Amol Agarwall

Title: Mobility Edge for Lévy Matrices

Abstract: Lévy matrices are symmetric random matrices whose entries are in the domain of attraction of an \alpha stable law. For \alpha < 1, it had been predicted that these matrices exhibit an Anderson transition, also called a mobility edge, a point in the spectrum where eigenvector behavior sharply transitions from delocalized to localized. In this talk, we describe recent results that establish the existence and also explicitly compute the location of this mobility edge for Lévy matrices. This is based on joint work with Charles Bordenave and Patrick Lopatto.

Morganne Austern

Title: Limit theorems for structured random objects

Abstract: Limit theorems are fundamental results of probability theory that have broad applications in many other fields. Some of those classical limit theorems include the central limit theorem, the Poisson limit theorem, the Wigner semi-circular law and the Marchenko-Pastur law. In this talk, we will greatly extend those to general random objects whose distribution is invariant under the action of a group. We will do so under appropriate moment, mixing and free mixing conditions. We draw on tools from ergodic theory, free probability, and the Stein method.

Emma Bailey

Title: Large deviations of Selberg's central limit theorem

Abstract: Selberg's CLT concerns the typical behaviour of the Riemann zeta function and shows that the random variable $\Re \log \zeta(1/2 + i t)$, for a uniformly drawn $t$, behaves as a Gaussian random variable with variance on the order of $\sqrt{\log\log t}$ as $t$ grows. It is natural to investigate how far in to the tails this Gaussianity persists. There are also very close connections to similar problems in circular unitary ensemble characteristic polynomials. It transpires that a `multiscale scheme' can be applied to both situations to understand these questions of large deviations, as well as certain maxima and moments. In this talk I will focus more on the techniques we apply to approach this problem and I will assume no number theoretic knowledge. This is joint work with Louis-Pierre Arguin.

Alex Dunlap

Title: The nonlinear stochastic heat equation in the critical dimension

Abstract: I will discuss a two-dimensional stochastic heat equation with a nonlinear noise strength, and consider a limit in which the correlation length of the noise is taken to 0 but the noise is attenuated by a logarithmic factor. The limiting pointwise statistics can be related to a stochastic differential equation in which the diffusivity solves a PDE somewhat reminiscent of the porous medium equation. This relationship is established through the theory of forward-backward SDEs. I will also explain several cases in which the PDE can be solved explicitly, some of which correspond to known probabilistic models. This talk will be based on current joint work with Cole Graham and earlier joint work with Yu Gu.

David Harper

Title: Exceptional events in critical 2d first-passage percolation

Abstract: In first-passage percolation (FPP), we let $\tau_v$ be i.i.d. nonnegative weights on the vertices of a graph and study the weight of the minimal path between distant vertices. If $F$ is the distribution function of $\tau_v$, there are different regimes: if $F(0)$ is small, this weight typically grows like a linear function of the distance, and when $F(0)$ is large, the weight is typically of order one. In between these is the critical regime in which the weight can diverge but does so sublinearly. This talk will consider a dynamical version of critical FPP on the triangular lattice where vertices resample their weights according to independent rate-one Poisson processes. We will discuss results that show that if the sum of $F^{-1}(1/2+1/2^k)$ diverges, then a.s. there are exceptional times at which the weight grows atypically, but if the sum of $k^{7/8} F^{-1}(1/2+1/2^k)$ converges, then a.s. there are no such times. Furthermore, in the former case, we compute the Hausdorff and Minkowski dimensions of the exceptional set and show that they can be but need not be equal. Then we will consider what the model looks like when the weight of a long path is unusually small by considering an analogous construction to Kesten's incipient infinite cluster in the FPP setting. This is joint work with M. Damron, J. Hanson, W.-K. Lam.

Nina Holden

Title: Regularity of the Schramm-Loewner evolution

Abstract: We find optimal (up to constant) bounds for the following measures for the regularity of the Schramm-Loewner evolution (SLE): variation regularity, modulus of continuity, and law of the iterated logarithm. For the latter two we consider the SLE with its natural parametrization. Based on a joint work with Yizheng Yuan.

Christopher Janjigian

Title: Ergodicity and synchronization of the Kardar-Parisi-Zhang equation

Abstract: The Kardar-Parisi-Zhang (KPZ) equation on the line has long been known to admit stationary distributions modulo additive constants given by Brownian motion with drift. In this talk, we will discuss some recent results studying the ergodicity properties of these distributions through the lens of the synchronization by noise phenomenon. We show that the solution to the equation started in the distant past from an initial condition with a given slope will converge almost surely to a Brownian motion with that same drift for all but a random countable set of slopes. Our analysis centers on the family of Brownian motions obtained in this way, which is known as the Busemann process for the equation, and connections to the infinite volume structure of the continuum directed polymer. Joint work with Firas Rassoul-Agha (Utah) and Timo Seppäläinen (Madison)

Philippe Sosoe

Title: Tail bounds in KPZ models

Abstract: The Kardar-Parisi-Zhang (KPZ) universality class of models is characterized by non-Gaussian asymptotic fluctuations coming from random matrices. In this talk, I will introduce a number of models which are known or expected to be in the KPZ universality class, including discrete and semi-discrete models of random polymers, interacting diffusions, and the stochastic six vertex model.

I will explain how, using an idea of Emrah-Janjigian-Seppalainen, one derives for each of these models the analogue of a formula due to Rains in the context of Last Passage Percolation. Several results on fluctuations, including upper tail bounds on the correct scale can be deduced from this formula.

Yuxin Zhou

Title: The Spherical Mixed p-Spin Glass At Zero Temperature

Abstract: In this talk I will discuss the spherical mixed p-spin glass model at zero temperature. I will present some recent results that classify the possible structure of the functional ordered parameter. For spherical p+s spin glasses, we classify all possibilities for the Parisi measure as a function of the model. Moreover, for the spherical spin models with n components, the Parisi measure at zero temperature is at most n-RSB or n-FRSB. Some of these results are jointly with Antonio Auffinger.