

Structure Learning of Linear Gaussian Structural Equation Models with Weak Edges

Marco Eigenmann¹, Preetam Nandy², and Marloes Maathuis¹

¹ETH Zurich

²University of Pennsylvania

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Abstract:

We consider structure learning of linear Gaussian structural equation models with weak edges. Since the presence of weak edges can lead to a loss of edge orientations in the true underlying CPDAG, we define a new graphical object that can contain more edge orientations. We show that this object can be recovered from observational data under a type of strong faithfulness assumption. We present a new algorithm for this purpose, called aggregated greedy equivalence search (AGES), that aggregates the solution path of the greedy equivalence search (GES) algorithm for varying values of the penalty parameter. We prove consistency of AGES and demonstrate its performance in a simulation study and on single cell data from Sachs et al. (2005).