SPARSE RECOVERY VIA FAST NONNEGATIVE LEAST SQUARES

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We address the problem of finding the sparsest solution to an underdetermined system of linear equations, i.e. the solution with most zero entries. This problem, with many applications in the field of signal processing, is known as sparse recovery and its solution is NP-hard in general, although it is well known that ℓ_1-minimization leads the sparsest solution for a restricted class of matrices [1]. Similarly, it has been observed (see e.g. [3]) that the nonnegativity constraint naturally enhances sparsity of the solution, leading to solve a NonNegative Least Squares (NNLS) problem. Many NNLS solvers require the objective function to be strictly convex, which is not true when dealing with underdetermined linear systems. The Lawson-Hanson algorithm [4] does not suffer from this drawback, however it is mainly based on BLAS2 operations, yielding limited performance. We propose to employ a recent block column selection strategy [2], devising a new algorithm we called Lawson-Hanson with Deviation Maximization (LHDM) that allows to exploit BLAS3 operations, leading to better performance. Numerical results are presented with an extensive campaign of experiments, where we compare LHDM against several ℓ_1-minimization solvers, showing that it is a valuable alternative for sparse recovery in terms of both quality of the solution found and execution times.

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References

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