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Learning DAGs based on sparsest permutations

Abstract: We consider the problem of learning a Bayesian network or directed acyclic graph (DAG) model from observational data. We propose the sparsest permutation algorithm, a nonparametric approach based on finding the ordering of the variables that yields the sparsest DAG. We prove consistency of this method under strictly weaker conditions than usually required. We discuss how to find the sparsest ordering by introducing the DAG associahedron and a simplex-type algorithm on this convex polytope. We end with discussing some applications to estimating gene regulatory networks.