Extremal Graph Theoretic Results for q-ary Vectors

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Recently, Patkós, Tuza, and Vizer [1] introduced the concept of q-graphs and posed several Turán-type questions concerning them. A q-graph is a generalization of an ordinary graph, where edges are represented by q-ary vectors with exactly two non-zero entries. We say a q-graph contains an s-copy of an ordinary graph F if there is a subset of q-edges whose support is isomorphic to F, and for any two incident edges, the sum of their entries at the common vertex is at least s. The extremal number $\mathrm{ex}(n, F, q, s)$ denotes the maximum number of edges in an n-vertex simple q-graph that avoids an s-copy of F.

In this talk, we reduce the problem of finding $\mathrm{ex}(n, F, q, q+1)$ for even q to the case $q = 2$, and determine the asymptotics of $\mathrm{ex}(n, C_{2k+1}, q, q+1)$.

This is based on a joint work [2] with Koppány Encz, Márton Marits and Máté Weisz.

[1] B. Patkós, Zs. Tuza, M. Vizer, Extremal graph theoretic questions for q-ary vectors, *Graphs and Combinatorics* **40** (2024), 57.

[2] K. Encz, M. Marits, B. Váli, M. Weisz, Results on extremal graph theoretic questions for q-ary vectors, *Stud. Sci. Math. Hung.* **61(1)** (2024), 30–42.