Department of Mathematics and Statistics Colloquium

Applied Pure Mathematics

Yongwu Rong , George Washington University

Abstract: In recent years, there have been significant applications of pure mathematics to other disciplines. This has made it tempting to coin a phrase "applied pure mathematics." Some examples are:

Persistent homology applied to medical image (Gunnar Carlsson)
Algebraic topology applied to sensor network (Robert Ghrist)
Knot Theory applied to DNA (De Witt Sumners)
Algebraic statistics applied to biology (Bernd Sturmfels)
Algebra applied to network dynamics (Reinhard Laubenbacher)
Analysis applied to compressive sensing (E. Candes & T. Tao)
Conformal field theory to Brownian motion (Wendelin Werner)
Differential geometry to computer graphics (D. Gu, F. Luo, & S. T. Yau)

In this talk, we will focus on our work on a Boolean model for biological networks. Such a network consists of units with activity levels of 0 or 1 that evolve over time, mathematically represented by the dynamics of the network. The interaction between units is represented by the topology of a graph. An interesting problem is to study the connection between topology and dynamics of such networks. In particular, the so called reverse engineering problem asks for the topology of the network given information on its dynamics. We prove that (1) the decision problem for network solution can be solved in polynomial time, and (2) the problem of finding a "minimal network" with the given property of dynamics is NP-hard.

Monday, October 14 at 3:45 in Roop 103
refreshments at 3:30