Lectures on Pure and Applied Physics

Research Topics in the Mathematical Sciences

Announcing

A Seminar Presentation on April 3, 2013 at 2:00 pm Kaplan 103

at The University of New Haven

Speaker: Dr. Peter Ronhovde

Webster University, St. Louis, Missouri

Title: Physical models in community detection with applications to complex amorphous systems

Abstract:

We present a spin-glass-type Potts model for the graph-theoretic problem of community detection (CD). With a simple algorithm, our approach is exceptionally accurate, robust to the effects of noise, and competitive with the best currently available algorithms in terms of speed and the size of solvable systems. In addition, it is free from a "resolution limit" that hinders community solutions for certain popular CD algorithms. We further quantitatively evaluate the multiresolution structure of a graph using correlations among various model "replicas" over a range of network scales. Strongly correlated replicas identify significant multiresolution structures. We introduce a "phase transition" effect and their analogous meaning for physical and computational transitions. Finally, we ascertain the most "natural" structures in two model glasses in an unbiased manner by constructing a model graph of the physical systems. We then solve for the communities in the model network and associate the best candidates with the natural structures in the physical systems.

Further Information

Refreshments are served from 1:40 pm until 2:00 pm.