Have I ever Seen Semidefinite Programming?

Seminar Modern Methods in Combinatorial Optimization

May 22, 2015

Write the Linear Program and Convex Quadratically Constrained Quadratic Program as a Semidefinite Program

Linear Program:

$$\min_{x} \quad b_0^T x$$
$$\text{s.t.} \quad b_i^T x + c_i \leq 0, \quad i \text{ in } 1, \ldots, n$$
$$x \geq 0$$

Hint: Consider diagonal matrices

CQCQP:

$$\min \quad x^T A_0 x + b_0^T x + c_0$$
$$\text{s.t.} \quad x^T A_i x + b_i^T x + c_i \leq 0, \quad i \text{ in } 1, \ldots, n$$

Hint:
Given $A_i = M_i^T M_i$ then

$$x^T A_i x + b_i^T x + c_i \leq 0 \Leftrightarrow \begin{pmatrix} I & M_i x \\ x^T M_i^T & -c_i - b_i^T x \end{pmatrix} \succeq 0$$