

# Network Differential Connectivity Analysis

Ali Shojaie

*University of Washington*

*E-mail: ashojaie@uw.edu*

**Abstract:** Recent evidence suggests that changes in biological networks, e.g., rewiring or disruption of key interactions, may be associated with development of complex diseases. These findings have motivated new research initiatives in computational and experimental biology that aim to obtain condition-specific estimates of biological networks, e.g. for normal and tumor samples, and identify differential patterns of connectivity in such networks, known as differential network biology.

In this talk, we focus on testing whether two Gaussian graphical models are the same. Existing methods try to accomplish this goal by either directly comparing their estimated structures, or testing the null hypothesis that the partial correlation values are equal. Unfortunately, these methods may lead to misleading results. To address this shortcoming, we propose a two-step inference framework, for testing the null hypothesis that the edge sets in two networks are the same. The proposed framework is especially appropriate if the goal is to identify nodes or edges that show differential connectivity. We investigate theoretical and numerical properties of the proposed framework and illustrate its utility in a study of changes in brain connectivity network associated with mild trauma.