Abstract

Directed acyclic graph (DAG) models may be characterized in four different ways: via a factorization, the d-separation criterion, the moralization criterion, and the local Markov property. As pointed out by Robins [2, 1], Verma and Pearl [6], and Tian and Pearl [5], marginals of DAG models also imply equality constraints that are not conditional independences. The well-known ‘Verma constraint’ is an example. Constraints of this type were used for testing edges [3], and an efficient variable elimination scheme [4]. Using acyclic directed mixed graphs (ADMGs) we provide a graphical characterization of the constraints given in [5] via a nested Markov property that uses a ‘fixing’ transformation on graphs. We give four characterizations of our nested model that are analogous to those given for DAGs. We show that marginal distributions of DAG models obey this property.

References

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