



THE UNIVERSITY OF  
**CHICAGO**

Department of Statistics

DISSERTATION PROPOSAL

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Generalized Adaptive Shrinkage Methods and Their Applications on  
Gene Expression Data

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### ABSTRACT

Motivated by the normal means problem, Stephens (2016) proposed Adaptive Shrinkage (ASH), a novel statistical approach for estimating false discovery rates (FDRs) and effect sizes on normal distributed data. We extend this normal adaptive shrinkage model and propose generalized adaptive shrinkage methods for data with more generic distributional assumptions. We will also discuss the applications of generalized adaptive shrinkage methods in various genomics problems. Specifically, we propose a pipeline for differential expression analysis on RNA-Seq data, which is adaptive, statistically powerful and gives well-calibrated FDRs. In particular, for small sample size cases, our proposed pipeline yields noticeably better performance compared to the existing widely-used differential expression analysis methods.

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