
Organizer: Nick Crawford
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course hours: Sunday 1030-1230 (on Zoom for now, but subject to change)

Syllabus: The goal of this course is to understand real-rooted polynomials and their multivariate generalizations (real stable, hyperbolic and Lorentzian polynomials) in the context of questions in combinatorics, probability, and algorithms. My main interest is in negative dependence, but we will take this opportunity to sample applications across all three disciplines.

Topics (not all will be covered): Poisson Binomial random variables, Monomer-Dimers and the Lieb Heilmann, Real Stable Polynomials, Lieb-Sokal Lemma, various types of Negative Correlations, Borcea-Branden and Borcea-Branden-Liggett, Bounds on permanents after Gurvits, Interlacing Families and Restricted Invertibility, Ramanujan graphs from the Matching polynomial, Hyperbolic polynomials and hyperbolicity cones. Lovasz Local Lemma via stable polynomials, Matroids, Lorentzian Polynomials, Ultra Log Concave Polynomials, Masons Conjecture

References:

1. Srivastava’s Berkeley course: https://math.berkeley.edu/~nikhil/courses/270/