Imaging Seminar - Department of Mathematics

Date and Time: Tuesday April 14, 2015, 11am-12pm
Location: PGH 646

Title: *Bias-free Sparse Optimization*
Speaker: Wotao Yin, UCLA. Department of Mathematics

Abstract: We introduce a new sparse signal recovery method that has a number of theoretical and computational properties. In particular, it doesn't have the bias found in LASSO. Known since Jianqing Fan and Runze Li's publication in 2001, points on a LASSO path are biased. In order to avoid the bias, instead of the convex l1 energy used in LASSO, one must minimize a nonconvex energy and therefore lose the computational advantages of convex minimization.

Our new method recovers a sparse signal by evolving an ordinary differential inclusion, which involves the subdifferential of the l1 energy. We show that our method can find a solution that is the unbiased estimate of the true signal and whose entries have the signs consistent with those of the true signal. All of these are achieved without any post-processing step of debiasing. In fact, it works better than LASSO combined with debiasing. We also show how to efficiently compute our path both exactly and inexactly but much faster. The exact path can be computed in finitely many steps at a low cost per step. For problems with huge data, we generate an approximate regularization path by so-called Linearized Bregman iteration, which is fast and easy to parallelize yet still have the sign-consistency property and is only slightly biased.

This is joint work with Stanley Osher, Feng Ruan, Jiechao Xiong, Ming Yan, and Yuan Yao.

Upcoming talks at: http://www.math.uh.edu/~dlabate/ImSeminar.html