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Designs in finite general linear groups

In his monumental Thesis in 1973, Delsarte introduced so-called T -designs, which generalise classical combinatorial designs by using a purely algebraic definition. In fact, a combinatorial design is equal to a T -design in the Johnson association scheme. Despite their purely algebraic definition, in the literature many T -designs have nice combinatorial characterisations. This confirms Delsarte's insight that this is indeed a general phenomenon, in his own words: "[...] T -designs will often have interesting properties." In this talk, we elaborate on this insight and discuss results on T -designs in finite general linear groups $GL(n, q)$. These designs turn out to be subsets acting transitively on flag-like structures, which are common generalisations of t -dimensional subspaces of $\mathbb{F}_q^n$ and bases of t -dimensional subspaces of $\mathbb{F}_q^n$. These results can be interpreted as q -analogues of corresponding results for the symmetric group. This is joint work with Kai-Uwe Schmidt.