Generic reflexivity for spaces of matrices

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The properties of algebraic reflexivity and local linear dependence, for a vector space of linear operators, are weak analogues of span and linear dependence, respectively. Both have established connection with the structure of invariant subspaces, Banach algebra derivations, and vector spaces of singular matrices.

Recently some authors (in particular Meshulam-Šemrl and Bračič-Kuzma) have obtained new bounds on rank and structure of low-dimensional spaces of linear operators with these properties.

In spite of these efforts, the exact relationship between the two properties remains unclear. Are they really closely related?

In the talk I introduce a new type of reflexivity property, called generic reflexivity, which presents a much closer affinity with local linear dependence. For example, a space W of matrices is locally linearly dependent iff it is contained in the generic reflexive hull of a strict subspace $W_1 \subset W$. This condition becomes only sufficient if the word "generic" is replaced by "algebraic".

In the case of spaces of matrices, I will survey and partially improve some of the recent results on algebraic reflexivity and local linar dependence, and describe their generic analogues. The Kronecker-Weierstrass canonical form was central in obtaining these results.