Composite Self-concordant Minimization*

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Abstract

We propose a variable metric framework for minimizing the sum of a self-concordant function and a possibly non-smooth convex function endowed with a computable proximal operator. We theoretically establish the convergence of our framework without relying on the usual Lipschitz gradient assumption on the smooth part. An important highlight of our work is a new set of analytic step-size selection and correction procedures based on the structure of the problem. We describe concrete algorithmic instances of our framework for several interesting large-scale applications, such as graph learning, Poisson regression with total variation regularization, and heteroscedastic LASSO.

*Machine Learning External Seminar, Gatsby Unit, June 12, 2014.