

## Maximum likelihood thresholds for Gaussian graphical models

Kevin Collins, Mark Curiel, Morgan Gauvin, Elizabeth Gross\*, Corrisa Heyes, and JoeAnna McDonald, University of Hawai'i at Mānoa

Gaussian graphical models are statistical models used in a variety of applications, from gene expression analysis to understanding microbiomes. They are particularly useful for network inference and identifying key interactions within a collection of random variables. In several settings, especially in biology, the number of observations is less than the number of random variables and the existence of the maximum likelihood estimate (MLE) becomes unknown. This motivates the study of several maximum likelihood thresholds including the the maximum likelihood threshold, which is the smallest number of observations  $n$  such that the MLE exists with probability 1, and the weak likelihood threshold, which is the smallest number of observations  $n$  such that the MLE exists with probability strictly greater than 0. In this talk, we will review the connection of these thresholds to combinatorial rigidity theory and present an algebraic condition for finding lower bounds on the weak maximum likelihood threshold.

Keywords: Gaussian graphical models, maximum likelihood estimation, rigidity theory