Stanford University
Department of Statistics

DEPARTMENTAL SEMINAR

4:15pm, Tuesday, November 18, 2014
*** Note Special Location ***
Sloan Mathematics Building 01-380 Room 380C
Cookies served at 3:45pm, 1st floor Lounge.

Speaker: Stefan Wager
Department of Statistics,
Stanford University

Title: Bootstrapping Regularizers

Abstract:
The success of a high-dimensional statistical procedure often hinges on the quality of its regularization. In this talk I will show how, by using a parametric bootstrap, we can turn noise models into regularizers that are closely tailored to the problem at hand. To give a concrete example, if our estimation procedure takes a noisy matrix $X$ as input, we may have a noise model that specifies whether each cell $X_{ij}$ is perturbed by Gaussian, Poisson, blankout, or some other form of noise. In each case, a different form of regularization is appropriate.

Our method can be applied to a wide variety of statistical techniques, including generalized linear models, low-rank matrix estimation, and sequence models used in natural language processing. If we bootstrap from the simplest possible noise model, we usually recover well-known procedures such as ridge penalization for linear regression or singular-value shrinkage for matrix estimation. But, once we are able to specify a more appropriate bootstrap noise model (e.g., Poisson noise for count data), we often get new procedures that can substantially improve on baselines and have surprising theoretical properties. The resulting approach is closely related to James–Stein shrinkage, and to the Efron–Morris theory of empirical Bayes estimation.

This is work is in collaboration with William Fithian, Julie Josse, Percy Liang, and Sida Wang.