Seminar/Talk

Conformal invariance of critical double random currents

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Host: M. Beiglböck, N. Berestycki, L. Erdös, J. Maas, F. Toninelli

The double random current (DRC) model is a natural percolation model whose geometric properties are intimately related to spin correlations of the Ising model. In two dimensions, it moreover carries an integer valued height function on the graph, called the nesting field. We study the critical DRC model on bounded domains of the square lattice. We fully describe the joint scaling limit of the (primal and dual) DRC clusters and the nesting field as the lattice mesh size vanishes. We prove that the nesting field becomes the Dirichlet Gaussian free field (GFF) in this limit, and that the outer boundaries of the DRC clusters with free boundary conditions are the conformal loop ensemble with $\kappa=4$ (CLE4) coupled to that GFF. Moreover, we also show that the inner boundaries of the DRC clusters form a two-valued local set with values ${\mp 2\lambda, (2\sqrt2 \mp 2) \lambda}$ for the field restricted to a CLE4 loop with boundary value $\pm 2\lambda$. Our proof is a combination of exact solvability of the Ising model, new crossing estimates for the DRC model (which does not possess the FKG property), and a careful analysis of the structure of two-valued local sets of the continuum GFF. This is joint work with Hugo Duminil-Copin and Wei Qian.

Tuesday, November 30, 2021 05:55pm - 06:55pm
Online via Zoom

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