Learning Directed Acyclic Graphs via Maximum Regularized Likelihood

Qing Zhou, Ph.D.
Professor
Department of Statistics
University of California, Los Angeles
Los Angeles, CA

Abstract:
We develop a penalized likelihood estimation framework to learn the structure of Bayesian networks, represented as directed acyclic graphs, from different types of data. Our main contribution is a family of score-based structure learning algorithms which do not restrict the search space. When experimental intervention is available, our methods construct causal networks in which a directed edge represents the causal relation between two nodes. We provide a comprehensive comparison of our approach to several popular structure learning methods on graphs with up to 8,000 nodes, and show that our algorithms obtain higher accuracy for high-dimensional data and scale efficiently as the number of nodes increases. We also establish theoretical guarantees for estimation and structure learning consistency under our framework. Our methods have been implemented as a new R package, sparsebn, which is freely available on CRAN.

Biography:
Dr. Qing Zhou received his Ph.D. degree in Statistics from Harvard University in 2006. Since then, he has been working in the Department of Statistics at UCLA as an assistant, associate and full professor. His research interests are in graphical models, high-dimensional inference, Monte Carlo methods, and bioinformatics. Dr. Zhou received a Career Award from the NSF Division of Mathematical Sciences in 2011.