INTERESTS

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Points over finite fields and cohomology

Cluster algebras of geometric type define algebraic varieties together with a morphism to an affine space or a complex torus. I am interested in counting points over finite fields in these algebraic varieties, as a first step towards computing their cohomology rings. One is naturally led to consider the fibers of this morphism and in particular the generic fiber. I have done some work on finite type already, obtaining nice and simple formulas, but much remains to be done.

See http://fr.arxiv.org/abs/0912.2342

Operad structure on type A cluster algebras

The collection of all moduli spaces of stable genus 0 curves with marked points $\overline{M}_{0,n}$ has the natural structure of an operad, which comes from the possibility of gluing marked points together.

There is a close relationship between these moduli spaces and Grassmannians of planes, hence cluster algebras of finite type A. It seems possible to define some kind of operad structure on the collection of cluster algebras. This may lead either to interesting operads or to technical tools useful for cluster algebras.

Categories in which 2-clusters are objects

I have been interested in the study of the category of modules over the incidence algebra of the Tamari posets. Its derived category is worth studying, having many different descriptions and seeming to be a fractionally Calabi-Yau category. It may also have a geometric description related to some isolated hypersurface singularities. I have recently described the spectrum of the Coxeter transformation for this category, using operads (see http://fr.arxiv.org/abs/1103.3755). This is also related to the recently introduced Tamari posets of higher slope.

Another interesting point is that one can define objects in this category associated with 2-clusters. When looking at all 2-clusters that have a non-zero morphism from a fixed 2-cluster, one can see many polytopes appear, including all associahedra.