Optimization Without Algebraic Models: Algorithms, Software, and Applications

Abstract: Fueled by a growing number of applications in science and engineering, the development of algorithms for solving optimization problems in the absence of algebraic models has found renewed interest in recent years. The topic is often referred to as derivative-free optimization and black-box optimization. In this talk, we first present a review of algorithms and systematic comparison of over twenty related software implementations using a test set of over 500 problems. Then, we propose a new family of local and global optimization algorithms for this class of problems, and summarize computational experience from a variety of applications.

Nick Sahinidis is John E. Swearingen Professor at Carnegie Mellon University. He joined Carnegie Mellon in 2007 after a sixteen-year long career at the University of Illinois at Urbana, where he taught in Industrial Engineering and Chemical Engineering. His research has included the development of theory, algorithms, and the BARON software for global optimization of mixed-integer nonlinear programs. Scientists and engineers have used BARON in many application areas, including the development of new Runge-Kutta methods for partial differential equations, energy policy making, modeling and design of metabolic processes, product and process design, engineering design, and automatic control. Since commercial versions of BARON were made available under the GAMS and AIMMS modeling systems, BARON has been used by several companies in the automotive, financial, and chemical process industries. His research activities have been recognized by a National Science Foundation CAREER award in 1995, the 2004 INFORMS Computing Society Prize, the 2006 Beale-Orchard-Hays Prize from the Mathematical Programming Society, and the 2010 Computing in Chemical Engineering Award.