DEPARTMENT of INDUSTRIAL ENGINEERING
UNIVERSITY of HOUSTON

FRIDAY SEMINAR SERIES
BROADEN HORIZONS | EXTEND MINDS

Professor Sven Leyffer
Deputy Division Director
Senior Computational Mathematician
Argonne National Lab., Chicago, IL

Date: Friday, Nov., 8, 2024
Time: 1 - 1:50 pm
Location: D2 Lect2
Zoom Meeting ID: 970 7656 5407
Passcode: 477211

Topological Design Problems and Integer Optimization

Abstract: Topological design problems arise in many important engineering and scientific applications, such additive manufacturing and the design of cloaking devices. We formulate these problems as massive mixed integer PDE-constrained optimization (MIPDECO) problems. We show that despite their seemingly hopeless complexity, MIPDECOs can be solved efficiently (at a cost comparable to a single continuous PDE-constrained optimization solve). We discuss two classes of methods: rounding techniques that are shown to be symptotically optimal, and trust-region techniques that converge under mesh refinement. We illustrate these solution techniques with examples from topology optimization.

Short Bio: Sven Leyffer joined the Mathematics and Computer Science Division at Argonne in 2002, where he is now a senior computational mathematician. Sven is a SIAM Fellow, and a senior fellow of the U. Chicago & Argonne Computation Institute. He is the current SIAM President and serves on the editorial boards of Computational Optimization and Applications, and Mathematics of Computation. In 2006, Leyffer and his colleagues received the Lagrange Prize in Continuous Optimization, which is awarded only once every 3 years. In 2016, he received the Farkas Prize from the INFORMS Optimization Society. Leyffer obtained his Ph.D. in 1994 from the University of Dundee, Scotland, and held postdoctoral research positions at Dundee, Argonne, and Northwestern University. His research interests include develop reliable methods for solving large-scale nonlinear optimization problems; implementation/analysis of filter-type algorithms and extending nonlinear optimization methodologies to emerging areas such as mixed-integer nonlinear optimization problems with complementarity constraints.