数学与系统科学研究院

计算数学所学术报告

报告人：　Associate Prof. Qingna Li

（ ***Beijing Institute of Technology*** ）

报告题目：

An Efficient Sparse Quadratic Programming Relaxation Based Algorithm for Large-Scale MIMO Detection

邀请人： 刘亚锋 副研究员

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下午 **15:30-16:30**

报告地点：科技综合楼

311 教室

Abstract:

Multiple-input multiple-output (MIMO) detection is a fundamental problem in wireless communications and it is strongly NP-hard in general. Massive MIMO has been recognized as a key technology in the fifth generation (5G) and beyond communication networks, which on one hand can significantly improve the communication performance, and on the other hand poses new challenges of solving the corresponding optimization problems due to the large problem size.

While various efficient algorithms such as semidefinite relaxation (SDR) based approaches have been proposed for solving the small-scale MIMO detection problem, they are not suitable to solve the large-scale MIMO detection problem due to their high computational complexities. In this paper, we propose an efficient sparse quadratic programming (SQP) relaxation based algorithm for solving the large-scale MIMO detection problem. In particular, we first reformulate the MIMO detection problem as an SQP problem. By dropping the sparse constraint, the resulting relaxation problem shares the same global minimizer with the SQP problem. In sharp contrast to the SDRs for the MIMO detection problem, our relaxation does not contain any (positive semidefinite) matrix variable and the numbers of variables and constraints in our relaxation are significantly less than those in the SDRs, which makes it particularly suitable for the large-scale problem. Then we propose a projected Newton based quadratic penalty method to solve the relaxation problem, {\color{red}which is guaranteed to converge to the transmitted vector of signals under reasonable conditions}.

By extensive numerical experiments, when applied to solve small-scale problems, the proposed algorithm is demonstrated to be competitive with the state-of-the-art approaches in terms of detection accuracy and solution efficiency; when applied to solve large-scale problems, the proposed algorithm achieves better detection performance and is more robust to the choice of the initial point than a recently proposed generalized power method.

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