Tom Alberts
Random Measures in Two-Dimensional Conformally Invariant Systems

Many lattice models from 2D statistical physics have scaling limits that can be fully described using the Schramm-Loewner Evolution or its variant, the Conformal Loop Ensembles. In the Ising model, for example, the collection of loops surrounding the regions of positive and negative spins become a CLE in the continuum. Often it is possible to gain some extra quantitative information on the system by constructing a measure on certain random sets created by the interface curves or loops; examples from the Ising model include a length measure on the loop boundaries or an area measure on the loops themselves. In the continuum setting it is natural to consider measures on the SLE curves, their intersections with the boundaries of their domains, the double points of the curves, the gasket of the CLE, etc. As the sets that are the most natural to consider usually have a fractional dimension, the construction of the corresponding measures is not entirely straightforward. In this talk I will describe some recent techniques for constructing these random measures directly from the continuum, and the important conformal covariance and Domain Markov properties that these measures possess (and often are characterized by). I will also survey some results (of various authors) that show how to scale the corresponding measures in the lattice setting to their continuum versions.

Daniela Bertacchi (and Fabio Zucca)
Approximating critical parameters of branching random walks

Given a branching random walk on a graph, we consider two kinds of truncations: either by inhibiting the reproduction outside a subset of vertices or by allowing at most m particles per vertex. We investigate the convergence of weak and strong critical parameters of these truncated branching random walks to the analogous parameters of the original branching random walk. As a corollary, we apply our results to the study of the strong critical parameter of a branching random walk restricted to the cluster of a Bernoulli bond percolation.

Partha Sarathi Dey
Applications of Stein's method for concentration inequailities

Stein's method is a semi-classical tool for establishing distributional convergence, particularly effective in problems involving complex dependencies. A general way of deriving concentration inequalities using Stein's method was introduced by Sourav Chatterjee in his PhD thesis. In this talk we present extension and some applications of Stein's method for concentration inequalities. We prove a concentration inequality for the magnetization in the Curie-Weiss model at critical temperature where it obeys a non-standard normalization and super-Gaussian concentration. We also show how this method can be used to derive exact large deviation asymptotics for the number of triangles in the Erdos-Renyi random graph G(n,p) when $p \geq 0.31$. Finally, we provide some interesting concentration inequalities for the Ising model on lattices that hold at all temperatures. This talk is based on joint work with Sourav Chatterjee.

Jian Ding
The mixing of critical Ising model on trees is polynomial in the height

We study the inverse-gap of the heat-bath Glauber dynamics for the Ising model on the b-ary tree, at the critical temperature. We show that the continuous-time inverse-gap is indeed polynomial in the height of the tree, while the degree of our polynomial bound does not depend on b and this result holds under any boundary condition. Furthermore, in the free boundary case, it is bounded from below by the square of the height. (Joint work with Eyal Lubetzky and Yuval Peres.)

Hugo Duminil-Copin
2D Ising model and random walks.

Using Yang-Baxter equalities, we will show how macroscopic observables of the 2D Ising model on the square lattice can be related to massive random walks. As a consequence, we will present new proofs of derivation of the critical point and of exponential decay in subcritical phase. Moreover, we will highlight how such techniques can be used to compute the correlation lengths (and the so-called Wulff crystal).

Sam Finch
1-dependent percolation and random cluster models on trees.

Tile the d-dimensional cube $X=[0,1]^d$ with 2^d similar "child" subcubes, then recursively tile each subcube with 2^d further subcubes. We may view these cubes as the vertices of a rooted $1+2^d$ tree. In this way we associate each infinite ray of the tree with a point in the cube. We investigate the random cluster model on a tree using this map as a boundary condition. That is we connect two rays at infinity if they map to the same point of the cube. We show that this model demonstrates a phase transition from "free" to "wired" behavior and use results from 1-dependent bond percolation to identify the critical probability.

Vadim Gorin
Around lozenge tilings of a hexagon.

The talk is about random uniformly distributed lozenge tilings of a hexagon also known as boxed plane partitions or 3d Young diagrams confined to a box. We will present results of two kinds: Computation of the bulk limit of the correlation functions as the hexagons become large, and construction of a simple Markov chain (shuffling algorithm) that relates random tilings of hexagons of various sizes.

Clement Hongler
The energy density in the 2D Ising model.

We will present some rigourous and exact results on Ising model in two dimensions at critical temperature using discrete complex analysis methods and SLE methods. In particular, we will determine the scaling limit of the one-point function of the energy operator and show a connection with hyperbolic geometry.

Yilei Hu
Multi-particle reinforced random walk

We study multi-particle edge reinforced random walk on $\mathbf{Z}$, which was first proposed by H.Othemer and A.Stevens[OS97] as a possible model for the movement of myxobacteria. Kovchegov studied two-particle case in [Kov08]. We first give some estimates of the evolution of the enviroment by coupling method. Then we proved that all particles will meet together at certain site at the same time infinitely often. This is joint work with Dr P. Tarr\`es.

Stephanie Jacquot
A historical law of large numbers for the Marcus-Lushnikov process

The historical tree of a particle present in the Marcus- Lushnikov process at a given time t encodes informations about the times and masses of the coagulation events that have formed that particle. We prove a law of large numbers for the empirical distribution of such historical trees. The limit is a natural measure on trees which is constructed from a solution to Smoluchowski coagulation equation.

Julia Komjathy
Order of current variance in interacting particle systems

In my thesis we proved that the constant rate totally asymmetric zero range process has fluctuations of order $t^{1/3}$ across the characteristics of the process. Since then, we generalized this method for some other kind of models which satisfy a condition called microscopic concavity. In my talk, I want to explain the model and the basic idea of proving such anomalous fluctuations.

Jeffrey Kuan
Large time asymptotics of Gelfand-Tsetlin patterns with a reflecting wall.

We use the representation theory of the infinite-dimensional orthogonal group to analyze the large time asymptotics of an interacting system of particles in the two-dimensional lattice with a reflecting wall. The admissible configurations of particles can also be interpreted as lozenge tilings of the quarter plane or as stepped surfaces.

Hubert Lacoin
Very strong disorder for directed polymers in environment

The aim of the talk would be recall some chararteristic features of the very strong disorder phase for the directed polymer model with bulk disorder, and to present some idea of the proof that very strong disorder holds at all temperature in dimension 2 (see arXiv:0901.0699v1).

Tom LaGatta

Riemannian first passage percolation

Standard first-passage percolation (FPP) is a random model of discrete geometry, and a generalization of classical percolation. The model is simple: take the lattice Z^2 and associate to each bond (edge) a random number, called the passage time. This induces a metric, where the shortest distance between two points is the minimum of passage times over all paths which connect the two points. Imagine fluid flowing through a grid of pipes of different sizes. I will present my dissertation research on Riemannian FPP, a continuum analogue of standard FPP. Instead of a random metric on the lattice, consider a random Riemannian metric on the plane. Both models have a global geometric structure; the advantage of the second is that it has a local structure as well. For this talk, I will define both models and present some of the interesting questions one can ask.

Cyrille Lucas
The arcsine law as the limit of the internal DLA cluster generated by Sinai's walk

Given a random environment on Z, we can generate a Diffusion Limited Aggregation cluster using random walks on this environment. The limit law of this cluster is a functional of a Brownian motion which turns out to be a new interpretation of the arcsine law.

Oren Louidor
Mixing time analysis of the Glauber dynamics for the q-state Potts model on the complete graph

We consider the q-state Potts model on the n-complete graph and use Glauber dynamics to simulate its Gibbs distribution. We analyze the mixing time of the Glauber chain, i.e. the time it takes for the state distribution to converge to stationarity, namely the Potts distribution. In the disorder phase $\beta < \beta_c$, we show the existence of a critical temperature $\beta_m < \beta_c$ above which the mixing time is ~1/(2(1-β/q)) nlog(n) and below which the mixing time is exponential.

In addition, we show that in the fast mixing regime, the chain exhibits a cutoff phenomena with a window size of O(n), i.e. the state distribution changes from being for from stationary to being close in a windows of O(n) steps, around the θ(nlog(n)) mixing time. We also analyze the case when the temperature is exactly critical for mixing and the case when the temperature converges to criticality with n. This is joint work with Yuval Peres, Paul Cuff, Jian Ding, Eyal Lubetzky and Allan Sly.

Fabio Machado
Non-homogeneous random walks systems on Z}

We consider a random walk system on Z in which each active particle performs an asymmetric simple random walk and activates all inactive particles it encounters. The movement of an active particle stops when it reaches a certain number of jumps without activating any particle. We prove that if the process counts on efficient particles (small probability of jumping to the left) placed strategically on Z, the process might survive, having active particles at any time with positive probability. On the other hand, we may construct a process that dies out eventually almost surely, even counting on efficient particles.

That is, we discuss what happens if particles are placed initially very far away from each other or if their probability of jumping to the right tends to 1 but not fast enough.

Peter Mester
Percolation with two big clusters.

I will present an invariant percolation on the planar lattice which has the property that it almost surely results in two infinite clusters both having critical probability less than 1. This is a result from our joint paper with Olle Haggstrom.

Weiyang Ning
Mixing Time of Swendsen-Wang dynamics on complete graph

Swendsen-Wang dynamics is widely used to sample the mean-field Ising model. Cooper, Dyer, Frieze and Rue proved that on the complete graph K_n the mixing time of the chain is $O(n^{1/2})$ for all non-critical temperatures. we improve their result and provide sharp bounds for the mixing time in all temperatures. In particular we show that at the critical temperature the mixing time is of order $n^{1/4}$. Joint work with Yun Long, Asaf Nachmias and Yuval Peres.

Ross Pinsky
Transience/recurrence and the speed of a one-dimensional random walk in a ``Have your cookie and eat it'' environment

Consider a simple random walk on the integers with the following transition mechanism. At each site x, the probability of jumping to the right is w(x) in [1/2,1), until the first time the process jumps to the left from site x, from which time onward the probability of jumping to the right is 1/2. We investigate the transience/recurrence properties of this process in both deterministic and stationary, ergodic environments w(x). In deterministic environments, we also study the speed of the process.

Eviatar B.Procaccia
Mutual exited random walks.

Consider two nearest neighbor random walkers on Z. The walkers are using the same clock. After two visits at a site, each walker leaves a drift p for the other walker. We prove the walkers have positive speed and conjecture the speed is non monotone in p. Appropriate simulation will be shown.

Leonardo Rolla
Phase transition for activated random walk models

We present the model of interacting activated random walks and consider some questions about its fixation. In particular, we prove phase transition in one dimension.

Bruno Schapira
Modified Cauchy walk

Consider the process on Z which at first visit to a site makes a Cauchy jump and at the next visits makes a +/-1 Bernoulli jump. Benjamini asked if this walk is recurrent or transient and if weak law of large numbers holds. We prove that it is recurrent and satisfies indeed a WLLN. (Joint work with Itai Bejnamini, Harry Kesten and Olivier Raimond.)

Emmanuel Schertzer
The voter model and the Potts model in one dimension

The voter model can be seen as a simple model for describing the propagation of opinions in a population where neighbors influence each other. More precisely, every integer is assigned with an original opinion at time t=0 and then updates its opinion by taking on the opinion of one of its neighbors chosen uniformly at random with rate 1. In the first part of the talk, I will show that such a model can easily be described in terms of a system of coalescing random walks.

In the second part of the talk, I will introduce a variation of the preceding model where the voters do not only change their mind under the influence of their environment, but where they are also able to come up with an opinion differing from their neighbors. This model is closely related to a classical model in statistical physics called the one dimensional stochastic Potts model. I will show that under the appropriate scaling, this model converges to a continuum object which can be constructed by a marking procedure of a family of coalescing Brownian motions. This is joint work with C. Newman and K. Ravishankar.

David Windisch
Random walks, disconnection and random interlacements

The disconnection of discrete cylinders and integer tori by trajectories of random walks has been the object of several recent works. We show that in local neighborhoods, the random walk trajectories in these problems look like random interlacements recently introduced by Sznitman. Results of this type link questions on disconnection of large graphs by random walks to percolation problems and should lead to a better understanding of disconnection phenomena.

Martin Zerner
Lyapunov exponents of the Green's function for small random potentials.

We consider quenched and annealed Lyapunov exponents of the Green's function for small non-negative i.i.d. potentials on the lattice Z^d and report about joint work with E. Kosygina and T. Mountford about the asymptotic behavior as the potential tends to 0.