

Subspace Techniques for Nonlinear Optimization

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In this talk, we review various subspace techniques that are used in constructing of numerical methods for nonlinear optimization. The subspace techniques are getting more and more important as the optimization problems we have to solve are getting larger and larger in scale. The applications of subspace techniques have the advantage of reducing both computation cost and memory size. Actually in many standard optimization methods (such as conjugate gradient method, limited memory quasi-Newton method, projected gradient method, and null space method) there are ideas or techniques that can be viewed as subspace techniques. The essential part of a subspace method is how to choose the subspace in which the trial step or the trust region should belong. Model subspace algorithms for unconstrained optimization and constrained optimization are given respectively, and different proposals are made on how to choose the subspaces. As an example, we also present an interior point method based on subspace techniques.