

Beyond the broken tetrahedron

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Abstract

Here we consider the hypergraph Turán problem in uniformly dense hypergraphs as was suggested by Erdős and Sós. Given a 3-graph F , the uniform Turán density $\pi_u(F)$ of F is defined as the supremum over all $d \in [0, 1]$ for which there is an F -free uniformly d -dense 3-graph, where uniformly d -dense means that every linearly sized subhypergraph has density at least d . Recently, Glebov, Král', and Volec and, independently, Reiher, Rödl, and Schacht proved that $\pi_u(K_4^{(3)-}) = \frac{1}{4}$, solving a conjecture by Erdős and Sós. There are very few hypergraphs for which the uniform Turán density is known. In this work, we determine the uniform Turán density of the 3-graph on five vertices that is obtained from $K_4^{(3)-}$ by adding an additional vertex whose link forms a matching on the vertices of $K_4^{(3)-}$. Further, we point to two natural intermediate problems on the way to determining $\pi_u(K_4^{(3)})$ and solve the first of these.

This talk is based on joint work with August Chen.