Optimization-based Approaches to Singular Value and Eigenvalue Problems.

Many problems in linear algebra can be reformulated as problems in optimization. It follows naturally that many successful solvers from the former domain have ties to successful solvers from the latter. In particular, the Hermitian eigenvalue problem has a well-known characterization as an optimization problem, which has resulted in the application of a number of classical optimization methods, including steepest descent, conjugate gradients, Newton’s method, and trust-region methods. Similarly, the related singular value problem has an optimization characterization, though it has seen less explicit attention from optimization-minded researchers. I will review the optimization characteristics of these and other problems from numerical linear algebra, along with some solution methodologies from Euclidean and Riemannian optimization. Emphasis will be given toward the application of these methods at extreme scales of computing. (Received September 21, 2011)