Talk 403

Bayesian Analysis of Neural-Behavioral Interactions in Mental Illness

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Terran Lane
University of New Mexico

Vincent Clark
University of New Mexico/The MIND Institute

Schizophrenia is an illness with enormous public health significance, affecting approximately 1% of the population and inflicting immense personal and economic cost. Treatment possibilities for schizophrenia are still limited, at least in part because of poor understanding its anatomical, neural, cognitive, and genetic substrates. Modern morphometric and functional neuroimaging technologies can provide us noninvasive views of the behavior of the schizophrenic brain, but identifying significant circuits in such rich data sources is challenging. In this work, we represent activity networks with multivariate, nonlinear, temporal statistical models. We use dynamic Bayesian networks (DBNs) as our model class and DBN structure search techniques as the statistical model induction method. This data is challenging for current DBN structure search techniques for a variety of reasons including high dimensionality, latent variables, conditional structure, and complex domain knowledge. In this talk, I will review our current status on applying these Bayesian statistical methods to fMRI data on dementia and schizophrenia, including problem formulation, statistical scoring and validation methods, and structure search techniques. I will conclude with a survey of some of our onging work and upcoming research directions.

Project (or PI) Website

http://www.cs.unm.edu/~terran/

Publications

1. Burge, J. and Lane, T. "Toward Learning Class-Discriminative Dynamic Bayesian Networks". Proc. of the Twenty-Second International Conference on Machine Learning (ICML-2005), pp 97-104.

2. Burge, J. and Lane, T. "Comprehensibility of Generative vs. Class Discriminative Dynamic Bayes Multinets". AAAI-2005 Workshop on Human Comprehensible Machine Learning.

3. Burge, J. and Lane, T., "Bayesian Network Structure Search on Hierarchically Related Random Variables", under review by ECML/PKDD-2006.

4. Burge, J., Clark, V. P., Lane, T., Link, H., and Qiu, S., “Discrete Dynamic Bayesian Network Analysis of fMRI Data.” In preparation for submission to *Human Brain Mapping*.