Anti-Ramsey number of matchings in hypergraphs

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Abstract

A k-matching in a hypergraph is a set of k edges such that no two of these edges intersect. The *anti-Ramsey number* of a k-matching in a complete s-uniform hypergraph $\mathcal{H}$ on n vertices, denoted by $\text{ar}(n, s, k)$, is the smallest integer c such that in any coloring of the edges of $\mathcal{H}$ with exactly c colors, there is a k-matching whose edges have distinct colors. The *Turán number*, denoted by $\text{ex}(n, s, k)$, is the maximum number of edges in an s-uniform hypergraph on n vertices with no k-matching. For $k \geq 3$, we conjecture that if $n > sk$, then $\text{ar}(n, s, k) = \text{ex}(n, s, k-1)+2$. Also, if $n = sk$, then $\text{ar}(n, s, k) = \begin{cases} \text{ex}(n, s, k-1) + 2 & \text{if } k < c_s \\ \text{ex}(n, s, k-1) + s + 1 & \text{if } k \geq c_s \end{cases}$,where c_s is a constant dependent on s. We prove this conjecture for $k = 2, k = 3$, and sufficiently large n, as well as provide upper and lower bounds. This is joint work with Michael Young.

Keywords: anti-Ramsey, rainbow, matching, hypergraph.