

**Title: Extensions of Bayesian Causal Forests with Applications to Large-Scale Educational Studies**

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**Abstract:**

When understanding how a unique individual's characteristics can lead to variations in their response to treatment, Bayesian non-parametric causal inference machine learning methods based on Bayesian Additive Regression Trees (BART) and Bayesian Causal Forests (BCF) have become the gold standard. A limitation of these methods, however, is that they are only applicable to data containing a single outcome variable, subject to a single binary treatment, at a single point in time. Motivated by these challenges, this talk presents recent work which has introduced a series of BCF extensions targeted at multiple outcomes, multiple treatments, and multiple time periods.

We demonstrate these extensions by applying them to data from large-scale educational studies including the Trends in International Mathematics and Science Study, and the High School Longitudinal Study of 2009. In doing so, we will also investigate multiple research questions from the world of education, such as identifying the optimal homework strategy for improving student achievement in mathematics and science, and determining the effect of intensive part-time work on the mathematics achievement of school students.

This talk is based on projects I have worked on as part of my PhD with Prof. Andrew Parnell, Prof. Ann O'Shea, and Yong Chen Goh.