Strong duality for robust minimax fractional programming problems

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Abstract

We develop a duality theory for minimax fractional programming problems in the face of data uncertainty both in the objective and constraints. Following the framework of robust optimization, we establish strong duality between the robust counterpart of an uncertain minimax convex-concave fractional program, termed as robust minimax fractional program, and the optimistic counterpart of its uncertain conventional dual program, called optimistic dual. In the case of a robust minimax linear fractional program with scenario uncertainty in the numerator of the objective function, we show that the optimistic dual is a simple linear program when the constraint uncertainty is expressed as bounded intervals. We also show that the dual can be reformulated as a second-order cone programming problem when the constraint uncertainty is given by ellipsoids. In these cases, the optimistic dual problems are computationally tractable and their solutions can be validated in polynomial time. We further show that, for robust minimax linear fractional programs with interval uncertainty, the conventional dual of its robust counterpart and the optimistic dual are equivalent.

Author keywords

Minimax fractional programming under uncertainty; Minimax linear fractional programming with uncertainty; Robust optimization; Strong duality

Indexed keywords

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