



## **Minisymposium 20 - Nonlinear and Stochastic Optimization**

### **Optimal Control of Gas and Water Networks**

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Operative planning in supply networks with nonlinear fluid dynamics leads to large-scale discrete-continuous optimization problems over graphs. The lecture focuses on the structural analysis of such DAE and PDE network models under fixed combinatorial decisions. We present topological index criteria for DAE arising in the incompressible case and discuss implications of the index on boundary value problems resulting from full discretizations in space and time. Observing that the associated large, structured KKT systems permit a decoupling of space and time based on parallel spatial projections, we develop highly efficient solution algorithms using interior methods. Comments on the issue of discrete decisions (pump switching) are also provided. For the municipal water supply network of Berlin, we finally present results of minimum-cost operation under reliable demand forecast.