GNMR: A Provable One-Line Algorithm for Low Rank Matrix Recovery Problems

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Low rank matrix recovery problems appear in a broad range of applications. In this work we present GNMR – an extremely simple iterative algorithm for low rank matrix recovery, based on a Gauss-Newton linearization. GNMR can be essentially described in one line, as in each iteration it only solves a linear least squares problem. On the theoretical front, we derive recovery guarantees for GNMR in three different problems: matrix completion, inductive matrix completion and matrix sensing. Our guarantees are sharper in several aspects than those currently available for other methods. Specifically, our results for inductive matrix completion follow from a novel mapping of independent interest we establish between this problem and the matrix sensing problem. On the empirical front, we show that for standard and inductive matrix completion with uniform sampling, GNMR performs better than several popular methods, especially with ill-conditioned matrices and very few observations, close to the information limit.