Combinatorial Algebraic Geometry
Géométrie algébrique combinatoire
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Concepts of stability and positivity for big and nef line bundles, divisorial sheaves and divisors on the Zariski Riemann spaces

A key feature of the Neron-Severi spaces of divisor classes on the Zariski Riemann spaces is the absence of an ample cone. This highlights the question of defining K-stability invariants and measures of positivity for big and nef classes on projective varieties. The purpose of this talk is to report on recent progress in this direction. Some emphasis will be placed on my recent results about slope K-stability for big and nef divisors. Time permitting, I will report on my additional very recently obtained results which are in the general direction of the Riemann-Roch problem for birational divisors. For instance, this includes construction of Newton-Okounkov bodies for birational divisors and a concept of Kodaria-Iitaka dimension for fractional b-generalized log varieties.

KATRINA HONIGS, Simon Fraser University
McKay correspondence for reflection groups and derived categories

The classical McKay correspondence shows that there is a bijection between irreducible representations of finite subgroups G of $\mathrm{SL}(2,\mathbb{C})$ and the exceptional divisors of the minimal resolution of the singularity $\mathbb{C}^2/G$. This is a very elegant correspondence, but it's not at all obvious how to extend these ideas to other finite groups.

Kapranov and Vasserot, and then, later, Bridgeland, King and Reid showed this correspondence can be recast and extended as an equivalence of derived categories of coherent sheaves. When this framework is extended to finite subgroups of $\mathrm{GL}(2,\mathbb{C})$ generated by reflections, the equivalence of categories becomes a semiorthogonal decomposition whose components are, conjecturally, in bijection with irreducible representations of G. This correspondence has been verified in recent work of Potter and of Capellan for a particular embedding of the dihedral groups D_n in $\mathrm{GL}(2,\mathbb{C})$. I will discuss recent joint work verifying this decomposition in further cases.

NATHAN ILTEN, Simon Fraser University

ELANA KALASHNIKOV, University of Waterloo

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Gröbner Cones for Finite Type Cluster Algebras

Cluster algebras are a class of commutative algebras defined by a combinatorial iterative method. Consequently, many properties of cluster algebras may be studied through combinatorial tools. In the case of finite cluster type, the cluster algebra $\mathcal{A}$ is canonically a quotient of a polynomial ring by an ideal $I_{\mathcal{A}}$. By work of Ilten, Nájera-Chávez, and Treffinger, there exists a term order such that the initial ideal of $I_{\mathcal{A}}$ is the ideal generated by products of incompatible cluster variables. We study the Gröbner cone $\mathcal{C}_{\mathcal{A}}$ corresponding to this initial ideal. In joint work with Ilten, we construct distinguished elements of $\mathcal{C}_{\mathcal{A}}$ using compatibility degrees, and give explicit descriptions of the rays and lineality spaces of $\mathcal{C}_{\mathcal{A}}$ in terms of combinatorial models for cluster algebras of types A_n, B_n, C_n, D_n with a special choice of frozen variables, and in the case of no frozen variables. In this talk, I will discuss the main results in types A_n, B_n, and C_n.

SARA STEPHENS, Cornell University

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