

Plan of Action

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Robust Optimization (Mode:Mixed)

Abstract

I will be studying a polynomial-time interior-point algorithm for a class of nonlinear saddle-point problems that involve semi-definiteness constraints on matrix variables. These problems originate from robust optimization formulations of convex quadratic programming problems with uncertain input parameters. As an application of this approach, I will implement a robust formulation of the Markowitz portfolio selection model (risk adjusted return model) with box uncertainty sets for mean and co-variance. For closure I will compare the result of this robust formulation with vanilla Markowitz portfolio selection model (empirical mean and co-variance estimates).

Challenges

One of the major challenge will be selection of upper and lower limits for box constraints as minimizing the worst case objective will depend heavily on this and no guidelines have been mentioned in the references. Implementing the algorithm itself will be challenging as it will require thorough understanding of lemmas which lead up to it.

Final report

The final report will include a theoretical analysis of the algorithm, results for the application and its comparison with the empirical approach. The report will be accompanied with code used to generate the results.

References

- R. Tütüncü and M. Koenig, Robust asset allocation, *Ann. Oper. Res.*, 132 (2004), pp. 157–187.
- B. Halldórsson and R. Tütüncü, An interior-point method for a class of saddle-point problems, *J. Optim. Theory Appl.*, 116 (2003), pp. 559–590.
- Bertsimas, Dimitris, David B. Brown, and Constantine Caramanis. "Theory and applications of robust optimization." *SIAM review* 53.3 (2011): 464-501.