VirginiaTech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Computer Science Seminar Series, 2012

National Capital Region

Learning Structural Changes of Gaussian Graphical Models between Two Experimental Conditions

Speaker: Dr. Bai Zhang
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Friday, March 30, 2012
1:00PM- 2:00PM, NVC 325

Abstract

Graphical models are widely used in scientific and engineering research to represent conditional independence structures between random variables. In many controlled experiments, environmental changes or external stimuli can often alter the conditional dependence between the random variables, and potentially produce significant structural changes in the corresponding graphical models. Therefore, it is of great importance to be able to detect such structural changes from data, so as to gain novel insights into where and how the structural changes take place and help the system adapt to the new environment.

In this talk, we report an effective learning strategy to extract structural changes in Gaussian graphical model using l1-regularization based convex optimization. We discuss the properties of the problem formulation and introduce an efficient implementation by the block coordinate descent algorithm. We demonstrate the principle of the approach on numerical simulation experiments, and we also apply the algorithm to the modeling of gene regulatory networks under different conditions and obtain promising yet biologically plausible results.

Biography

Bai Zhang is currently a research associate in the Department of Pathology, School of Medicine, The Johns Hopkins University. He received his B.S. and M.S. degrees from Tsinghua University, Beijing, China in 2004 and 2006, respectively, and his Ph.D. degree from Virginia Tech in 2011. His research interests include machine learning, signal processing and bioinformatics, focusing on developing novel statistical and computational approaches for biomedical research with an emphasis on cancer studies.