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String polytopes, G–C polytopes and geometry of flag and spherical varieties

The classical results in toric geometry (e.g. results of Bernstein, Kushnirenko and Khovanskii) relate the geometry/topology of a toric variety and the complete intersections inside it to the combinatorics of the associated Newton polytopes. In this talk we show how one can obtain the same results for the flag variety and the string polytopes.

More specifically we give formula for the intersection numbers of divisors, (arithmetic and geometric) genus of complete intersections as well as the Euler char. of a complete intersection in the flag variety, in terms of the number of integral points and the volume of the corresponding polytopes. The formula for the intersection numbers of divisors is due to Brion–Alexeev. These results (partially) generalize to the bigger class of spherical varieties.

This is joint work with A. G. Khovanskii.

String polytopes are the generalization of the classical Gelfand–Cetlin polytopes assocaited to an irreducible representation of $\mathrm{GL}(n, C)$, to any reductive group.