MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

Monday, July 14 2024 at 10:15-10:40, D. Dan and Betty Kahn Building, Room 217

The seminar will be delivered as part of that day's GSC conference

Tractable downfall of basis pursuit in structured sparse optimization

Maya V. Marmary

Adviser: Dr. Christian Grussler

The problem of finding the sparsest solution to a linear underdetermined system of equations, often appearing, e.g., in data analysis, optimal control, and system identification problems, is considered. This non-convex problem is commonly solved by convexification via ℓ_1-norm minimization, known as basis pursuit (BP). In this work, a class of structured matrices, representing the system of equations, is introduced for which (BP) tractably fails to recover the sparsest solution. In particular, this enables efficient identification of matrix columns corresponding to unrecoverable non-zero entries of the sparsest solution, determination of the uniqueness of such a solution, and certification of (BP) failing to compute a sparsest solution without prior knowledge on its non-zero entry locations. These deterministic guarantees contrast with popular probabilistic ones and provide valuable insights into the a priori design of sparse optimization problems. As our matrix structures appear naturally in optimal control problems, we exemplify our findings based on a fuel-optimal control problem for a class of discrete-time linear time-invariant systems.

Note: the seminar will be given in English