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Castelnuovo-Mumford regularity of ladder determinantal ideals via Grothendieck polynomials

We give degree formulas for Grothendieck polynomials indexed by vexillary permutations. We apply our formulas to compute the Castelnuovo–Mumford regularity of classes of generalized determinantal ideals. In particular, we give combinatorial formulas for the regularities of all one-sided mixed ladder determinantal ideals.

We also derive formulas for the regularities of certain Kazhdan–Lusztig ideals, including those coming from open patches of Grassmannians. This provides a correction to a conjecture of Kummini–Lakshmibai–Sastry–Seshadri (2015). This is joint work with Jenna Rajchgot and Anna Weigandt.