

Comparing Machine Learning Methods for Personalized Treatment Allocation

Assistant Professor Noémi Kreif

Randomized controlled trials report average treatment effects, yet their results are used by clinicians to make treatment choices for individual patients. Machine learning methods promise to bridge this gap by estimating conditional average treatment effects (CATEs), but there is limited evidence on how well competing methods support the binary decision that follows: whether or not to treat a given patient. This talk presents a simulation study comparing 16 treatment allocation strategies, including traditional trial analyses, outcome-regression meta-learners, causal forests, and doubly robust learners, across 24 data-generating processes at sample sizes typical of RCTs. Rather than judging methods on estimation accuracy alone, we evaluate the treatment decisions they produce, using correct classification, false positive and false negative rates, and the net regret of the resulting allocation. We ask which methods can be trusted when the structure of treatment effect heterogeneity is unknown, and whether a method that estimates the CATE more accurately also makes better treatment decisions. We close by connecting this evaluation framework to decision-analytic modeling, where machine-learned individualized treatment effects serve as inputs for treatment stratification (Glynn et al., Health Economics, 2024).

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Summary

Dr. Noémi Kreif is an Assistant Professor at the Comparative Health Outcomes, Policy, and Economics (CHOICE) Institute, University of Washington School of Pharmacy. Her research advances the use of causal inference and machine learning methods to improve health policy evaluation and economic evaluation, with a particular focus on making these approaches relevant for real-world decision making. Her recent work examines how machine learning methods can estimate heterogeneous treatment effects to inform individualized treatment decisions, and how these estimates can serve as inputs to decision-analytic models. Before joining the University of Washington, she was a Senior Research Fellow at the Centre for Health Economics, University of York, where she developed a research agenda on causal machine learning for health policy evaluation, including in low- and middle-income countries. She holds a PhD in Health Economics from the London School of Hygiene and Tropical Medicine.

This lecture is accredited with 1 DFP-point for members of the Austrian Medical Chamber.



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