Extreme local statistics in random graphs: maximum tree extension counts

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Abstract

We consider a generalization of the maximum degree in random graphs. Given a rooted tree T, let X_v denote the number of copies of T rooted at v in the binomial random graph $G_{n,p}$. We ask the question where the maximum $M_n = max\{X_1, ..., X_n\}$ of X_v over all vertices is concentrated. For edge-probabilities $p = p(n)$ tending to zero not too fast, the maximum is asymptotically attained by the vertex of maximum degree. However, for smaller edge probabilities $p = p(n)$, the behavior is more complicated: our large deviation type optimization arguments reveal that the behavior of M_n changes as we vary $p = p(n)$, due to different mechanisms that can make the maximum large.

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