Numerical Analysis and Scientific Computing Seminar

Backtracking-Based Accelerated Descent Methods for Large-Scale Linear Inverse Problems

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Abstract: Large-scale linear inverse problems arise in a wide range of applications such as image processing and statistical inference. However, the high dimensional (possibly dense and ill-conditioned) matrix in data fidelity term often brings significantly computational challenges when solving the formulated optimization problem and hence hindered the applicability of the sophisticated interior point method and second-order optimization methods. To tackle those challenges, first-order gradient descent method turns into a good choice. In this talk, we first review some classical first-order accelerated descent methods, then introduce our proposed backtracking based accelerated descent methods, which are capable of hunting for more aggressive stepsize via conducting fewer number of line searches. A brief convergence analysis will be presented. The numerical results on structured (low rank and/or sparsity and/or group sparsity) network learning and total-variation based image reconstruction problems indicate the efficiency and effectiveness of the proposed algorithms.

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