Effective Countable Generalized Moment Problems

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Abstract

The Generalized Moment Problem (GMP) provides a unified framework for optimization problems that can be formulated as linear programs over measures. Examples of such problems include polynomial optimization, optimal control, and symmetric tensor decomposition. To solve these infinite-dimensional problems, Moment-Sum-of-Squares (SoS) hierarchies offer a sequence of finite-dimensional semidefinite relaxations. These hierarchies are known to converge under standard (Archimedean and compactness) conditions.

Recently, progress has been focused on the convergence rate of these hierarchies, with rate analyses now available for polynomial optimization, volume computation, and optimal control. We build on these advances by establishing convergence rates for the GMP itself.

Under standard Archimedean, S-fullness, and dual attainment conditions, we provide new geometry-adaptive bounds for problems with countable moment constraints on vectors of measures. These results guarantee convergence for the optimal values, the feasibility sets in Hausdorff distance, and the optimizers in the weak* topology. We demonstrate our results by providing new, effective convergence rates for symmetric tensor decomposition.

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