THE UNIVERSITY OF CHICAGO

Department of Statistics

DISSERTATION PROPOSAL

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Multivariate Adaptive Shrinkage

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ABSTRACT

We are interested in estimating "effects" from observations. Our goal here is to improve estimates of by using "shrinkage" methods. Shrinkage is a powerful idea, but the usual problem is "how much to shrink". Here, the amount of shrinkage is to be learned from the data, so this is why we refer to it as "adaptive" shrinkage. We allow for correlation among observations and apply adaptive shrinkage to estimate the effects. In this case a reasonably good estimation for the correlation among all the observations or the precision matrix is needed to calculate the likelihood. We apply Dynamic Statistical Comparisons to different methods on estimating precision matrix with different assumptions. The low rank assumption on precision matrix turns out to be reasonable and computationally feasible for gene expression data. It allows us learn the structure of the data in a low dimensional space and try to recover the correlation structure by using factor model. An adaptive shrinkage methods on factors and loadings is applied here allowing grouping information of variables (genes) and samples (individuals) on latent features. The applications for this study could be multiple testing, mean estimation with correlated observations, and gene set enrichment analysis.

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