NYU Stern School of Business
Department of Information, Operations & Management Sciences
OPERATIONS MANAGEMENT RESEARCH SEMINAR

TOPIC: Some Remedies for Some Intractable Optimization Problems
SPEAKER: Aharon Ben-Tal (Technion)
DATE: Wednesday, February 11, 2015
TIME: 11:00 AM-12:00PM
PLACE: KMC 3-120

ABSTRACT

The need to solve real-life optimization problems poses frequently a severe challenge, as the underlying mathematical programs threaten to be intractable. The intractability can be attributed to any of the following properties: large dimensionality of the design dimension; lack of convexity; parameters affected by uncertainty. In problems of designing optimal mechanical structures (truss topology design, shape design, free material optimization), the mathematical programs typically has a large dimensional Semi Definite Program. Some Signal Processing and Estimation problems may result in nonconvex formulations. In the wide area of optimization under uncertainty, some classical approaches, such as chance (probabilistic) constraints, give rise to nonconvex NP-hard problems.

In all the above applications we explain how the difficulties were resolved. In some cases this was achieved by mathematical analysis (notoriously duality theory) which converted the problems (or its dual) to a tractable convex program. In the Robust Control example, a reparameterization scheme is developed under which the problem is converted to a tractable deterministic convex program.

BIO

Aharon Ben-Tal is a Professor of Operations Research and former Head of the MINERVA Optimization Center at the Faculty of Industrial Engineering and Management at the Technion – Israel Institute of Technology, and holder of the Dresner Chair. He received his Ph.D. in Applied Mathematics from Northwestern University in 1973. He has been a Visiting Professor at the University of Michigan, University of Copenhagen, Delft University of Technology, MIT, CWI Amsterdam, Columbia and NYU. His interests are in Continuous Optimization, particularly nonsmooth and large-scale problems, conic and robust optimization, as well as convex and nonsmooth analysis. Recently the focus of his research is on optimization problems affected by uncertainty. In the last 15 years, he has devoted much effort to engineering applications of optimization methodology and computational schemes. Some of the algorithms developed in the

MINERVA Optimization Center are in use by Industry (Medical Imaging, Aerospace). He has published more than 125 papers in professional journals and co-authored three books: Optimality in Nonlinear Programming: A Feasible Direction Approach (Wiley-Interscience, 1981) Lectures on Modern Convex Optimization: Analysis, Algorithms and Engineering Applications (SIAM-MPS series on optimization, 2001) and Robust Optimization (Princeton University press ,2009). Prof. Ben-Tal served two term as the Dean of the Faculty of Industrial Engineering and Management at the Technion. He served as a council member of the Mathematical Programming Society (1994-1997). He was Area Editor (Continuous Optimization) of Math. of Operations Research (1993-1999), member of the Editorial Board of SIAM J. Optimization, J. Convex Analysis, OR Letters, Mathematical Programming, Management Science, Math. Modeling and Numerical Analysis, European J. of Operations Research and Computational Management Science. From January 2012 he is the Area Editor (Optimization) for Operations Research.