The Art of Repeatedly Project your Problems

Speaker: Matthias Chung, Emory University

Abstract: Inference by means of mathematical modeling from a collection of observations remains a crucial tool for scientific discovery and is ubiquitous in application areas such as signal compression, imaging restoration, and supervised machine learning. With ever-increasing model complexities and growing data size, new specially designed methods are urgently needed to recover meaningful quantities of interest. We consider the broad spectrum of linear inverse problems where the aim is to reconstruct quantities with a sparse representation on some vector space; often solved using the (generalized) least absolute shrinkage and selection operator (lasso). The associated optimization problems have received significant attention, in particular in the early 2000s, because of their connection to compressed sensing and the reconstruction of solutions with favorable sparsity properties using augmented Lagrangians, alternating directions and splitting methods. We provide a new perspective on the underlying l1 regularized inverse problem by exploring the generalized lasso problem through variable projection methods. We arrive at our proposed variable projected augmented Lagrangian (vpal) method. We provide numerical examples demonstrating the computational efficiency of various imaging problems.