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Forbidden Berge hypergraphs

Joint work with Santiago Salazar. A *simple* matrix is a $(0,1)$ -matrix with no repeated columns. For a $(0,1)$ -matrix F , we say that a $(0,1)$ -matrix A has F as a *Berge hypergraph* if there is a submatrix B of A and some row and column permutation of F , say G , with $G \leq B$. Letting $\|A\|$ denote the number of columns in A , we define the extremal function $Bh(m, F) = \max\{\|A\| : A \text{ is an } m\text{-rowed simple matrix with no Berge hypergraph } F\}$. We determine the asymptotics of $Bh(m, F)$ for all 3- and 4-rowed F and most 5-rowed F . For certain F , this becomes the problem of determining the maximum number of copies of K_r in a m -vertex graph that has no $K_{s,t}$ subgraph, a problem studied by Alon and Shikhelman.