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Nilpotent zero-nonzero patterns over finite fields

A zero-nonzero (znz) pattern $\mathcal{A}$ is a square matrix whose entries come from the set $\{*, 0\}$ where $*$ denotes a nonzero entry. Fix a field $\mathbb{F}$. We then set $Q(\mathcal{A}, \mathbb{F}) = \{A \in M_n(\mathbb{F}) : (A)_{i,j} \neq 0 \Leftrightarrow (\mathcal{A})_{i,j} = * \text{ for all } i, j\}$. An element $A \in Q(\mathcal{A}, \mathbb{F})$ is called a matrix realization of $\mathcal{A}$. A znz-pattern $\mathbb{A}$ is said to be potentially nilpotent over $\mathbb{F}$ if there exists a matrix realization A such that $A^k = 0$ for some positive integer k. In this talk I will discuss the problem of classifying the znz-patterns that are potentially nilpotent, and how one can use techniques from commutative algebra when working on this question.

This is joint work with Keven N. Vander Meulen.