Master's Thesis

A strong second-order sequential optimality condition for nonlinear optimization

Guidance

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Abstract

Many numerical optimization methods have been proposed for solving nonlinear optimization problems. Most of them are designed to find a point satisfying optimality conditions. Although the Karush-Kuhn-Tucker (KKT) conditions are specifically well-known optimality conditions, they are meaningless if some constraint qualification (CQ) is not satisfied. Recently, sequential optimality conditions have been presented and they are known as genuine optimality because they hold at any local optimum regardless whether a CQ holds or not. In particular, they can be classified into the first- and second-order optimality conditions. This thesis focuses on the second-order sequential optimality conditions for nonlinear programming (NLP) and nonlinear semidefinite programming (NSDP) problems. The first part revises the existing strong approximate KKT2 (SAKKT2) conditions for NLP. The proposed conditions are satisfied at each local optimum under a relaxed constant rank assumption, which is weaker than the constant rank CQ (CRCQ), whereas the existing conditions require the CRCQ. In the latter part, we propose the SAKKT2 for NSDP. To the authors' best knowledge, the SAKKT2 conditions have not been extended for NSDP, and hence the proposed conditions provide a novel optimality. We also prove that the proposed optimality conditions hold at each local optimum under a relaxed constant rank assumption for NSDP.