Rainbow cliques in randomly perturbed dense graphs

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Abstract. For two graphs G and H, write $G \xrightarrow{\text{rbw}} H$ if G has the property that every *proper* colouring of its edges yields a *rainbow* copy of H. In this talk we will study the aforementioned *anti-Ramsey* property in the perturbed model, which is a graph distribution of the form $G \cup \mathbb{G}(n,p)$, where G is an n-vertex graph with edge-density at least $d > 0$, and d is a constant that does not depend on n. We determine the threshold for the property $G \cup \mathbb{G}(n,p) \xrightarrow{\text{rbw}} K_s$ for every s. We show that for $s \geq 9$ the threshold is $n^{-1/m_2(K_{\lceil s/2 \rceil})}$; in fact, our 1-statement is a supersaturation result. This turns out to (almost) be the threshold for $s = 8$ as well, but for every $4 \leq s \leq 7$, the threshold is lower and is different for each $4 \leq s \leq 7$.
Moreover, we prove that for every $\ell \geq 2$ the threshold for the property $G \cup \mathbb{G}(n,p) \xrightarrow{\text{rbw}} C_{2\ell-1}$ is n^{-2}; in particular, the threshold does not depend on the length of the cycle $C_{2\ell-1}$. (For even cycles, or more generally for any fixed bipartite graph, no random edges are needed at all.)

Based on joint work [1,2] with Elad Aigner-Horev, Dan Hefetz and Shoham Letzter.

References

1. E. Aigner-Horev, O. Danon, D. Hefetz and S. Letzter, *Large rainbow cliques in randomly perturbed dense graphs*, (2020) Arxiv preprint arXiv:1912.13512.
2. E. Aigner-Horev, O. Danon, D. Hefetz and S. Letzter, *Small rainbow cliques in randomly perturbed dense graphs*, European J. of Combinatorics, (2021) to appear.