Proximal methods for nonsmooth and nonconvex fractional programs: when sparse optimization meets fractional programs

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Abstract

Nonsmooth and nonconvex fractional programs are ubiquitous and also highly challenging. It includes the composite optimization problems studied extensively lately, and encompasses many important modern optimization problems arising from diverse areas such as the recent proposed scale invariant sparse signal reconstruction problem in signal processing, the robust Sharpe ratio optimization problems in finance and the sparse generalized eigenvalue problem in discrimination analysis.

In this talk, we will introduce extrapolated proximal methods for solving nonsmooth and nonconvex fractional programs and analyse their convergence behaviour. Interestingly, we will show that the proposed algorithm exhibits linear convergence for the scale invariant sparse signal reconstruction model, and the sparse generalized eigenvalue problem with either cardinality regularization or sparsity constraints. This is achieved by identifying the explicit desingularization function of the Kurdyka-Łojasiewicz inequality for the merit function of the fractional optimization models. Finally, if time permits, we will present some preliminary encouraging numerical results for the proposed methods for sparse signal reconstruction and sparse Fisher discriminant analysis

The talk is Based on joint work with R.I. Boţ, M. Dao, T.K. Pong and P. Yu.