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High-Dimensional Gaussian Graphical Model Selection: Tractable Graph Families

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We consider the problem of high-dimensional Gaussian graphical model selection. We identify a set of graphs for which an efficient estimation algorithm exists, and this algorithm is based on thresholding of empirical conditional covariances. Under a set of transparent conditions, we establish structural consistency (or sparsistency) for the proposed algorithm, when the number of samples n=omega(J_{min}^{-2} log p), where p is the number of variables and J {min} is the minimum (absolute) edge potential of the graphical model. The sufficient conditions for sparsistency are based on the notion of walk-summability of the model and the presence of sparse local vertex separators in the underlying graph. We also derive novel nonasymptotic necessary conditions on the number of samples required for sparsistency.

Subjects: **Learning (cs.LG)**; Statistics Theory (math.ST)

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