

Title: Solution Paths of Polyhedral Regularizations

Joint work with Daniel Cremers, Felix Krahmer, and Michael Möller.

Abstract: To reconstruct a signal from a few linear measurements, one often computes the minimizers of energy functionals with a quadratic data fidelity term and an ℓ_1 -regularization. The data fidelity term captures how closely we fit the measured data, while the ℓ_1 -regularization imposes prior information about the signal to be reconstructed. The choice of the regularization parameter t , which determines the trade-off between fitting the data and satisfying the prior information, is often a delicate issue. Instead of solving the problem for a fixed regularization parameter t , I will explain how to compute a solution for every nonnegative parameter, i.e., a solution path.

Under a certain condition the well-known homotopy method computes the solution path by solving a sequence of linear systems. To illustrate that this condition is necessary, I will discuss an example in which the homotopy method fails. Subsequently, I will introduce a new generalized homotopy method, which replaces the linear systems with nonnegative least squares problems, and provably works in every scenario. Finally, I will extend the generalized homotopy method from ℓ_1 -regularizations to polyhedral regularizations.