HENRY WOLKOWICZ, University of Waterloo

Regularized Nonsmooth Newton Algorithms for Best Approximation with Applications

We consider the problem of finding the best approximation point from a polyhedral set, and its applications, in particular to solving large-scale linear programs. The classical best approximation problem has many various solution techniques as well as applications. We study a regularized nonsmooth Newton type solution method where the Jacobian is singular; and we compare the computational performance to that of the classical projection method of Halpern-Lions-Wittmann-Bauschke (HLWB).

We observe empirically that the regularized nonsmooth method significantly outperforms the HLWB method. However, the HLWB method has a convergence guarantee while the nonsmooth method is not monotonic and does not guarantee convergence due in part to singularity of the generalized Jacobian.

Our application to solving large-scale linear programs uses a parametrized best approximation problem. This leads to a finitely converging stepping stone external path following algorithm. Other applications are finding triangles from branch and bound methods, and generalized constrained linear least squares. We include scaling methods and sensitivity analysis to improve the efficiency. (work with Y. Censor, W. Moursi, T. Weames)