THE UNIVERSITY OF CHICAGO

Department of Statistics
MASTER'S THESIS PRESENTATION

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Comparison of Methods for False Discovery Rate Estimation and Implementation of an Adaptive Shrinkage Method with Student-t Likelihood

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ABSTRACT

Modern scientific techniques in genomics and image processing is providing a new class of hypothesis testing problems with hundreds or thousands of cases to consider simultaneously. Each case has some associated effect size, while most cases have no effect. It is often important to estimate the effect size and the local or tail-area false discovery rate for each case. Three widely used empirical Bayes approaches for doing the estimation, that are 'local fdr' (Efron), 'mixfdr' (Muralidharan) and 'fdrtool' (Strimmer) methods, are introduced and compared in this paper. Overall, methods vary widely in bias and variability. The 'mixfdr' method with careful choices of parameters outperforms the other two in normal data simulations. Although 'mixfdr' method is relatively convincing, it restricts the variation in the standard deviation of each observation. To be more generic and flexible, an adaptive shrinkage method with student-t likelihood for unknown quantities is implemented.