MATHEMATICAL PHYSICS

Place and time: In M103 on Friday, Jan 5, at 10:30–12:00
Organizer: Antti Kemppainen (University of Helsinki)
Contact email: antti.h.kemppainen@helsinki.fi

Scaling limits of critical Ising correlations: convergence, fusion rules, applications to SLE

Konstantin Izyurov *(University of Helsinki)*,
konstantin.izyurov@helsinki.fi

Abstract. We prove convergence to conformally covariant scaling limits for a family of observables in the critical 2D Ising model, including spins, energies, disorders and fermions. We also check that the limits satisfy fusion rules (a. k. a. operator product expansions) as predicted by Conformal Field Theory. I will also explain how to apply these results to deduce convergence of Ising interfaces to SLE(3) variants in a general setting.

Joint work with D. Chelkak and C. Hongler.

Ising model on infinite random triangulation of the half plane

Linxiao Chen *(University of Helsinki)*, linxiao.chen0@gmail.com

Abstract. Liouville quantum gravity (LQG) is an approach to reconcile gravity with quantum physics. It consists of integrating the physical observables with respect to an appropriate probability distribution on all possible space-time geometries, generalizing the idea of Feynman's path integral. Recently, some progress has been made in two-dimensional LQG, leading to the construction of the 2D random geometry that modelizes the space-time fluctuations in the absence of matter.

In this talk I will present a model of 2D random triangulation of the half plane coupled to the Ising model (LQG in the presence of matter). Thanks to its spatial Markov property, the exact partition function of this model is easier to compute than its counterpart for the Ising model on regular lattices. We will exploit the explicit partition function to construct a limit in distribution of the model at its critical point, and derive properties of the Ising interfaces in this limit. These results indicate that the geometry of the corresponding LQG theory is drastically changed by the coupling to the critical Ising model. They also confirm the so-called KPZ relation predicted by the conformal field theory.

Joint work with J. Turunen.

Branches in a uniform spanning tree and conformal invariance

Alex Karrila *(Aalto University)*, alex.karrila@aalto.fi

Abstract. It is predicted by physicists that continuum limits of critical random models on planar lattices should be described by conformally invariant quantum field theories. The aim of this talk is to characterize the limit of a certain collection of random interfaces, on increasingly dense lattices, in terms of conformally invariant random geometry. In more detail, let Λ be a bounded and simply con-

nected planar domain and Λ^δ its natural approximation by the square grid $\delta\mathbb{Z}^2$. We consider a uniform random spanning tree of the graph Λ^δ, and condition it on the existence of certain boundary-to-boundary branches. The weak limit of the corresponding random interfaces, as $\delta \to 0$, is a conformally invariant family of random curves called the local multiple $SLE(2)$.

Partly based on joint work with K. Kytölä and E. Peltola.