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PROJECTION METHODS IN SEMIDEFINITE PROGRAMMING

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There exists an explicit expression for the projection of a symmetric matrix onto the cone of positive semidefinite matrices. In general though, the projections on the subsets of this cone are not explicit ; but they are still easy to compute using methods of convex optimization.

In this presentation, I will first review these numerical methods, insisting on the dual method introduced in [1], that has then opened the way for further developments (both theoretical and practical [2,3]). Next, I will explain how these projections allow to set up a new family of algorithms [4] for solving semidefinite programming problems by using a proximal approach. I will give numerical illustrations on challenging problems, like computing the nearest correlation matrix, computing the Lovasz theta number of big graphs, and solving the relaxations of frequency assignment problems.

References

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[4] J. Malick, J. Povh, F. Rendl and A. Wiegele, Regularization methods for semidefinite programming, *SIAM Journal on Optimization*, **20(1)** (2009).