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Efficiently Using Second Order Information in Large l1 Regularization Problems

Xiaocheng Tang, Katya Scheinberg

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We propose a novel general algorithm LHAC that efficiently uses second-order information to train a class of large-scale l1-regularized problems. Our method executes cheap iterations while achieving fast local convergence rate by exploiting the special structure of a low-rank matrix, constructed via quasi-Newton approximation of the Hessian of the smooth loss function. A greedy active-set strategy, based on the largest violations in the dual constraints, is employed to maintain a working set that iteratively estimates the complement of the optimal active set. This allows for smaller size of subproblems and eventually identifies the optimal active set. Empirical comparisons confirm that LHAC is highly competitive with several recently proposed state-of-the-art specialized solvers for sparse logistic regression and sparse inverse covariance matrix selection.

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