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Convex optimization via domain-driven barriers and primal-dual algorithms

During the last two decades, primal-dual algorithms enjoyed very significant advances in solving convex optimization problems in conic form over symmetric cones. However, many other highly demanded convex optimization problems lack comparable advances. To close this gap, we propose a theory of infeasible-start primal-dual interior-point algorithms for convex optimization problems in "domain-driven" formulation. We show that the domain-driven formulation covers many interesting classes of optimization problems including those in a conic form, naturally (without artificial embedding variables etc.). After presenting our techniques, and our convergence theorems, we introduce our Matlab-based code that solves a large class of problems including LP, SOCP, SDP, QCQP, Geometric programming, and Entropy programming among others, and mention some numerical challenges.

This talk is based on joint work with Mehdi Karimi.