

Stanford University
Department of Statistics

DEPARTMENTAL SEMINAR

4:30pm, Tuesday, February 26, 2019
Sloan Mathematics Center Room 380C

Refreshments served at 4pm in Sequoia Lounge.

Speaker: Cun-Hui Zhang, *Rutgers University*

Title: **Second-Order Stein: SURE for SURE and other applications**

Abstract:

Stein's formula states that a random variable of the form $z^\top f(z) - \text{div}f(z)$ is mean-zero for all functions f with integrable gradient. Here, $\text{div}f$ is the divergence of the function f and z is a standard normal vector. We develop Second-Order Stein formulas for statistical inference with high-dimensional data. In the simplest form, the Second-Order Stein formula characterizes the variance of $z^\top f(z) - \text{div}f(z)$. A first application of the Second-Order Stein formula is an Unbiased Risk Estimate for Stein's Unbiased Risk Estimator (SURE for SURE): an unbiased estimate provides information about the squared distance between SURE and the prediction error in the Gaussian sequence model. SURE for SURE has a simple form and can be computed explicitly for almost differentiable estimators, for example the Lasso and the Elastic Net. Other applications of the Second-Order Stein formula are provided in high-dimensional regression. This includes novel bounds on the variance of the size of the model selected by the Lasso, and a general semi-parametric scheme to de-bias an almost differentiable initial estimator in order to estimate a low-dimensional projection of the unknown regression coefficient vector.

This is joint work with Pierre Bellec.