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Natural realizations of sparsity matroids

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Abstract

A hypergraph G with n vertices and m hyperedges with d endpoints each is (k, l)-sparse if for all subhypergraphs G' on n' vertices and m' edges, $m' \leq kn' - l$. For integers k and l satisfying $0 \leq l \leq dk - 1$, this is known to be a linearly representable matroidal family. Motivated by problems in rigidity theory, we give a new linear representation theorem for the (k, l)-sparse hypergraphs that is *natural*; i.e., the representing matrix captures the vertex-edge incidence structure of the underlying hypergraph G.

Keywords: Matroids, combinatorial rigidity, sparse graphs and hypergraphs.

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Naravne realizacije redkih matroidov

Povzetek

Hipergraf G na n vozliščih z m hiperpovezavami, kjer ima vsaka d koncev je (k, l)-redek, če za vse pod-hipergrafe G' na n' vozliščih z m' povezavami velja, da je $m' \leq kn' - l$. V članku podamo nov izrek o linearni upodobitvi za (k, l)-redke hipergrafe, ki je *naraven* v tem smislu, da reprezentativna matrika zajema vozliščno-povezavno incidenčno strukturo pripadajočega hipergrafa G.

Ključne besede: Matroidi, kombinatorična rigidnost, redki grafi in hipergrafi.