## Penalized Squared Error and Likelihood: Risk Bounds and a Fast Algorithm

by

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## Abstract

The presentation in three parts: 1. OVERVIEW OF RISK ANALYSIS. Variable-distortion, variable-complexity covers are shown to give an appropriate information-theoretic tool for demonstrating acceptable penalties for which the risk of the estimator is bounded by a corresponding population tradeoff between accuracy of approximation and penalty relative to the sample size. 2.  $l_1$  PENALIZED SQUARED ERROR. Accuracy is proven for a variant of greedy term selection in solving the  $l_1$  penalized squared error optimization. Its risk is shown to be superior to greedy term selection with subset size penalty in the case of libraries with certain covering properties. The bounds show smaller risk than the typical  $\sqrt{(\log p)/n}$  where p is the library size and n is the sample size. 3.  $l_1$  PENALIZED LOG-LIKELIHOOD AND A FAST ALGORITHM FOR LASSO. Analogous conclusions are discussed for  $l_1$  penalized log likelihood in log-linear models and inverse covariance estimation. A fast algorithm for solving LASSO is also introduced with the sampling idea, which is an underlying tool for all three parts of the talk.