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Mathematics Institute of Computational Science and Engineering - MATHICSE

SEMINAR OF NUMERICAL ANALYSIS

➤ **MONDAY 11 APRIL 2016 - ROOM MA B1 11 - 16h15**

Dr. Drew KOURI (SANDIA National Laboratoires, USA) will present a seminar entitled:

“A data-driven approach to PDE-constrained optimization under uncertainty”

Abstract:

Many science and engineering applications require the control or design of a physical system governed by partial differential equations (PDEs). More often than not, PDE inputs such as coefficients, boundary conditions, or initial conditions are unknown and estimated from experimental data. In this talk, I will discuss some theoretical challenges associated with such PDE-constrained optimization problems, including their mathematical formulation and their efficient numerical solution. First, I will assume that we know the probability distributions that characterize the uncertain PDE inputs. For this case, I will introduce the notion of a risk measure as a means to quantify the "hazard" associated with large objective function values. Often risk-averse quantities are not differentiable in the classic sense and thus not appropriate for derivative-based optimization. To circumvent this issue, I will present a theory for smooth risk measures in the context of PDE-constrained optimization. Next, to handle the situation of an unknown probability distribution, I will introduce and analyze a distributionally-robust formulation for the optimization problem. To enable numerical solutions, I will present a novel discretization for the unknown probability measure and provide rigorous error bounds for this approximation. I will conclude with numerical results confirming the aforementioned error bounds.

Lausanne, 8 March 2016/FN/cr