School of Mathematical and Statistical Sciences
Arizona State University

M E M O R A N D U M

DATE: 07/14/2023

TO: Faculty and Students

FROM: Professor(s) Paul Hahn
Chair/Co-Chairs of Nikolay Krantsevich
Defense for the PhD in Applied Mathematics
Committee Members
Jingyu He
Robert McCulloch
Shiwei Lan
Shuang Zhou

DEFENSE ANNOUNCEMENT

Candidate: Nikolay Krantsevich

Defense Date: Monday July 31, 2023

Defense Time: 9:00 AM

Virtual Meeting Link: https://asu.zoom.us/j/81901180525?pwd=b0pZaTJyUThvSEtyUUxOQ3lXcmRSZz09
Location: Wexler Hall 546 (Tempe)

Title: Tree Ensemble Algorithms for Causal Machine Learning

Please share this information with colleagues and other students, especially those studying in similar fields. Faculty and students are encouraged to attend. The defending candidate will give a 40-minute talk, after which the committee members will ask questions. There may be time for questions from those in attendance. However, guests are primarily invited to attend as observers and will be excused when the committee begins its deliberations or if the committee wishes to question the candidate privately.

ABSTRACT
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ABSTRACT

This dissertation contributes to the topic of treatment effect estimation in the field of causal inference, and aims to expand the toolkit for effect estimation when the treatment variable is binary. Two new stochastic tree-ensemble methods for treatment effect estimation in the continuous outcome setting are presented. The Accelerated Bayesian Causal Forrest (XBCF) model handles variance via a group-specific parameter, and the Heteroskedastic version of XBCF (H-XBCF) uses a separate tree ensemble to learn covariate-dependent variance.

This work also contributes to the field of survival analysis by proposing a new framework for estimating survival probabilities via density regression. Within this framework, the Heteroskedastic Accelerated Bayesian Additive Regression Trees (H-XBART) model, which is also developed as part of this work, finds use in treatment effect estimation for right-censored survival outcomes.

All models have been implemented as part of the XBART R package and their performance is evaluated via multiple simulation studies with appropriate sets of comparators.