

Title: Algebraic constructions of semifields and maximum rank distance codes

Abstract: Rank-metric codes are codes consisting of matrices, with the distance between two matrices being the rank of their difference. Codes with maximum size for a fixed minimum distance are called Maximum Rank Distance (MRD) codes. These have received increased attention in recent years, in part due to their applications in Random Linear Network Coding.

(Finite) semifields are nonassociative division algebras over a field. Existence of non-trivial examples was established by Dickson in 1906. They have many connections with interesting objects in finite geometry, such as projective planes, spreads, flocks. The number of equivalence classes of semifields remains an open problem. By considering the maps defined by multiplication, there is a correspondence between semifields and MRD codes of a certain type.

In this talk we will review the known constructions for semifields and MRD codes, focusing in particular on those constructed using linearized polynomials and skew-polynomial rings. We will introduce a new family, which contains new examples of semifields and MRD codes, and incorporates previously distinct constructions into one family.