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*Recent progress on Gaussian free fields on fractals*

A Gaussian free field on a discrete (resp. continuous) space $X$ is a centered Gaussian process whose covariance is given by the Green's function for simple random walk (resp. Brownian motion) on $X$. As such the properties of this random field are intimately connected to the Laplacian on $X$. While the free fields on $\mathbb{R}^d$ or $\mathbb{Z}^d$ have been well studied for decades, rigorous investigations of free fields on fractals have just begun to take off, taking advantage of the potential theoretic techniques developed for studying analysis on fractals.

In this talk I will describe several recent results concerning the geometry of the free field on fractals or fractal-like graphs. These include:

(i) Maxima of the free field on recurrent fractal graphs. (Kumagai-Zeitouni)

(ii) Entropic repulsion of the free field on high-dimensional Sierpinski carpet graphs. (C.-Ugurcan)

(iii) Regularity properties and level sets of continuous free fields on post-critically finite fractals, with applications to random dendrites. (C., in progress)

If time permits, I will discuss how these results can help answer physically inspired problems on fractals, such as: estimating the time that a random walk covers all vertices of a fractal graph; or determining whether a pinned random interface on a fractal substrate undergoes a wetting transition.