M10 : Semidefinite Programming
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23/04/2007 – 27/04/2007

The field of Semidefinite Programming (SDP) or Semidefinite Optimization (SDO) deals with optimization problems over symmetric positive semidefinite mat rix variables with linear cost function and linear constraints. Popular special cases are linear programming and convex quadratic programming with convex quadratic constraints. There are good reasons for studying semidefinite programming. First, positive semidefinite constraints arise directly in a number of important applications. Secondly, many convex optimization problems, e.g., linear programming and (convex) quadratically constrained quadratic programming, can be cast as semidefinite programs. Most importantly, semidefinite programming can be solved efficiently, both in theory and in practice. In fact, it has been shown that semidefinite problems can be solved in polynomial time by interior point methods (Nesterov and Nemirovski 1990) and in the last ye ars many code have been developed to solve this important class of problems and many of them are available on the web. The aim of this course is to introduce the basic notions of SDP, showing the basic duality results, and to describe in detail some algorithms for solving SDP and their convergence properties.

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