A Critical Probability for Biclique Partition of $G_{n,p}$

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The biclique partition number of a graph $G = (V, E)$, denoted $bp(G)$, is the minimum number of pairwise edge-disjoint bicliques of G so that each edge of G belongs to exactly one of them. It is easy to see that $bp(G) \leq n - \alpha(G)$, where $\alpha(G)$ is the independence number of G. Erdős conjectured in the 80's that $bp(G_{n,1/2}) = n - \alpha(G_{n,1/2})$ with high probability, though later Alon showed this to be false. In this presentation we consider all constant probabilities p between 0 and 1/2 and present the following new result: that there is a critical probability $p_0 \approx 0.312$ such that, if $p < p_0$, then $bp(G_{n,1/2}) = n - \alpha(G_{n,1/2})$, but if $p > p_0$, then $bp(G_{n,1/2}) \neq n - \alpha(G_{n,1/2})$ whp. We discuss the derivation of the probability p_0 and the motivations behind the proof of our result.