2016 FLPS Short Talks

Friday 4/22

The six phases of a two-parameter scaled Brownian penalization
(Hugo Panzo, University of Connecticut)

In a series of papers, Roynette-Vallois-Yor initiated a study of weak limits of Wiener measure weighted by various path functionals, the so-called Brownian penalizations. A particular two-parameter penalization they considered exhibited three distinct phases corresponding to three regions in the parameter plane. We extend their results by considering a scaled version of this model and show the existence of three additional "critical" phases corresponding to the rays separating the three regions.

Intermediate disorder directed polymers and the multi-layer stochastic heat equation
(Mihai Nica, Courant Institute of Mathematical Sciences)

We consider directed polymer models involving multiple non-intersecting random walks moving through a space-time disordered environment in one spatial dimension. For a single random walk, Alberts, Khanin and Quastel proved that under the correct scaling, the polymer partition function converges to the solution to the stochastic heat equation with multiplicative white noise. We prove the analogous result for multiple non-intersecting random walks started and ended grouped together. The limiting object now is the multi-layer extension of the stochastic heat equation introduced by O'Connell and Warren.

On a diffusion process that arises in quickest change-point detection
(Aleksey Polunchenko, Binghamton University)

We consider the diffusion $(R_t)_{t\geq 0}$ generated by the stochastic differential equation $dR_t = dt + \mu R_t dB_t$ with $R_0 = 0$, where $\mu \neq 0$ is given and $(B_t)_{t\geq 0}$ is standard Brownian motion. We obtain a closed-form expression for the quasi-stationary distribution of $(R_t)_{t\geq 0}$, i.e., the limit $\lim_{t\to+\infty} \mathbb{P}(R_t \leq x | T_A > t)$, $x \in [0, A]$, where $T_A = \inf\{t > 0 : R_t = A\}$ with $A > 0$ fixed. We conclude with a brief discussion of the obtained result with particular emphasis placed on its application in the theory of quickest change-point detection.

Optimality in decentralized change detection
(Grigory Sokolov, Binghamton University)

Consider a decentralized multisensor sequential change detection problem, where a number of possibly correlated sensors monitor an environment in real time and transmit information to the fusion center. At some unknown time there is a change in an unknown subset of components of the underlying parameter vector; we consider the problem of detecting the time of the change as soon as possible under certain communication constraints, while controlling the rate of false alarms. We establish the second-order asymptotic optimality of various generalizations of the CUSUM rule; that is, we show that their additional expected worst-case detection delay—relative to the one that could be achieved if the affected subset was known—remains bounded as the rate of false alarm goes to zero, for any possible subset of affected components. This is joint work with Georgios Fellouris (Department of Statistics, University of Illinois at Urbana-Champaign).

Saturday 4/23

Corners in tree-like tableaux
(Amanda Lohss, Drexel University)

Tree-like tableaux are combinatorial objects which exhibit a natural tree structure and are connected to the partially asymmetric simple exclusion process (PASEP). Corners in tree-like tableaux are inherently interesting as they are related to positions in the PASEP where particles may hop to the right or the left. There was a conjecture made on the total number of corners in tree-like tableaux and the total number of corners in symmetric tree-like tableaux. I will discuss the proof of both of these conjectures. The proofs are based on bijections with permutation tableaux and type–B permutation tableaux. Consequently, results for these tableaux will also be discussed.

Involution factorizations of random permutations chosen from the Ewens distribution
(Charles Burnette, Drexel University)

An involution is a permutation that is its own inverse. Given a permutation σ of $[n]$, let $\mathbf{N}_n(\sigma)$ denote the number of ways to write σ as a product of two involutions of $[n]$. If we endow the symmetric groups S_n with Ewens measures, then the random variables $\mathbf{N}_n$ are asymptotically lognormal. The proof is based upon the observation that, for most permutations σ, $\mathbf{N}_n(\sigma)$ can be well approximated by $\mathbf{B}_n(\sigma)$, the product of the cycle lengths of σ. Asymptotic lognormality of $\mathbf{N}_n$ can therefore be deduced from Erdős and Turán's theorem that $\mathbf{B}_n$ is itself asymptotically lognormal.

Separation cutoff for a class of stochastically monotone chains
(Chek Hin Choi, Cornell University)

For a class of stochastically monotone chains which are not necessarily reversible, we show that they have real and distinct eigenvalues by establishing an intertwining relationship with birth-and-death chains. For this class of Markov chains, we derive the distribution of the fastest strong stationary time. We also give a spectral criterion for this class of chains exhibiting separation cutoff.

Hypocoercivity in some non-local Markov semigroups: A spectral interpretation
(Yixuan Zhao, Cornell University)

In this talk, we will present an original methodology that provides explicit rates of convergence to equilibrium for a class of non-self-adjoint and non-local Markov semigroups. Our approach relies on an intertwining relation that we establish between these semigroups and a specific self-adjoint and local Markov semigroup. Using these spectral developments, we observe several rates of convergence including the so-called hypocoercivity phenomenon that has been intensively studied in the context of Fokker-Planck equation. In our setting, this rate of decay is explained in terms of the spectral gap and the norms of the spectral projections.