Variable Selection for Optimal Treatment Decision

Wenbin Lu*, North Carolina State University
Hao Zhang, North Carolina State University
Donglin Zeng, University of North Carolina at Chapel Hill

Abstract

In decision-making on optimal treatment strategies, it is of great importance to identify variables that are involved in the decision rule, i.e. those interacting with the treatment. Effective variable selection helps to improve the prediction accuracy and enhance the interpretability of the decision rule. We propose a new penalized regression framework which can simultaneously estimate the optimal treatment strategy and identify important variables. The advantages of the new approach include: (i) it does not require the estimation of the baseline mean function of the response, which greatly improves the robustness of the estimator; (ii) the convenient loss-based framework makes it easier to adopt shrinkage methods for variable selection, which greatly facilitates implementation and statistical inferences for the estimator. Computation of the new estimator can be done using existing state-of-the art software like LARS. Theoretical properties of the new estimator are studied. Its empirical performance is evaluated using simulation studies and further illustrated with an application to an AIDS clinical trial.

Keywords: A-learning; Optimal treatment strategy; Personalized drugs; Shrinkage method; Variable selection.

* Presenting author