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Results on The Dynamic Erdős-Rényi Graph — The Critical Case

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Abstract

The dynamic Erdős-Rényi graph is a natural extension of an Erdős-Rényi graph, in which one starts with n vertices and 0 edges and—independently for each vertex pair—add and remove edges according to a birth-death process. We shall study the critical version of such a model where the birth and death rates are chosen in such a way that the stationary distribution of the dynamic graph equals that of a critical Erdős-Rényi graph.

In studying such a model we present two main results, the first being on how long it takes for the dynamic graph to reach stationarity if it starts with 0 edges. We give an explicit expression for this time, as well as proving that this is the fastest time to reach stationarity.

The second result is regarding how the size of the largest component evolves through time. Mainly we give a lower bound for the probability $P(C(t) > \epsilon \cdot n)$ where $C(t)$ is the size of the largest component in the interval $[0, t]$, and $\epsilon \in (0, 1)$

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