Short Talks

Friday April 21 5:15-6:30pm

1. Moumanti Podder, Courant Institute
   "The strange logic of Galton-Watson trees"

   This talk will focus on the rooted Galton-Watson (GW) tree with Poisson(λ) offspring distribution, though most of the results can be extended to very general distributions. I shall discuss the analysis of first order (FO) properties: these capture the local structures inside a tree. I give a complete description of the probabilities $P_\lambda[A]$ of all possible FO sentences A conditioned on the survival of the GW tree. There are, up to tautology, only a finite number of FO sentences of given quantifier depth k. For an arbitrary k, I introduce a natural distributional recursion Ψ_k, such that the probabilities of these sentences form a fixed point of Ψ_k. I further show that Ψ_k is a contraction, and that its fixed point is unique and analytic in λ.

2. Wenjian Liu, City University of New York
   "Reconstruction for the Asymmetric Ising Model on d-ary Trees"

   It is known that the Kesten-Stigum reconstruction bound is tight for roughly symmetric binary channels. We adopt a refined analysis of moment recursion on a weighted version of the magnetization, and then establish the critical condition of the asymmetric Ising model to make Kesten-Stigum bound the reconstruction threshold on regular d-ary trees.

3. Daniel Cooney, Princeton University
   "PDE limits for evolutionary games with multilevel selection"

   We will consider a model of evolutionary game theory in group-structured populations, extending Luo and Mattingly's multilevel selection framework to account for frequency-dependent selection. Competition at the within-group level will follow a frequency-dependent Moran process, and the dynamics of competition between groups will follow a Moran process with transition probabilities proportional to the average fitness of group members. We will explore a PDE description of this system in the limit of large group number and group size, and discuss the long-term behavior of solutions to this PDE.

Saturday April 22 1:30-3:00pm

1. Vladislav Kargan, Binghamton University
   "Three-Dimensional Ginibre Point Field"

   I will talk about a three-dimensional random point field defined using the quaternion determinant and similar to the Ginibre ensemble in the complex plain. I will explain an explicit formula for the determinate kernel and its asymptotics in the bulk.

2. Joe Chen, Colgate University
   "Shape theorems for aggregation models on fractal graphs"

   Internal diffusion-limited aggregation (IDLA) is a stochastic growth model on a graph G which describes the formation of a random set of vertices growing from the origin (some fixed vertex) of G. Particles start at the origin and perform simple random walks; each particle moves until it lands on a site which was not previously visited by other particles. This random set of occupied sites in G is called the IDLA cluster. In this talk I will explain that when G is the Sierpinski gasket graph, the IDLA cluster is a ball in the graph metric (centered at the origin). The proof combines elements of potential analysis on fractals and past IDLA works on lattices. Then if time permits, I will also describe related shape results on related aggregation or sandpile models on the Sierpinski gasket graph. The main takeaway is that they all have the same limit shape, but with different fluctuations.

   This talk covers results already completed with Wilfried Huss (TU Graz), Ecaterina Sava-Huss (TU Graz), Sasha Teplyaev (UConn) [now at arXiv:1702.04017], as well as ongoing work with Jonah Kudler-Flam (Colgate).

3. Swee Hong Chan, Cornell University
   "Random walks with local memory on the square lattice"

   How much randomness is needed to prove a scaling limit result? In this talk we consider this question for random walks with local memory on the square lattice. When the randomness is turned to maximum, we have the symmetric random walk, which is known to scale to a two-dimensional Brownian motion. When the randomness is turned to zero, we have the rotor walk, for which its scaling limit is an open problem. This talk is about random walks that lie between these two extreme cases and for which we can prove their scaling limit.