Semiparametric Adaptive Estimation in Survey Sampling

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In survey sampling, it is often difficult to equitably sample data from a population so that the samples are biased. However, information on the inclusion probabilities of samples is available to remove the selection bias. The Horvitz-Thompson estimator is one of the most well-known debiased estimators. Although the Horvitz-Thompson estimator is consistent and asymptotically normal, it is not efficient. In this talk, we derive the semiparametric efficiency bound for various target parameters by treating the inclusion probability itself as a random variable and propose a semiparametric optimal estimator with some working models on the inclusion probability. The proposed estimator is consistent, asymptotically normal, and efficient among the regular and asymptotically linear estimators. We apply the proposed method to the 1999 Canadian Workplace and Employee Survey data.