**Title:**
Preconditioning for Consistency in Sparse Inference

**Speaker:**
Dr. Jinzhu Jia
Department of Probability and Statistics
School of Mathematical Sciences
Peking University

**Time & Place:**
Wednesday, Nov. 13, 2013, 4:00-5:00pm
Room 140 Bardeen
*(Cookies & Coffee @ 3:30 in Rm 1210 MSC)*

**Abstract:**
Preconditioning is a technique from numerical linear algebra that can accelerate algorithms to solve systems of equations. In this paper, we demonstrate how preconditioning can circumvent three stringent assumptions for various types of consistency in sparse linear regression. Given $X \in \mathbb{R}^{n \times p}$ and $Y \in \mathbb{R}^{n}$ that satisfy the standard regression equation, this paper demonstrates that even if the design matrix $X$ does not satisfy the irrepresentable condition, the restricted eigenvalue condition, or the restricted isometry property, the design matrix $FX$ often does, where $F \in \mathbb{R}^{n \times n}$ is a preconditioning matrix defined in this paper. By computing the Lasso on $(FX,FY)$, instead of on $(X,Y)$, the necessary assumptions on $X$ become much less stringent. As an example of preconditioning technique, I also talk about my recent work on the analysis of the fused Lasso. We find that in general, the FLSA might not be able to recover the signal pattern. We then apply the Puffer Transformation on the transformed Lasso problem. We call the new method the preconditioned fused Lasso and we give non-asymptotic results for this method. Results show that when the signal jump strength (signal difference between two neighboring groups) is big and the noise level is small, our preconditioned fused Lasso estimator always gives the correct pattern with high probability.