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*Syzygies of Determinantal Thickenings via General Linear Lie Superalgebra Representations.*

The coordinate ring  $S = \mathbb{C}[x_{i,j}]$  of space of  $m \times n$  matrices carries an action of the group  $\mathrm{GL}_m \times \mathrm{GL}_n$  via row and column operations on the matrix entries. If we consider any  $\mathrm{GL}_m \times \mathrm{GL}_n$ -invariant ideal  $I$  in  $S$ , the syzygy modules  $\mathrm{Tor}_i(I, \mathbb{C})$  will carry a natural action of  $\mathrm{GL}_m \times \mathrm{GL}_n$ . Via BGG correspondence, they also carry an action of  $\bigwedge^\bullet(\mathbb{C}^m \otimes \mathbb{C}^n)$ . It is a recent result by Raicu and Weyman that we can combine these actions together and make them modules over the general linear Lie superalgebra  $\mathfrak{gl}(m|n)$ . We will explain how this works and how it enables us to compute all Betti numbers of any  $\mathrm{GL}_m \times \mathrm{GL}_n$ -invariant ideal  $I$ . The latter part will involve the combinatorics of Dyck paths. (Received June 11, 2019)