

# Second-order analysis for nonlinear semidefinite and second-order cone programming

Leonardo Makoto Mito<sup>1</sup>

<sup>1</sup> USP

In this talk, we will present some new results regarding second-order necessary optimality conditions that involve a single Lagrange multiplier, for two classes of conic optimization problems. In contrast with other related works, which rely on the so-called Nondegeneracy (or Transversality) Condition, our results are based on a simple extension of the so-called Weak Constant Rank property paired with Robinson's Constraint Qualification; which are, as a joint condition, strictly weaker than Nondegeneracy. Inspired by recent works, we adopt a penalty-based strategy, which means that our results can be useful for supporting global convergence results for first- and second-order algorithms. Since we do not assume strict complementarity, the critical cone does not reduce to a subspace; thus, the second-order condition we arrive at is defined in terms of the lineality space of the critical cone. In the case of nonlinear programming, this condition reduces to the standard second-order condition widely used as second-order stationarity measure in the algorithmic practice.

Joint work with Ellen H. Fukuda e Gabriel Haeser.