

The University of Chicago

Department of Statistics

Seminar

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“Iterative Conditional Fitting for Gaussian Ancestral Graph Models”

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ABSTRACT

Ancestral graph models, introduced by Richardson and Spirtes (2002), are a new class of graphical models that generalizes both Markov random fields (underlying undirected graph) and Bayesian networks (underlying DAG = directed acyclic graph). A key feature of ancestral graph models is that they can encode all conditional independence structures, which may arise from a Bayesian network/DAG model with selection and unobserved variables.

In this talk, we consider Gaussian ancestral graph models and present a new algorithm for maximum likelihood estimation. We call this new algorithm iterative conditional fitting (ICF) since in each step of the procedure, a conditional distribution is estimated, subject to constraints, while a marginal distribution is held fixed. This approach is in duality to the well-known iterative proportional fitting algorithm, in which a marginal distribution is fitted for a fixed conditional distribution. We show that in the considered Gaussian case, ICF may be implemented by regressions on “pseudo-variables”. Since ICF is a partial maximization algorithm we can give some convergence guarantees. Finally, the ICF approach seems promising for future development of methodology in the case of discrete variables.

This is joint work with Thomas Richardson, Department of Statistics, University of Washington.
