

# Extensions of Constant Rank Qualification Constraint Condition to Nonlinear Conic Programming

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## Abstract

We present new constraint qualification conditions for nonlinear conic programming that extend some of the constant rank-type conditions from nonlinear programming. Specifically, we propose a general and geometric approach, based on the study of the faces of the cone, for defining a new extension of this condition to the conic context. We then compare these new conditions with some of the existing ones, including the nondegeneracy condition, Robinson's constraint qualification, and the metric subregularity constraint qualification. The main advantage of the latter is that we are able to recast the strong second-order properties of the constant rank condition in a conic context. In particular, we obtain a second-order necessary optimality condition that is stronger than the classical one obtained under Robinson's constraint qualification, in the sense that it holds for every Lagrange multiplier, even though our condition is independent of Robinson's condition.

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