

# Differential equations and optimization (M. Heinkenschloss)

Matthias Heinkenschloss  
`heinken@rice.edu`  
Rice University, USA

The numerical solution of optimization problems governed by differential equations (DEs) poses challenges not encountered in the solution of large-scale nonlinear programming problems. These challenges include the very large scale of the optimization problems, the computation of first and second order derivative information using sensitivity equation or adjoint equation approaches (especially if the underlying DEs involve complex nonlinearities, are discretized using higher order methods, or involve intricate boundary conditions), inexactness in function and derivative evaluations (e.g., due to iterative DE solves), and interactions between discretization and problem solution that are far more complex in DE optimization than in DE simulation. On the other hand, DE optimization problems exhibit problem structure that can not be found in many other large-scale problems and that can be used in the design and the analysis of efficient and robust algorithms for DE optimization problems.

The talks in this minisymposium highlight some of the difficulties encountered in DE optimization and approaches for their solution.