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“Innovative Robust Boosting Algorithms”

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Abstract

Classical robust statistical methods dealing with noisy data are often based on modifications of convex loss functions. For example, Huber loss is more robust than least squares in regression. In recent years, however, nonconvex loss based robust methods have been increasingly popular. A nonconvex loss can provide robust estimation for data contaminated with outliers. A significant challenge is that a nonconvex loss can be numerically difficult to optimize. The presentation focuses on some recently developed computational methodologies in this area. Combining majorization-minimization algorithm with machine learning boosting algorithm, a class of nonconvex robust loss functions can be minimized. Convergence guarantees are presented. The new algorithms improve classification accuracy and variable selection, illustrated using a pediatric database developed for the US Healthcare Cost and Utilization Project, and breast cancer gene expression data.