A Combinatorial Study of the Special Fiber of Ladder Determinantal Modules

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In this talk, we consider the special fiber algebra arising from ladder determinantal modules; in other words, we study the algebra generated by the maximal minors of a ladder-shaped matrix. Using SAGBI degeneration and Gröbner basis techniques of Lin and Shen `https://arxiv.org/pdf/2408.01903`, we show that this algebra has the same multiplicity and dimension as a certain simplicial complex Δ. Through a combinatorial approach, we establish that Alexander dual ideal of Δ has linear quotients. We also compute the multiplicity of the algebra using skew Young tableaux. Our results recover well-known multiplicity formulas for Grassmannian varieties and for sparse determinantal ideals of $2 \times n$ matrices. This is a joint work with Alessandra Costantini, Louiza Fouli, Kriti Goel, Kuei-Nuan Lin, Haydee Lindo, and Whitney Liske.

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