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Spectral nearness problems via Riemannian optimization

Monday, September 1, 2025 11:30 AM (30 minutes)

We describe a framework based on Riemannian optimization to solve certain nearness problem on matrices of the form
$\min \|X - A\|_F^2 \quad X \in \mathcal{Q}$
$tag1 where Q is a certain subset of \mathbb{C}^{n \times n}$ that enforces both a linear structure (e.g., a fixed sparsity pattern, Toeplitz/Hankel structure...) and a constraint on the eigenvalues (e.g., X is singular, or has k eigenvalues inside a given subset $\Omega \subseteq \mathbb{C}$).

This framework reduces (1) to a Riemannian optimization problem, which is then solved using algorithms from Matlab's library Manopt.

We describe how several problems that have been studied independently in the past can be reduced to this framework and solved with similar techniques. The numerical results obtained with this technique are close, or better, to those of state-of-the-art algorithms.

References

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