Southern California Probability Symposium 2020

The 2020 Southern California Probability Symposium will be held virtually over two half days, Saturday December 5th and Sunday December 6th, at the Zoom link:

https://usc.zoom.us/j/93059186661?pwd=R1VWcmV6WlRIZW9ZVkNHOFcxUWpxdz09
Meeting ID: 930 5918 6661
Passcode: SCPS50YRS

Schedule:

Saturday:

- 9:00 - 9:25 Ruth Williams, UCSD: 50th year of the SCPS
- 9:30 - 10:20 Swee Hong Chan, UCLA
- 10:20 - 11:00 Break (out rooms)
- 11:00 - 11:50 Ruimeng Hu, UCSB, Convergence Of Deep Fictitious Play For Stochastic Differential Games
- 11:50-1:00 Lunch
- 1:00 - 1:50 Alan Hammond, UCB

Sunday:

- 9:00 - 9:50 Reminiscences of Tom Liggett: Marek Biskup, and others
- 10:00 - 10:50 Yuriy Nemish, UCSD, preprint
- 10:50 - 11:30 Break (out rooms)
- 11:30 - 12:20 Persi Diaconis, Stanford University, preprint

Abstracts:

- Swee Hong Chan, UCLA. Sorting probability for Young diagrams: Can you always find two elements x,y of a partially ordered set, such that, the probability that x is ordered before y when the poset is ordered randomly, is between 1/3 and 2/3? This is the celebrated 1/3-2/3 Conjecture, which has been called "one of the most intriguing problems in the combinatorial theory of posets". We will explore this conjecture for posets that arise from (skew-shaped) Young diagrams, where total orderings of these posets correspond to standard Young tableaux. We will show that that these probabilities are arbitrarily close to 1/2, by using random walk estimates and the state-of-the-art hook-length formulas of Naruse. This is a joint work with Igor Pak and Greta Panova.

- Ruimeng Hu, UCSB. Convergence Of Deep Fictitious Play For Stochastic Differential Games: In this talk, I will focus on the convergence analysis for deep fictitious play, which is a novel machine-learning algorithm for finding Markovian Nash equilibrium of large N-player asymmetric stochastic differential games. By incorporating the idea of fictitious play, the algorithm decouples the game into N sub-optimization problems, and identifies each player's optimal strategy with the deep backward stochastic differential equation method parallelly and repeatedly. I will show the proof of convergence of the algorithm to the true Nash equilibrium, and show that the strategy based on DFP forms an \epsilon-Nash equilibrium. I will also discuss some generalizations by proposing a new approach to decouple the games and present numerical results of large population games showing the empirical convergence of the algorithm beyond the technical assumptions in the theorems.

- Alan Hammond, UCB. Stability and chaos in dynamical last passage percolation: Many complex statistical mechanical models have intricate energy landscapes. The ground state, or lowest energy state, lies at the base of the deepest valley. In examples such as spin glasses and Gaussian polymers, there are many valleys; the abundance of near-ground states (at the base of valleys) indicates the phenomenon of chaos, under which the ground state alters profoundly when the model's disorder is slightly perturbed. Indeed, a monograph of Sourav Chatterjee from 2014 establishes that, for a class of models of Gaussian disorder, this abundance of competing minimizers is accompanied both by a rapid outset of chaos under perturbation of the system by noise, and by the effect of super-concentration, in which model statistics have lower variance than in classical scenarios, for which a central limit theorem may apply.
  In this talk, a recent investigation, jointly undertaken with Shirshendu Ganguly, of a natural dynamics for a model of planar last passage percolation will be discussed. Robust probabilistic and geometric technique permits a very quantified analysis of the presence of close rivals in energy to the ground state for the static version of the model; consequently, the order of the scale that heralds the transition from stability to chaos for the dynamical model is identified. The tools that drive the investigation include harmonic analytic technique present in Chatterjee's work, and the use of Brownian Gibbs resampling analysis for random ensembles of curves naturally associated to last passage percolation via the Robinson-Schensted-Knuth correspondence.

- Yuriy Nemish, UCSD. Rational Functions of Random Matrices and Scattering in Quantum Dots: The random matrix model of transport in quantum dots was introduced and developed in the late 80's and early 90's of the last century and is among the most prominent examples of using random matrix techniques to study open quantum systems. In one of their celebrated series of papers, Beenakker and Brouwer considered a quantum dot of size M with a small number N of scattering channels. By using a self-adjoint random matrix with independent Gaussian entries as a model for the Hamiltonian of the quantum dot, they derived an explicit formula for the density of the transmission eigenvalues in the large M limit.
  We revisit this problem allowing for (i) arbitrary ratios r := N/M between the number of scattering channels and the size of the quantum dot, and (ii) general (not necessarily Gaussian) distributions for the matrix entries of the Hamiltonian. In the regime where r approaches zero, we recover Beenakker's formula. In the other regimes, we analyze the singularities of the density at zero and full transmission. To access this level of generality, we develop the theory of global and local laws for the spectral density of a large class of noncommutative rational expressions in large random matrices with i.i.d. entries.This is a joint work with Laszlo Erdös and Torben Krüger.

- Persi Diaconis, Stanford University. Gambler's Ruin with Three Gamblers: Consider three gamblers with initial capital A,B,C. Each time, a pair is chosen (uniformly at random) and then a fair coin is flipped and 1$ transferred in the usual way. Eventually one of them hits zero and the game continues with the remaining two until one of them winds up with all the cash. This determines an elimination order (eg 312 means gambler three is eliminated first, followed by one leaving two with all). In joint work with Kelsey Houston-Edwards,Laurent Saloff-Coste and Stew Ethier we have been working at getting good approximations for this type of problem. For example, how do things go for 312 when A=B=1, C=N-2 (when N is large). It's small, asymptotic to const/N^3. We can't do the parallel result for four gamblers.

  The math involves some sophisticated geometric analysis (John and inner uniform domains, Whitney covers and Carlesson estimates). Getting the math to match exact computations is a whole other challenge. These questions are important in Tournament poker games where outcomes are determined by chip counts (eg A,B,C) but the reward to the winning player is a fixed prize. We were set upon this question by poker legend Chris Ferguson.