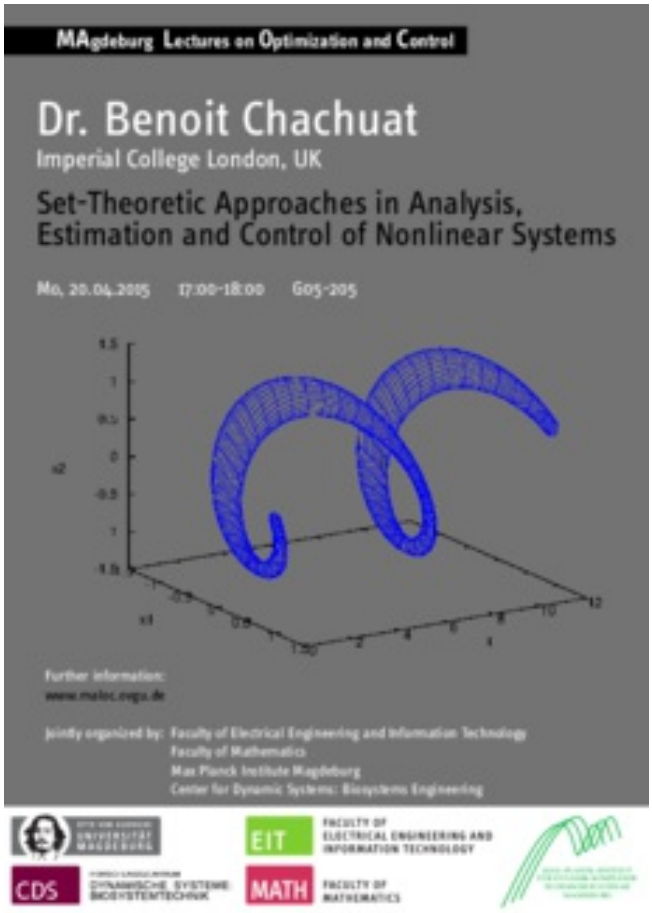
OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

MAGDEBURG LECTURES ON OPTIMIZATION AND CONTROL

Benoit Chachuat



Trust-region adaptive stochastic collocation for PDE optimization under uncertainty

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Time & Place
The presentation on June 29, 2015 will be given in the Senatssaal (building 05, room 205) and starts at 5.00 p.m.

Abstract
I will present a trust-region algorithm with adaptive sparse grids for the solution of optimization problems governed by partial differential equations (PDEs) with uncertain coefficients. The algorithm adaptively builds two separate sparse grids: one to generate optimization models for the optimization step computation, and one to approximate the objective function to evaluate whether to accept the step. The quality of the adaptive sparse grid models is determined by the trust-region algorithm. Conditions on inexact function and gradient evaluations in previous trust-region frameworks are extended to allow the rigorous use of asymptotic (discretization) error estimates for objective function and gradient approximations. Our algorithm often generates adaptive sparse grids that contain significantly fewer points than the high-fidelity grids, which leads to a dramatic reduction in the computational cost. Moreover, the numerical results indicate that the new algorithm rapidly identifies the stochastic variables that are relevant to obtaining an accurate optimal solution. When the number of such variables is independent of the dimension of the stochastic space, the algorithm exhibits near dimension-independent behavior.

Short CV
Matthias Heinkenschloss is professor of Computational and Applied Mathematics at Rice University. His research is concerned with the development, analysis, and applications of algorithms for large-scale optimization problems governed by partial differential equations. He has served/is serving on editorial boards of several professional journals including Mathematical Programming, Numerical Linear Algebra with Applications, and SIAM Journal on Control and Optimization. Prior to joining Rice

University in 1996, he was an assistant professor at Virgina Tech (1993-96), and Wissenschaftlicher Assistent at the University of Trier, Germany, (1992-93). He received his doctoral degree in 1991 from the University of Trier, Germany.