DISTRIBUTIONAL PROPERTIES OF STABLE GRAPHS

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This talk is based on the papers in preparation [3, 4].

Consider a graph with label set \{1, 2, \ldots, n\} chosen uniformly at random from those such that vertex \(i\) has degree \(D_i\), where \(D_1, D_2, \ldots, D_n\) are i.i.d. strictly positive random variables. The condition for criticality (i.e. the threshold for the emergence of a giant component) in this setting is \(E[D^2] = 2E[D]\), and we assume additionally that \(P(D = k) \sim ck^{-(\alpha+2)}\) as \(k\) tends to infinity, for some \(\alpha \in (1, 2)\). In Joseph [5], it was shown that the largest components have sizes on the order of \(n^{\alpha/(\alpha+1)}\). Building on that work, we prove a metric space scaling limit for the sequence of components when distances are rescaled by \(n^{-(\alpha-1)/(\alpha+1)}\), which we call the stable graph. The limit object is related to a forest of stable trees via an absolute continuity relation and vertex-identifications. In this talk, we will explore the distributional properties of the limit components, showing how they can be constructed out of randomly rescaled stable trees, and also giving a line-breaking construction. These results are natural generalisations of those which hold for the scaling limit of the Erdős–Rényi random graph [1, 2].

Acknowledgement C.G.’s research is supported by EPSRC Fellowship EP/N004833/1.

References