

## On strict unimodality of $q$ -binomial coefficients

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**Abstract:** In 2013, Igor Pak and Greta Panova proved the strict unimodality property of  $q$ -binomial coefficients  $\begin{bmatrix} \ell+m \\ m \end{bmatrix}_q$  (as polynomials in  $q$ ) based on the combinatorics of certain Young tableaux and the semigroup property of certain Kronecker coefficients. They showed it to be true for all  $\ell, m \geq 8$  and a few other cases. We propose a different (step-by-step, computation-based) approach to this problem, where we establish a closed form for the coefficients of these polynomials and use one of our favorite computer algebra tools (cylindrical algebraic decomposition) to identify exactly the range of coefficients on which strict unimodality holds (for all  $\ell$  and  $m$ ). We believe that this strategy allows for generalizations of the problem to show unimodality with larger gaps. This is joint work with Christoph Koutschan and Ali Uncu.