



# THE UNIVERSITY OF CHICAGO

Departments of Computer Science, Mathematics, Statistics and the Computation Institute  
**SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR**

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**AUSTIN BENSON**

Institute for Computational and Mathematical Engineering  
Stanford University

“Tools for Higher-Order Network Analysis”

THURSDAY, January 12, 2017 at 4:30 PM  
226 Jones Laboratory, 5747 S. Ellis Avenue  
Host: Lek-Heng Lim

## ABSTRACT

Networks are a fundamental model of complex systems in physics, biology, neuroscience, engineering, and social science. Many networks are known to exhibit rich, lower-order connectivity patterns that can be captured at the level of individual nodes and edges. However, higher-order connectivity patterns, such as small subgraphs, or network motifs, are essential for understanding the fundamental structures that control and mediate the behavior of many complex systems. I will discuss several new tools for analyzing networks based on higher-order structures. Specifically, I will introduce a motif-based clustering methodology, a formalism for temporal motifs to study temporal graphs, a generalization of the network clustering coefficients, and a stochastic process connected to higher-order Markov chain models of networks. I will show applications of higher-order network analysis in several domains including neuroscience, ecology, online social networks, transportation, and human communication.

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### Organizers:

Lek-Heng Lim, Department of Statistics, [lekheng@galton.uchicago.edu](mailto:lekheng@galton.uchicago.edu)

Ridgway Scott, Departments of Computer Science and Mathematics, [ridg@cs.uchicago.edu](mailto:ridg@cs.uchicago.edu)

Jonathan Weare, Department of Statistics and The James Franck Institute, [weare@uchicago.edu](mailto:weare@uchicago.edu).

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