

STATISTICS COLLOQUIUM

MONDAY, MARCH 3rd, 2008

TALK: 4:00 PM — SCIENCE CENTER RM. 309

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

“A Unified Approach to Model Selection and Sparse Recovery Using Regularized Least Squares”

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ABSTRACT

We propose a family of penalty functions $\{\rho_a : a \in [0, \infty]\}$ connecting the L_0 and L_1 norms, where a controls the maximum concavity of ρ_a . We then propose a unified approach of ρ_a -regularized least squares for two interrelated problems of model selection and sparse recovery. For both problems we present a comprehensive theory identifying when regularized least squares with a general penalty can recover the true sparse model. In particular we establish the oracle property of the ρ_a -regularized least squares estimator. We further identify the optimal penalty in $\{\rho_a : a \in [0, \infty]\}$ that attains minimal maximum concavity and guarantees theoretical recoverability. In addition to theoretical contributions, we also propose an innovative algorithm, Sequentially and Iteratively Reweighted Squares (SIRS), for solving regularized least squares with a general penalty. Through empirical studies of simulated and real data sets we show the superior performance of our new methods on model selection and sparse recovery.