Data Science Seminar

Hosted by Department of Mathematical Sciences

- Date: Tuesday, May 9, 2017
- Time: 12:00-1:00
- Room: WH-100E
- Speaker: Yuying Xie (Michigan State University)
- Title: Joint Estimation of Multiple Dependent Gaussian Graphical Models with Applications to Mouse Genomics

Abstract

Gaussian graphical models are widely used to represent conditional dependence among random variables. In this paper, we propose a novel estimator for data arising from a group of Gaussian graphical models that are themselves dependent. A motivating example is that of modeling gene expression collected on multiple tissues from the same individual: here the multivariate outcome is affected by dependencies acting not only at the level of the specific tissues, but also at the level of the whole body; existing methods that assume independence among graphs are not applicable in this case. To estimate multiple dependent graphs, we decompose the problem into two graphical layers: the systemic layer, which affects all outcomes and thereby induces cross-graph dependence, and the category-specific layer, which represents graph-specific variation. We propose a graphical EM technique that estimates both layers jointly, establish estimation consistency and selection sparsistency of the proposed estimator, and confirm by simulation that the EM method is superior to a simple one-step method. We apply our technique to mouse genomics data and obtain biologically plausible results.

More details about the Data Science seminar can be found at https://www2.math.binghamton.edu/p/seminars/sml