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## ONE WORLD OPTIMIZATION SEMINAR

April 12<sup>th</sup> 2021 @ 15:30 CEST (Central European Summer Time)

**MICHAEL ULBRICH**

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### **An Approximation Scheme for Distributionally Robust Nonlinear Optimization with Applications to PDE-Constrained Problems under Uncertainty**

**Abstract.** We present a sampling-free approximation scheme for distributionally robust nonlinear optimization (DRO). The DRO problem can be written in a bilevel form that involves maximal (i.e., worst case) value functions of expectation of nonlinear functions that depend on the optimization variables and random parameters. The maximum values are taken over an ambiguity set of probability measures which is defined by moment constraints. To achieve a good compromise between tractability and accuracy we approximate nonlinear dependencies of the cost / constraint functions on the random parameters by quadratic Taylor expansions. This results in an approximate DRO problem which on the lower level then involves value functions of parametric trust-region problems and of parametric semidefinite programs. Using trust-region duality, a barrier approach, and other techniques we construct gradient consistent smoothing functions for these value functions and show global convergence of a corresponding homotopy method. We discuss the application of our approach to PDE constrained optimization under uncertainty and present numerical results.

*The link of the zoom-room of the meeting and the corresponding password will be announced the day before the talk on the mailing list of the seminar, to which one can subscribe on <https://owos.univie.ac.at>.*