Title:

Long-range first-passage percolation on the complete graph

Abstract:

We consider first-passage percolation on the complete graph K_n, where vertices have a spatial position on the d-dimensional torus $\mathbb{Z}_n^d$. For $\alpha \geq 0$, each edge e in the graph is assigned an independent transmission time $T_e = \|e\|^\alpha E_e$, where E_e denotes a rate-one exponential random variable and $\|e\|$ denotes the length of the edge (with respect to a p-norm on the torus $\mathbb{Z}_n^d$ for some $p \in [1, \infty) \cup \{\infty\}$). When $\alpha = 0$ we obtain the non-spatial case of first-passage percolation on the complete graph.

We study the behaviour of the random metric induced by the transmission times in the case that $\alpha < d$. In particular, we investigate the typical distance, flooding time, and diameter of the graph, and obtain results akin to the well-established results for $\alpha = 0$ case. If time permits, we shall also look into on-going work on competing long-range first-passage percolation, where two infections with transmission times T_e and λT_e for some $\lambda > 0$ and each edge e in the graph, respectively, occupy the vertices of the graph over time. Here, we investigate the possibility of coexistence for different values of λ, among other things.

Mostly joint work with Remco van der Hofstad, and partially with Neeladri Maitra.