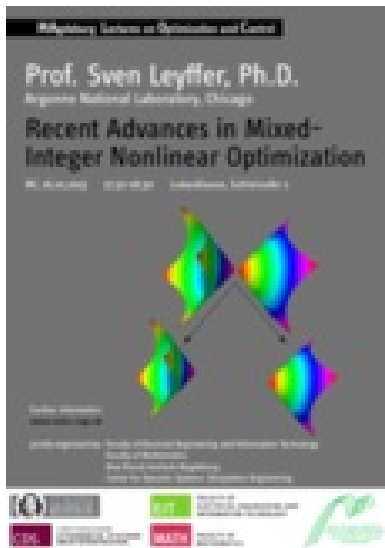


## MAGDEBURG LECTURES ON OPTIMIZATION AND CONTROL

### Sven Leyffer



### Recent Advances in Mixed-Integer Nonlinear Optimization

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#### Time & Place

The presentation on October 16, 2013 will be given in the Lukas Klause › (Schleiufer 1, 39104 Magdeburg) (<http://ifatwww.et.uni-magdeburg.de/syst/maloc/seminars/Standort%20Lukas%20Klause.pdf>) and starts at 5.30 p.m.

#### Abstract

Scientists are increasingly moving from the simulation of complex processes to the optimization, control, and design of complex systems. Many important design problems involve not only

continuous variables with nonlinear constraints but also discrete decisions, giving rise to mixed-integer nonlinear programming problems (MINLPs). MINLPs combine the combinatorial complexity of the discrete decisions with the numerical challenges of the nonlinear functions. The last decade has seen a rise in new ideas, algorithmic approaches, and software packages for solving MINLPs. We will review the underlying theory of these algorithms and discuss their practical performance. We will describe extensions to other classes of MINLP such as conic-constrained MINLPs and special classes of nonlinear functions, emphasizing how to exploit their structure within a solution process. Finally, we will present a new package for solving mixed-integer nonlinear optimization problems, MINOTAUR. The MINOTAUR toolkit is designed to provide a flexible and efficient framework for solving MINLPs. The code is developed in a modular way to enable developers and users to efficiently combine the knowledge of problem structure with algorithmic insights.

#### Short CV

Sven obtained his Ph.D. in 1994 from the › University of Dundee (<http://www.dundee.ac.uk/>), working on mixed-integer nonlinear programming problems with Roger Fletcher. He has held postdoc positions at Dundee, Northwestern, and Argonne, where he now works as a computational mathematician in the › Mathematics and Computer Science Division (<http://www.mcs.anl.gov/index.php>). Sven is a Senior Fellow of the › Computation Institute (<http://www.ci.anl.gov/>) at the University of Chicago. Sven is the current › SIAM (<http://www.siam.org/>) Vice President for Programs, a co-editor of › Mathematical Programming (<http://www.springer.com/mathematics/journal/10107>) and an editor-in-chief of › Mathematical Methods of Operations Research (<http://www.springer.com/math/journal/186>). He serves on the editorial board of › Computational Optimization and Applications (<http://www.springer.com/math/journal/10589>). In addition, Sven edits the › SIAG/OPT Views-and-News ([http://wiki.mcs.anl.gov/NEOS/index.php/SIAG/Optimization\\_View\\_and\\_News](http://wiki.mcs.anl.gov/NEOS/index.php/SIAG/Optimization_View_and_News)). He has served as the › INFORMS Optimization (<http://optimization.society.informs.org/>) Vice-Chair for nonlinear programming and as the Program Director of the › SIAM activity group on optimization (<http://www.siam.org/activity/optimization/>). For other appointments, see › this list of other appointments

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