THE UNIVERSITY OF CHICAGO

Department of Statistics

# DISSERTATION PRESENTATION AND DEFENSE

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# High-Dimensional First Passage Percolation and Occupation Densities of Branching Random Walk

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Jones 304, 5747 S. Ellis Avenue

## ABSTRACT


We prove limiting theorems for two particles systems, first passage percolation (FPP) and branching random walk (BRW).

For the FPP model on $\mathbb{Z}^d$, we show that if the passage times have finite mean, then $\lim_{d\to\infty} \frac{\mu(\mathbf{e}_1)d}{\log d} = \frac{1}{2a}$, where $\mu(\mathbf{e}_1)$ is the time constant in the $\mathbf{e}_1$ direction and $a \in [0,\infty]$ is a constant that depends only on the distribution of the passage times at 0. For the same class of distributions, we also prove that the limit shape is not an Euclidean ball, nor a $d$-dimensional cube or diamond, when $d$ is large enough.

For the BRW model, we prove that the rescaled occupation densities of a one-dimensional critical BRW converge to the occupation densities of a super-Brownian motion. We further show that the limiting occupation density process is a pure-jump subordinator in $\mathcal{C}_0(\mathbb{R})$, whose jumps are rescaled versions of i.i.d. copies of an Integrated super-Brownian Excursion (ISE) density, weighted by the jump sizes of a real-valued stable-$\frac{1}{2}$ subordinator.


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