

**Title:**

Property testing in graphical models: testing small separation numbers

**Abstract:**

In many statistical applications, the dimension is too large to handle for standard high-dimensional machine learning procedures. This is particularly true for graphical models, where the interpretation of a large graph is difficult and learning its structure is often computationally impossible either because the underlying graph is not sufficiently sparse or the number of vertices is too large. To partially address this issue, we develop a procedure to test a property of a graph underlying a graphical model that requires only a subquadratic number of correlation queries (i.e., we require that the algorithm only can access a tiny fraction of the covariance matrix). This provides a conceptually simple test to determine whether the underlying graph is a tree or, more generally, if it has a small separation number, a quantity closely related to the treewidth of the graph. The proposed method is a divide-and-conquer algorithm that can be applied quite generally.