

## Publication

A complete analysis of the  $L_{1,p}$  Group-Lasso

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The Group-Lasso is a well-known tool for joint regularization in machine learning methods. While the  $L_{1,2}$  and the  $L_{1,\infty}$  version have been studied in detail and efficient algorithms exist, there are still open questions regarding other  $L_{1,p}$  variants. We characterize conditions for solutions of the  $L_{1,p}$  Group-Lasso for all  $p$ -norms with  $1 \leq p \leq \infty$ , and we present a unified active set algorithm. For all  $p$ -norms, a highly efficient projected gradient algorithm is presented. This new algorithm enables us to compare the prediction performance of many variants of the Group-Lasso in a multi-task learning setting, where the aim is to solve many learning problems in parallel which are coupled via the Group-Lasso constraint. We conduct large-scale experiments on synthetic data and on two real-world data sets. In accordance with theoretical characterizations of the different norms we observe that the weak-coupling norms with  $p$  between 1.5 and 2 consistently outperform the strong-coupling norms with  $p \ll 2$ .

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