

Department of Applied and Computational Mathematics and Statistics Colloquium



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Bayesian Weighted Learning in Dynamic Treatment Regime

Tailoring treatment according to patient characteristics is the ultimate objective of precision medicine. Dynamic Treatment Regime (DTR) offers an analytical framework for optimizing treatment rules. Within the context of DTR, Q-learning provides a way to find treatment options that maximize the expected outcome, given the patient characteristics and their responses to different treatments. The current Q-learning methods, however, lack an appropriate mechanism for incorporating existing evidence on treatment effects from prior studies. The number of treatment options and correlated patient characteristics also pose challenges to optimizing the Q-function. In this research, we present a regularized Q-learning that incorporates existing knowledge of treatment effects through a Bayesian weighting mechanism. Simulation studies show that the proposed method outperforms the existing Q-learning methods, especially when strong a priori information exists; regularization improves the numerical stability and precision of the Q-function estimation. Motivated by the desire to optimize antihypertensive therapies, we analyzed data from the Systolic Blood Pressure Intervention Trial (SPRINT) as an illustration.

Mon, Sept. 23, 2024

3:45 – 4:45 PM

127 Hayes-Healy Center

Colloquium Tea – 3:15 PM in 101A Crowley Hall