

# Algorithmic Operation Research From Linear to Conic Duality

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### 1 Introduction

Linear Programming (LP) models cover numerous applications. Whenever applicable, LP allows to obtain useful quantitative and qualitative information on the problem at hand. The specific analytic structure of LP programs gives rise to a number of general results, which provide us in many cases with valuable insight and understanding. This analytic structure underlies some specific computational techniques for LP, which by now are perfectly well developed, allowing us to solve routinely quite large LP programs. However, there are situations in reality which cannot be covered by the LP models. To handle these "essentially nonlinear" cases, one needs to extend the basic theoretical result and computational techniques known for LP beyond the bounds of Linear Programming.

The widest class of optimization problems to which the basic results of LP were extended, is the class of convex optimization problems.

When passing from a generic LP problem

$$\min_x$$