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A journey from the theory of self-concordant functions and variable metrics to applications in convex optimization

Abstract: Self-concordant functions (variation of the Hessian is bounded by a suitable function of the Hessian) and variable metric methods are central to many of the successful approaches for solving convex optimization problems. We will report on some of the recent progress on solving convex optimization problems by algorithms designed via self-concordant functions and variable metric methods. We will treat convex optimization problems that can be formulated by using, in some combination, second-order cones, cones of symmetric positive semidefinite matrices, power functions and p-norms, entropy function, relative vector entropy, quantum entropy, hyperbolic multivariate polynomial inequalities, nuclear norm and many others. Among important features of our approach are that our algorithms deliver dual certificates and that our algorithms are easily extensible to cover new classes of convex sets.

This talk is based on joint work with Mehdi Karimi.