the Winner of the INFORMS Health Application Society Student Paper Competition, and two-time Finalists of the MSOM Student Paper Competition.