Convex Optimization
Matlab Assignment-2

Apr. 7, 2017

Q1: Consider the following semidefinite program:

$$\min_{\boldsymbol{Q}} \quad Trace(\boldsymbol{Q})$$

$$\text{s.t.} \quad \boldsymbol{Q} \succeq 0, \quad \boldsymbol{x}_1^T \boldsymbol{Q} \boldsymbol{x}_1 \geq \gamma_1, \quad \boldsymbol{x}_2^T \boldsymbol{Q} \boldsymbol{x}_2 \geq \gamma_2, \quad \boldsymbol{x}_3^T \boldsymbol{Q} \boldsymbol{x}_3 \geq \gamma_3,$$

where $\boldsymbol{x}_1,\ \boldsymbol{x}_2,\ \boldsymbol{x}_3 \in \mathbb{R}^{n\times 1}$ are known vectors which can be generated randomly (e.g. using 'randn' function in Matlab); $\gamma_1 = 3,\ \gamma_2 = 2,\ \gamma_3 = 1$; $\boldsymbol{Q} \in \mathbb{S}_+^n$ is unknown. Find:

(a) the optimal point and optimal value of the above semidefinite program, and

(b) verify if the optimal point is a positive semidefinite matrix using eigen-decomposition.