![ASU School of Mathematical and Statistical Sciences — Arizona State University]

MEMORANDUM

DATE: 03/28/2023

TO: Faculty and Students

FROM: Professor(s)   Paul Hahn

Chair/Co-Chairs of   Andrew Herren

Defense for the   PhD   in   Statistics

Committee Members

Hedibert Lopes
Ming-Hung Kao
Robert McCulloch
Shuang Zhou

DEFENSE ANNOUNCEMENT

Candidate: Andrew Herren

Defense Date: Thursday, April 13, 2023

Defense Time: 10:30 AM

Virtual Meeting Link: https://asu.zoom.us/j/86733765218?pwd=dXU2d1EvNWRMcnoxRHQ1M

Title: Machine Learning and Causal Inference: Theory, Examples, and Computational Results

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. But, 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
-See next page-

ABSTRACT

This dissertation covers several topics in machine learning and causal inference. First, the question of "feature selection," a common byproduct of regularized machine learning methods, is investigated theoretically in the context of treatment effect estimation. This involves a detailed review and extension of frameworks for estimating causal effects and in-depth theoretical study. Next, various computational approaches to estimating causal effects with machine learning methods are compared with these theoretical desiderata in mind. We identify several ways to improve current methods for causal machine learning and pinpoint several angles for further study. Finally, a common method used for "explaining" predictions of machine learning algorithms, SHAP, is evaluated critically through a statistical lens.