

Structure and Classifications of Fano Polytopes

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Abstract

Lattice polytopes, i.e. polytopes whose vertices are contained in the integer lattice, are an important subclass of polytopes with applications in number theory, optimization, and algebraic geometry, among others. Lattice polytopes naturally correspond to toric varieties, and many properties of the polytope or variety are reflected on the other side.

A lattice polytope is a Fano polytope if the origin is the unique interior lattice point in the polytope. These polytopes correspond to toric Fano varieties. Their analysis is an important step in the study of general lattice polytopes.

In my talk I will introduce Fano polytopes, discuss their connection to toric varieties, and explain structural results. In particular, I will discuss simplicial, terminal and reflexive d -dimensional Fano polytopes. These polytopes have at most $3d$ vertices, and I will classify those with at least $3d-2$ vertices. This extends previous work of Casagrande, Nill, and Oebro.

This is based on joint work with Benjamin Assarf and Michael Joswig.