

Nonmonotone spectral projected gradient method variant for semidefinite optimization problem with log-determinant and ℓ_1 norm terms

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The problem we address here is the (inverse) sparse covariance selection problem which has some variants depending on how we determine the sparsity of the covariance matrix. It can be cast as a convex semidefinite optimization problem which has a log-determinant and ℓ_1 regularization term in the objective function. There are several methods to solve this problem, including interior-point methods, proximal point algorithms, accelerated gradient methods, graphical lasso, *etc.*

We propose to solve this problem applying a variant of the nonmonotone spectral projected gradient method [1] to the dual problem. This allows to obtain a duality gap certificate of the optimal solution in some cases. We also prove the convergence of the proposed algorithm.

Preliminary numerical experiments show that our method has a superior performance at least than [2], especially for large-scale problems.

References

- [1] E. G. Birgin, J. M. Maritínez, and M. Raydan, “Nonmonotone spectral projected gradient methods on convex sets,” *SIAM J. Optim.* **10** (2000), pp. 1196–1211.
- [2] Z. Lu, “Smooth optimization approach for sparse covariance selection,” *SIAM J. Optim.* **19** (2008), pp. 1807–1827.