Zero–Pattern Rank-Metric Codes

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On the space of $m \times n$ matrices over a (finite) field, one can consider the metric induced by the rank. A linear rank-metric code is a subspace of the space of $m \times n$ matrices endowed with the rank distance. Several special families of rank-metric codes with restrictions have been investigated. We will focus on the family of zero-pattern rank-metric codes. They can be defined as subspaces of matrices whose nonzero entries can be only those corresponding to indices from a subset of $\{1, \dots, m\} \times \{1, \dots, n\}$. They generalize codes in the Hamming metric, which are obtained by only allowing nonzero entries on the diagonal, sum-rank metric codes, where the nonzero entries lie on diagonal blocks, and Ferrers diagram rank-metric codes, where the nonzero entries only appear on a prescribed Ferrers diagram. The aim of this project is to explore combinatorial, geometric, and algebraic features of zero-pattern rank-metric codes, extending those for Hamming-metric, (sum-)rank-metric, and Ferrers diagram rank-metric codes.