

Emergent Planarity in Two-dimensional Ising Models with Finite-range Interactions

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The boundary spin correlations for planar Ising models have a well-known Pfaffian structure. For Ising models on the square lattice with finite-range interactions, the corresponding graph is not planar and the Pfaffian structure no longer holds. Nevertheless, at criticality, the Pfaffian structure of boundary correlations emerges asymptotically (when boundary points are taken far apart). The proven statement establishes an aspect of universality in two dimensions beyond the solvable cases. In this talk, I will present this result and discuss the main ideas of proof, that involve a percolation interpretation of the problem (via Aizenman random currents, and FK percolation) and recent progress in percolation theory (robust Russo-Seymour-Welsh theory). This talk is based on a joint work with Michael Aizenman, Hugo Duminil-Copin and Simone Warzel.

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