FUNCTIONAL LIMIT THEOREMS FOR THE PROFILE OF RANDOM RECURSIVE TREES

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Let $X_n(k)$ denote the number of vertices at level k in a random recursive tree with $n+1$ vertices. I am going to discuss a functional limit theorem for the vector-valued process $(X_{[n^t]}(1), \dots, X_{[n^t]}(k))_{t\geq 0}$, for each $k \in \mathbb{N}$. It will be explained that, after proper centering and normalization, this process converges weakly to a vector-valued Gaussian process whose components are integrated Brownian motions. The other topic of my interest is the asymptotic behavior of $X_n(k)$ for intermediate levels $k = k_n$ satisfying $k_n \to \infty$ and $k_n = o(\log n)$ as $n \to \infty$. It turns out that the finite-dimensional distributions of the process $(X_n([k_n t]))_{t>0}$, properly normalized and centered, converge weakly as $n \to \infty$. The limit is a centered Gaussian process with explicitly known covariance. Both results are deduced from new functional limit theorems for Crump-Mode-Jagers branching processes generated by increasing random walks with increments that have finite second moment.

The talk is based on the two recent papers [1, 2] joint with Zakhar Kabluchko (Münster).

References

[1] A. Iksanov and Z. Kabluchko. A functional limit theorem for the profile of random recursive trees. *Electron. Commun. Probab.* **23** (2018), paper no. 87, 1–13

[2] A. Iksanov and Z. Kabluchko. Weak convergence of the number of vertices at intermediate levels of random recursive trees. *J. Appl. Probab.* **55** (2018), 1131–1142

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