

Fractional clique decompositions of dense balanced multipartite graphs

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This is joint work with Tao Feng and Hengrui Liu

This talk concerns fractional K_s -decompositions of multipartite graphs. For integers $r \geq s \geq 3$, we consider balanced r -partite graphs G on rn vertices. We establish necessary conditions for G to admit a fractional K_s -decomposition, extending the notion of s -admissibility from the case $r = s$ to $r > s$. Using an association scheme on the edge set of a complete r -partite graph, we prove that if $r \geq s + 2$ and the partite minimum degree of G is at least $(1 - c)n$ with $c \leq 1/((s - 2)(s + 1)(s - 1)^4)$, then G has a fractional K_s -decomposition. For $r = s + 1$, we show that under the condition $c \leq 1/(3s^3(s - 2)^2)$, every s -admissible balanced $(s + 1)$ -partite graph with partite minimum degree at least $(1 - c)n$ admits a fractional K_s -decomposition. These results provide new degree thresholds for fractional K_s -decompositions of multipartite graphs with more than s parts.