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Hyperdeterminants of Polynomials

The coefficients of a degree d homogeneous polynomial may be arranged in a d-dimensional matrix. Analogous to the determinant of a matrix, Cayley introduced the notion of the hyperdeterminant of a multi-dimensional matrix. I will consider this hyperdeterminant (and its partially symmetric cousins the μ-discriminants) applied to a polynomial. In this talk I will describe some of the beautiful symmetry, geometry and combinatorics of these symmetrized hyperdeterminants. I will give the geometric description via dual varieties, and use this to show that the symmetrized hyperdeterminant splits into several factors (with multiplicities) that are controlled by refinements of partitions.