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A Sequence of Relaxations Constraining Hidden Variable Models

Greg Ver Steeg, Aram Galstyan

(Submitted on 8 Jun 2011 (v1), last revised 20 Jul 2011 (this version, v2))

Many widely studied graphical models with latent variables lead to nontrivial constraints on the distribution of the observed variables. Inspired by the Bell inequalities in quantum mechanics, we refer to any linear inequality whose violation rules out some latent variable model as a "hidden variable test" for that model. Our main contribution is to introduce a sequence of relaxations which provides progressively tighter hidden variable tests. We demonstrate applicability to mixtures of sequences of i.i.d. variables, Bell inequalities, and homophily models in social networks. For the last, we demonstrate that our method provides a test that is able to rule out latent homophily as the sole explanation for correlations on a real social network that are known to be due to influence.

Comments:	UAI 2011 Best Paper Runner-Up; Proceedings of the 27th Conference on Uncertainty in Artificial Intelligence (UAI 2011)
Subjects:	**Artificial Intelligence (cs.AI)**; Social and Information Networks (cs.SI); Physics and Society (physics.soc-ph); Quantum Physics (quant-ph); Machine Learning (stat.ML)
Cite as:	**arXiv:1106.1636** [cs.AI]
	(or **arXiv:1106.1636v2** [cs.AI] for this version)

Submission history

From: Greg Ver Steeg [view email]

[v1] Wed, 8 Jun 2011 19:53:37 GMT (214kb,D)
[v2] Wed, 20 Jul 2011 10:38:52 GMT (214kb,D)

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