Abstract

Erdős-Ko-Rado, Cameron-Liebler and Hilton-Milner results in finite projective spaces

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Let $\mathrm{PG}(n, q)$ be the projective space of dimension n over the finite field $\mathbb{F}_q$ of order q.

An *Erdős-Ko-Rado k-set* in $\mathrm{PG}(n, q)$ is a set of k-spaces, pairwise intersecting in at least one point.

Here, the main problem is to characterize the largest Erdős-Ko-Rado k-sets in $\mathrm{PG}(n, q)$.

Cameron-Liebler k-sets in $\mathrm{PG}(n, q)$ can be defined in many equivalent ways. For instance, if $(k + 1)|(n + 1)$ and k-spreads exist in $\mathrm{PG}(n, q)$, a *Cameron-Liebler k-set in PG(n, q) with parameter x* is a set of k-spaces sharing always exactly x k-spaces with every k-spread in $\mathrm{PG}(n, q)$.

Here, the main problem is to investigate whether Cameron-Liebler k-sets in $\mathrm{PG}(n, q)$ with parameter x exist, and if such Cameron-Liebler k-sets exist, to characterize Cameron-Liebler k-sets in $\mathrm{PG}(n, q)$ with parameter x.

One of the interesting facts about these two types of substructures in finite projective spaces is that many techniques from algebraic combinatorics can be used to investigate these substructures.

This talk will present results on these two types of substructures, showing the great relevance of algebraic combinatorics for finite geometry.

The *Hilton-Milner* problem in $\mathrm{PG}(n, q)$ regards the characterization of the second largest maximal Erdős-Ko-Rado k-sets in $\mathrm{PG}(n, q)$.

Hilton-Milner results have proven to be very useful to derive results on Cameron-Liebler k-sets in $\mathrm{PG}(n, q)$, showing the interaction between all these types of substructures.