# Enhancing Sparsity by Reweighted l1 Minimization

*E. J. Candes, M. B. Wakin, and S. Boyd*

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It is now well understood that (1) it is possible to reconstruct sparse signals exactly from what appear to be highly incomplete sets of linear measurements and (2) that this can be done by constrained l1-minimization. In this paper, we study a novel method for sparse signal recovery that in many situations outperforms l1-minimization in the sense that substantially fewer measurements are needed for exact recovery. The algorithm consists of solving a sequence of weighted l1-minimization problems where the weights used for the next iteration are computed from the value of the current solution. We present a series of experiments demonstrating the remarkable performance and broad applicability of this algorithm in the areas of sparse signal recovery, statistical estimation, error correction and image processing. Interestingly, superior gains are also achieved when our method is applied to recover signals with assumed near-sparsity in overcomplete representations — not by reweighting the l1 norm of the coefficient sequence as is common, but by reweighting the l1 norm of the transformed object. An immediate consequence is the possibility of highly efficient data acquisition protocols by improving on a technique known as compressed sensing.