
# Sharpness, Restart and Compressed Sensing Performance

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**Abstract:** We show that several classical quantities controlling compressed sensing performance directly match parameters controlling algorithmic complexity. We first describe linearly convergent restart schemes on first-order methods using a sharpness assumption. The Lojasievicz inequality shows that sharpness bounds on the minimum of convex optimization problems hold almost generically. Here, we show that sharpness directly controls the performance of restart schemes. For sparse recovery problems, sharpness at the optimum can be written as a condition number, given by the ratio between true signal sparsity and the largest signal size that can be recovered by the observation matrix. Overall, this means that in compressed sensing problems, a single parameter directly controls both computational complexity and recovery performance.

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