

Stanford University
Departments of Mathematics and Statistics

PROBABILITY SEMINAR

4pm, Monday, November 5, 2018
Sequoia Hall Room 200

Refreshments served at 3:30pm in the Lounge.

Speaker: Nima Anari, *Stanford Computer Science*

Title: **Log-Concave Polynomials: Counting and Sampling
Matroid Bases and Beyond**

Abstract:

I will discuss an analytic property of multivariate polynomials, which we call complete log-concavity. This property defines a large class of discrete distributions that should be thought of as the discrete analog of the well-studied continuous log-concave distributions. Examples satisfying this property include determinantal point processes and fractional powers of them, the random cluster model and Potts model for some regime of parameters, strongly Rayleigh distributions, uniform distributions over bases or independent sets of matroids, and other generalizations. Complete log-concavity is intimately connected to Hodge-Riemann relations of order one from Hodge theory, and also surprisingly high-dimensional expanders. The second connection allows us to efficiently sample from discrete distributions satisfying complete log-concavity. For many of the example distributions, this provides the first efficient sampling algorithm. In particular we obtain the first polynomial time algorithm to sample approximately uniformly from bases of an arbitrary matroid.

This is joint work with Kuikui Liu, Shayan Oveis Gharan, and Cynthia Vinzant.