

# Matrix Computations and Scientific Computing Seminar

Organizer: J. Demmel and M. Gu

Wednesday, 12:00–1:00 pm, 380 Soda Hall

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Sep 21      **Christine Klymko**, LLNL

*Detection of highly-cyclic communities in directed networks*

Many large, real-world complex network have rich community structure that a network scientist seeks to understand. These communities may overlap or have intricate internal structure. Extracting communities with particular topological structure, even when they overlap with other communities, is a powerful capability that would provide novel avenues of focusing in on structure of interest. In this work we consider extracting highly-cyclic regions of directed graphs (digraphs). We demonstrate that embeddings derived from complex-valued eigenvectors associated with stochastic propagator eigenvalues near roots of unity are well-suited for this purpose. We prove several fundamental theoretic results demonstrating the connection between these eigenpairs and the presence of highly-cyclic structure and we demonstrate the use of these vectors on a few real-world examples.