HIGHER ORDER SELF-DUAL TORIC VARIETIES

Ragni Piene

Abstract. To a projective variety one associates its dual variety: the set of hyperplanes tangent to the given variety. It is well known that the only smooth varieties that are "self-dual", i.e., are such that the dual variety is isomorphic to the variety, are quadric hypersurfaces in characteristic 0 and Fermat hypersurfaces in characteristic $p > 0$. By replacing tangency conditions by higher order contact conditions, one can define *higher order* dual varieties and ask for a classification of those that are "higher" self-dual. In this talk I will report on joint work with Alicia Dickenstein, where we study higher order dual varieties of *toric embeddings*.

A lattice point configuration $\mathcal{A} \subset \mathbb{Z}^n$ defines a (real or complex) toric embedding in $\mathbb{P}^N$, where $N = \#\mathcal{A} - 1$. The aim is to characterize those varieties that are isomorphic to one of its higher order dual varieties, in particular to find conditions on the configuration $\mathcal{A}$ or its convex lattice polytope $P = \mathrm{Conv}(\mathcal{A})$ for this to happen. I will explain our results, give examples, and state some conjectures.