Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

FAKULTÄT
FÜR MATHEMATIK, INFORMATIK
UND NATURWISSENSCHAFTEN
Fachbereich Mathematik

Kolloquium über Mathematische Statistik und Stochastische Prozesse

Olga Heijmans-Kuryatnikova

Assistant Professor, Econometric Institute of Erasmus University Rotterdam

15.04.2025, 16:15 Uhr, Geom Hörsaal H5

Sparse Polynomial Optimization for Water Networks

Abstract:
In this research we explore sparsity in the valve setting problem (VSP), which optimizes the main parameters, such as pressure and flow, in water networks. The ideas are applicable to electricity and especially gas networks, but we use water networks as the main example. The VSP can be formulated as a quadratic program that consists of many small subproblems. These subproblems involve few variables and polynomial terms and are connected with sparse linking constraints. As a result, the VSP exhibits so-called correlative sparsity (subsets of variables appearing separately in constraints), term sparsity (few monomials present in the problem), and ideal sparsity (potential for size reduction due to equality constraints). We propose a simple moment-based semidefinite programming relaxation that uses all types of sparsity to reach a trade-off between the relaxation quality and running times. We compare the new relaxation analytically and empirically with the existing SDP relaxations and report numerical results on water networks ranging in size from 4 to about 2000 nodes. This is joint work with Bissan Ghaddar from Ivey Business School.

Olga Heijmans-Kuryatnikova
kuryatnikova@ese.eur.nl
https://www.kuryatnikova.com/

Kontakt:
Prof. Dr. Johannes Lederer
johannes.lederer@uni-hamburg.de
https://www.math.uni-hamburg.de/forschung/bereiche/st/math-data-methoden/personen/lederer-johannes.html