



A Markov property for systems of equations

Tineke Blom¹; Mirthe van Diepen¹; Joris Mooij¹

¹ University of Amsterdam, the Netherlands

Abstract:

Real-world complex systems are often modelled by systems of equations with endogenous and independent exogenous random variables. The structure of such systems of equations can be encoded by a bipartite graph, with variable and equation nodes that are adjacent if a variable appears in an equation. We make use of Simon's causal ordering algorithm and the Dulmage-Mendelsohn decomposition to construct a Markov ordering graph out of the bipartite graph, and prove that it encodes conditional independences in the distributions of the solutions of the equations under a certain unique solvability assumption via the d-separation criterion. This Markov property is shown to generalize the well-known Markov property for structural equation models.

Keywords:

Conditional Independence, Causal Ordering, Graphical Models