1049-90-24 **Jon Lee***, IBM TJ Watson Research Center, PO Box 218, Yorktown Heights, NY 10598.
Parametric Nonlinear Discrete Optimization.

I will discuss algorithms for solving max f(Wx), over x in F, where f is nonlinear, the rows of the matrix W can be thought of as describing several linear objectives, and F is a finite set of points. The function f can be though of as balancing the various linear objectives. We look at various combinatorial choices of F. So our work fits somewhere on the landscape between multi-criteria optimization and nonlinear discrete optimization.

In full generality the model is intractable, so we look at cases that yield poly-time algorithms and approximation schemes. Our results involve broad special cases. E.g., regarding F, we consider multi-knapsacks, matchings and (poly)matroids. Regarding f, we consider optimization of concave and convex functions, etc. Regarding W, we usually assume that it has a fixed number of rows and the entries are small in some sense.

Most of our algorithms were mainly designed for theoretical efficiency. Nonetheless, there is a good argument for trying to implement some of these methods on modern high-performance platforms. We describe such an effort, using ultra-high precision solution of linear systems on the BlueGene supercomputer.

Joint work, different parts with Berstein, Gunnels, Margulies, Maruri-Aguilar, Onn, Riccomagno, Weismantel, Wynn. (Received January 21, 2009)