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An Efficient Algorithm for Deciding the Vanishing of Schubert Polynomial Coefficients

Schubert polynomials form a basis of all polynomials and appear in the study of cohomology rings of flag manifolds. The vanishing problem for Schubert polynomials asks if a coefficient of a Schubert polynomial is zero. We give a tableau criterion to solve this problem, from which we deduce the first polynomial time algorithm. These results are obtained from new characterizations of the Schubitope, a generalization of the permutahedron defined for any subset of the $n \times n$ grid. In contrast, we show that computing these coefficients explicitly is $\#P - complete$. This is joint work with Anshul Adve and Alexander Yong.