Regression-Based Methods for Learning Dynamic Bayesian Networks

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Understanding interactions between variables in experimental data sets, as well as predicting information about these components at future times is of interest in many fields. Dynamic Bayesian Network (DBN) approaches address this problem. DBN analysis involves learning dependencies between variables (i.e. learning the parents of each node) and learning the values of parameters in the DBNs closed-form expression. It is assumed that the values of each random variable at any given time are independent, which allows for the parents of each node to be learned separately; however, in some real-world applications, this assumption may be too restrictive as the variables may interact with each other over time. Further, analyzing the learned topology to identify a subset of parameters which can be estimated from data is often ignored; however, performing this step is crucial to understand which relationships can be reliably uncovered and quantified. In this poster, we break the independence assumption and construct a closed-form expression for the DBN using a coupled system of regression equations with possible nonlinear terms. Additionally, we present a workflow to select identifiable parameters and estimate this subset using Markov Chain Monte Carlo (MCMC) sampling methods.

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