The syzygies of some thickenings of determinantal varieties

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The space of m x n matrices admits a natural action of the group GL_m x GL_n via row and column operations on the matrix entries. The invariant closed subsets are the determinantal varieties defined by the (reduced) ideals of minors of the generic matrix. The minimal free resolutions of these ideals are well-understood by work of Lascoux and others. There are however many more invariant ideals which are non-reduced, and they were classified by De Concini, Eisenbud and Procesi in the 80s. I will give a conjectural description of syzygies (and some supporting evidence) for a large class of these ideals, based on a surprising connection with the representation theory of general linear Lie superalgebras. Joint work with Jerzy Weyman.