

# Quot schemes and varieties of commuting matrices

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Let  $C_n(M_d)$  denote the affine variety of all  $n$ -tuples of commuting  $d \times d$  matrices. The ADHM construction relates these varieties to Quot schemes, and in particular to Hilbert schemes. On the more applied side, varieties  $C_n(M_d)$  are directly connected to the question whether a tensor has minimal border rank. Although  $C_n(M_d)$  is usually reducible for  $n > 2$  and  $d > 3$ , very few irreducible components are known. In the talk we classify irreducible components for small  $d$  and all  $n$ . Moreover, we show that  $C_n(M_d)$ , viewed as a scheme defined by the quadratic commutativity relations, has generically nonreduced components whenever  $d \geq 8$  and  $n \geq 4$ , while it is generically reduced for  $d \leq 7$ . Our results give the corresponding results for Quot schemes of points. In particular, the Quot scheme parametrizing degree 8 quotients of a free module of rank 4 over polynomial ring in 4 variables has a generically nonreduced component.

This is joint work with Joachim Jelisiejew.

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