



# Distributed Learning of Gaussian Graphical Models via Marginal Likelihoods

Zhaoshi Meng, Dennis Wei, Ami Wiesel, Alfred Hero III

(Submitted on 19 Mar 2013)

We consider distributed estimation of the inverse covariance matrix, also called the concentration matrix, in Gaussian graphical models. Traditional centralized estimation often requires iterative and expensive global inference and is therefore difficult in large distributed networks. In this paper, we propose a general framework for distributed estimation based on a maximum marginal likelihood (MML) approach. Each node independently computes a local estimate by maximizing a marginal likelihood defined with respect to data collected from its local neighborhood. Due to the non-convexity of the MML problem, we derive and consider solving a convex relaxation. The local estimates are then combined into a global estimate without the need for iterative message-passing between neighborhoods. We prove that this relaxed MML estimator is asymptotically consistent. Through numerical experiments on several synthetic and real-world data sets, we demonstrate that the two-hop version of the proposed estimator is significantly better than the one-hop version, and nearly closes the gap to the centralized maximum likelihood estimator in many situations.

Comments: Appearing in Proceedings of the 16th International Conference on Artificial Intelligence and Statistics (AISTATS) 2013, Scottsdale, AZ, USA

Subjects: **Machine Learning (stat.ML)**; Learning (cs.LG)

Cite as: [arXiv:1303.4756 \[stat.ML\]](#)  
(or [arXiv:1303.4756v1 \[stat.ML\]](#) for this version)

## Submission history

From: Zhaoshi Meng [[view email](#)]

[v1] Tue, 19 Mar 2013 20:34:47 GMT (220kb,D)

*Which authors of this paper are endorsers?*

## Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

stat.ML

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1303](#)

Change to browse by:

[cs](#)

[cs.LG](#)

[stat](#)

## References & Citations

- [NASA ADS](#)

Bookmark([what is this?](#))

