

Monday 22 July 2024

11:00-12:30 Invited Session 1 (Main Room)

Causal Inference and Machine Learning (Chair: Els Goetghebeur)

Double robust: a great asset not to be constructed lightly

Erin Gabriel (University of Copenhagen, Denmark)

Double robustness has been a vehicle through which machine learning entered the causal inference literature - even for randomized clinical trials. There are now many options for doubly robust estimation. However, there is a concerning trend in the applied literature where authors believe that any combination of a propensity score and an adjusted outcome model automatically results in a doubly robust estimator. This is particularly true for inverse probability of treatment (propensity score) weighted (IPTW) Cox PH models, which is the method used in several high-impact applied papers. We will demonstrate that IPTW PH models, Cox or parametric, are not doubly robust away from the null. This is not to say that there are no simple doubly robust estimators. Canonical link generalized linear models (GLM) fit via inverse probability of treatment (propensity score) weighted maximum likelihood estimation followed by standardization (the g-formula) for the average causal effect, which we call IPTW GLM, is a doubly robust estimation method. Understanding how IPTW GLM is doubly robust and how IPTW Cox, or IPTW non-canonical link GLM, is not, requires clarity on several concepts that are often assumed known in the causal inference literature and thus confused in the applied literature. We aim to provide a clear outline of these concepts, in addition to simulated and real data examples.

Ref: Statistics in Medicine 2023: Gabriel EE, et al. Inverse probability of treatment weighting with generalized linear outcome models for doubly robust estimation.

<https://arxiv.org/abs/2310.16207>: Gabriel EE, et al. Propensity score weighting plus an adjusted proportional hazards model