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Variable Selection Models for Weight Trimming

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Abstract

In unequal-probability-of-selection sample, correlations between the probability of selection and the sampled data can induce bias. Weights equal to the inverse of the probability of selection are often used to counteract this bias. Highly disproportional sample designs have large weights, which can introduce unnecessary variability in statistics such as the population mean estimate. Weight trimming reduces large weights to a fixed cutpoint value and adjusts weights below this value to maintain the untrimmed weight sum. This reduces variability at the cost of introducing some bias. Standard approaches are not "data-driven": they do not use the data to make the appropriate bias-variance tradeoff, or else do so in a highly inefficient fashion. This presentation develops Bayesian variable selection methods for weight trimming to supplement standard, ad-hoc design-based methods in disproportional probability-of-inclusion designs where variances due to sample weights exceeds bias correction. These methods are used to estimate linear and generalized linear regression model population parameters in the context of stratified and poststratified known-probability sample designs. Applications will be considered in the context of traffic injury survey data, in which highly disproportional sample designs are often utilized.

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