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An Erdős-Ko-Rado theorem in general linear groups

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Let S_n be the symmetric group on n points. Deza and Frankl [M. Deza and P. Frankl, On the maximum number of permutations with given maximal or minimal distance, J. Combin. Theory Ser. A 22 (1977) 352--360] proved that if ${\cal F}$ is an intersecting set in S_n then $|{\cal F}|\leq(n-1)!$. In this paper we consider the q-analogue version of this result. Let $\mathbb{F}_q^n$ be the n-dimensional row vector space over a finite field $\mathbb{F}_q$ and $GL_n(\mathbb{F}_q)$ the general linear group of degree n. A set ${\cal F}_q\subseteq GL_n(\mathbb{F}_q)$ is {\it intersecting} if for any $T,S\in{\cal F}_q$ there exists a non-zero vector $\alpha\in \mathbb{F}_q^n$ such that $\alpha T=\alpha S$. Let ${\cal F}_q$ be an intersecting set in $GL_n(\mathbb{F}_q)$. We show that $|{\cal F}_q|\leq q^{(n-1)n/2}\prod_{i=1}^{n-1}(q^i-1)$.

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