



Department of Mathematics and Statistics

Colloquium

Tuesday October 23

AMB 164 4:00 pm

Multidimensional Monotonicity Discovery with mBART

Robert McCulloch

Arizona State University

Abstract

For the discovery of a regression relationship between y and x , a vector of p potential predictors, the flexible nonparametric nature of BART (Bayesian Additive Regression Trees) allows for a much richer set of possibilities than restrictive parametric approaches. To exploit the potential monotonicity of the predictors, we introduce mBART, a constrained version of BART that incorporates monotonicity with a multivariate basis of monotone trees, thereby avoiding the further confines of a full parametric form. Using mBART to estimate such effects yields

- (i) function estimates that are smoother and more interpretable,
- (ii) better out-of-sample predictive performance and
- (iii) less post-data uncertainty.

By using mBART to simultaneously estimate both the increasing and the decreasing regions of a predictor, mBART opens up a new approach to the discovery and estimation of the decomposition of a function into its monotone components.

This is joint work with Hugh Chipman, Edward George, and Tom Shively.

Refreshments at 3:45