Weighted Rank Regression with Adaptive Penalty Function

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Abstract : The use of regularization for statistical methods has become popular. The least absolute shrinkage and selection operator (LASSO) framework has become the standard tool for sparse regression. However, it is well known that the LASSO is sensitive to outliers or leverage points. We consider a new robust estimation which is composed of the weighted loss function of the pairwise difference of residuals and the adaptive penalty function regulating the tuning parameter for each variable. Rank regression is resistant to regression outliers, but not to leverage points. By adopting a weighted loss function, the proposed method is robust to leverage points of the predictor variable. Furthermore, the adaptive penalty function gives us good statistical properties in variable selection such as oracle property and consistency. We develop an efficient algorithm to compute the proposed estimator using basic functions in program R. We used an optimal tuning parameter based on the Bayesian information criterion (BIC). Numerical simulation shows that the proposed estimator is effective for analyzing real data set and contaminated data.

Keywords : adaptive penalty function, robust penalized regression, variable selection, weighted rank regression

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