Optimization with random uniform state constraints

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In this talk, we discuss optimization problems subject to random state constraints, where we distinguish between the chance-constrained case and the almost sure formulation. We highlight some of the difficulties in the infinite-dimensional setting, which is of interest in physics-based models where a control belonging to a Banach space acts on a system described by a partial differential equation (PDE) with random inputs or parameters. We study the setting in which the obtained state should be bounded uniformly over the physical domain with high probability, or even probability one. A simple example from PDE-constrained optimization under uncertainty is shown. The obtained optimality conditions, which are in part based on the spherical radial decomposition of Gaussian random vectors, are used to compute the numerical solution.

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