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*Double Machine Learning for Nonresponse in Surveys*

Predictive models are increasingly integrated into survey strategies, supporting tasks such as model-based estimation, model-assisted estimation, and the treatment of nonresponse through imputation and reweighting. In recent decades, the rise of statistical learning has provided survey statisticians with highly flexible new tools, alongside new theoretical and computational advancements. However, incorporating statistical learning into survey estimation poses challenges for conducting valid inference. In this work, we propose an extension of the Double Machine Learning framework to survey sampling, focusing on the treatment of nonresponse through Augmented Inverse Probability Weighting (AIPW) estimators. We establish that the resulting AIPW estimators are square-root n consistent and asymptotically normal under realistic rate conditions on the statistical learning algorithms. We further propose a consistent variance estimator, enabling the construction of asymptotically valid confidence intervals. Issues related to model selection and aggregation will also be discussed. Simulation studies demonstrating the strong performance of the proposed methods will be presented. This is a joint work with David Haziza (UOttawa).