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Sets of symmetric matrices over finite fields

A set of $m \times m$ symmetric matrices over a finite field is called an (m, d)-set if the difference between distinct elements has rank at least d. I will present constructions of (m, d)-sets and use association schemes to prove fundamental combinatorial properties of (m, d)-sets, showing optimality of the constructions in certain cases. These results have applications in the theory of codes over Galois rings and shed new light on the Z_4-linearity of Kerdock and Delsarte-Goethals codes.