The University of Chicago
Department of Statistics

PhD Thesis Presentation

HAN HAN

Department of Statistics
The University of Chicago

From Bayes Calculus to Efficient Integration of Studies

WEDNESDAY, August 15, 2012, at 10:00 AM
110 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

My thesis contains three main parts: the first part discusses a theoretical development in Bayes calculations, while the latter two parts focus on statistical methods with the applications to genetics. The focus of the talk is on a new meta-analysis approach to identify common predictors from multiple related studies. Identifying molecular signatures for complex diseases remains one major objective in gene expression studies. Commonly used strategies mainly investigate one gene expression study at a time, where the combination of small sample size and a large number of genetic predictors often leads to low detection power and to inaccuracy in the estimation of the set of relevant genes. We present here methodology for improving the power of identifying gene signatures by combining summary statistics from several relevant studies. The group lasso proposed by Yuan and Lin (2006) could be used for this purpose, where the regression coefficients of the same predictor across multiple studies naturally form a group. Their approach is challenged when predictors have heterogeneous effects or effect direction coherence. Motivated by these issues, we introduce a nonparametric approach called Meta-Rank Selection. Our three-step approach first infers the rank of a predictor and its marginal correlation with the response in each individual study, combines the two scores to form a consensus ranking path of all predictors, then selects the relevant predictors along the consensus ranking path. We present theoretical properties of Meta-Rank Selection and use simulations to compare its performance with other methods such as the group lasso. We also discuss its extensions, including ways to incorporate effect direction coherence and tools to deal with strong correlations among predictors.

Information about building access for persons with disabilities may be obtained in advance by calling Matt Johnston at 773.702-0541 or by email (mhj@galton.uchicago.edu).