Southern California Probability Symposium
December 8, 2018
Kaprelian Hall (KAP) 414
at University of Southern California

Program:

9:30-10:00	Registration/Refreshments
10:00-10:50	Steven Heilman (USC)
10:50-11:20	Coffee break
11:20-12:10	Wenpin Tang (UCLA)
12:10-2:00	Lunch
2:00-2:50	Alex Shkolnik (UCSB)
2:50-3:20	Coffee break
3:20-4:10	Benson Au (UCSD)
4:10-5:00	Rene Carmona (guest speaker, Princeton)
6:00	Dinner at Industrial Restaurant (609 S Grand Ave Los Angeles, CA)

Speakers, Titles and Abstracts:

Steven Heilman (USC)

Title: Minimal Gaussian Partitions, Clustering Hardness and Voting

Abstract: A single soap bubble has a spherical shape since it minimizes its surface area subject to a fixed enclosed volume of air. When two soap bubbles collide, they form a "double-bubble" composed of three spherical caps. The double-bubble minimizes total surface area among all sets enclosing two fixed volumes. This was proven mathematically in a landmark result by Hutchings-Morgan-Ritore-Ros and Reichardt using the calculus of variations in the early 2000s. The analogous case of three or more Euclidean sets is considered difficult if not impossible. However, if we replace Lebesgue measure in these problems with the Gaussian measure, then recent work of myself (for 3 sets) and of Milman-Neeman (for any number of sets) can actually solve these problems. We also use the calculus of variations. Time permitting, we will discuss an improvement to the Milman-Neeman result and applications to optimal clustering of data and to designing elections that are resilient to hacking.

Wenpin Tang (UCLA)

Title: Discrete and continuous ranking models

Abstract: In this talk, I will discuss two different 'ranking' models: Mallows' ranking model and rank-dependent diffusions. In the first part, I will focus on the Mallows' permutation, and various generalizations. In particular, I will talk about a general model, called regenerative permutations. I will also discuss the statistical properties and algorithms of these Mallows' type ranking models. This is partly joint with Jim Pitman. In the second part, I move onto the rank-dependent diffusions. I will focus on two models: Up the River model, and N-player games with fuel constraints. These problems require treating carefully the corresponding PDEs. The former is joint with Li-Cheng Tsai, and the latter joint with Xin Guo and Renyuan Xu. If time permits, I will discuss recent progress on the random walk derived from random permutations, joint with many coauthors from AIM workshop.

Alex Shkolnik (UCSB)

Title: Monte Carlo estimation for multivariate jump-diffusions

Abstract: Techniques for the simulation of stochastic differential equations have attracted a significant amount of interest in the Monte Carlo methods and applied probability communities. But, while there have been recent breakthroughs on generic algorithms for multivariate diffusions, extensions of these simulation schemes to state-dependent jumps present unique challenges. We discuss some recent results on biased and unbiased simulation of multivariate jump-diffusions with general drift, volatility and jump-intensity coefficients. We illustrate how certain point process martingales that induce changes of probability measure can facilitate the analysis of jumps for both biased and unbiased schemes. We present the first (to our knowledge) unbiased simulation algorithm for a multivariate jump-diffusion with general coefficients. Preliminary numerical results with application to mathematical finance are discussed. Joint work with Guanting Chen and Kay Giesecke (Stanford University).

Benson Au (UCSD)

Title: The infinitesimal distribution of a random band matrix

Abstract: A long-standing conjecture of Fyodorov and Mirlin proposes a dichotomy for the spectral behavior of random band matrices: strong disorder for small band widths; weak disorder for large band widths; and a sharp transition around the critical value $\sqrt{N}$. We study this problem from a different perspective, namely, within the framework of infinitesimal free probability. For periodically banded GUE matrices, we find that a sharp transition around the conjectured critical value occurs at the level of the infinitesimal distribution, both in the single and multi-matrix model.

Rene A. Carmona (Princeton University)

Title: Mean Field Games with finite states in the weak formulation, and application to contract theory.

Abstract: Models for Mean Field Games (MFGs) with finite state spaces are typically introduced using controlled Markov chains and studied through the solutions of Hamilton-Jacobi-Bellman and Fokker-Planck equations. We introduce the weak formulation based on change of measure techniques for stochastic integral equations and prove existence and uniqueness in this setting. We then apply these results to a contract theory problem in which a principal faces a field of agents interacting in a mean field manner. We reduce the problem to the optimal control of dynamics of the McKean-Vlasov type, and we solve this problem explicitly in a special case reminiscent of the linear - quadratic mean field game models. We conclude with a numerical example of epidemic containment.

Pariking Information:

Free parking is available – just tell the parking booth attendant that you are going to the Probability Symposium. You must use the Downey Way Entrance (sometimes called Entrance 6) on the west side of campus, at Vermont Ave. and 36th Place; attendants elsewhere may not know of the Symposium. Parking is in the Downey Way Structure (sometimes called Parking Structure A) close to the campus entrance, and close to Kaprelian Hall where the conference takes place. Kaprelian is on your left as you pass the parking booth.

Dinner information:

Industriel Restaurant at 6:00 pm
609 S Grand Ave Los Angeles, CA 90017

http://industrielfarm.com/

Cash payment is preferred. There is underground parking on 6th and Wilshire, under the Wilshire One building, and valet parking located on Grand between 5th/6th.