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Debiasing the Lasso with Inaccurate Precision Matrix

We propose a method for providing consistent and unbiased estimates of a single coordinate in a sparse high-dimensional linear model with random designs. Existing results are able to achieve consistency and unbiasedness when the precision matrix of the design is known or can be estimated well. We provide a method that achieves consistency when only an inaccurate estimate of the precision matrix is available. Our procedure applies to a semi-supervised setting in which both labelled and unlabelled samples are available, and is carefully designed to account for errors induced by inaccuracy in the precision matrix. Theory establishes consistency of our method using a novel application of the CGMT to the joint distribution of estimates computed using the same data. Simulations provide evidence that our estimator is also approximately unbiased.