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Critical last passage percolation

Monday, May 19, 2025 3:00 PM (1 hour)

Last passage percolation (LPP) is a model of random geometry where the main observable is a directed path evolving in a random environment. When the environment distribution has light tails and a fast decay of correlation, the random fluctuations of LPP are predicted to be explained by the Kardar-Parisi-Zhang (KPZ) universality theory. However, the KPZ theory is not expected to apply in many natural settings, such as "critical" environments exhibiting a hierarchical, fractal-like structure which should give rise to a fluctuation theory featuring logarithmic corrections with novel critical exponents. Predictions for these exponents are missing, even from the physics literature. In recent joint work with Victor Ginsburg and Kyeongsik Nam we initiated the study of LPP in hierarchical environments, developing a framework based on multi-scale analysis and obtaining bounds on critical exponents for two canonical examples: an i.i.d. environment with critical power-law tails, and a hierarchical approximation of the two-dimensional Gaussian Free Field. In this talk I will discuss these results and, time permitting, will also touch upon ongoing work with Victor Ginsburg and Kaihao Jing exploring connections to fractal percolation as well as related polymer models.

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