

Berkeley-Stanford Algebraic Geometry Colloquium

Tuesday, February 26, at Berkeley

Jerzy Weyman (Northeastern) 3:45-4:45, 939 Evans

The existence of pure resolutions

Abstract: I will report on one half of the recent proof of Boij-Soderberg conjectures on Betti numbers of graded modules, proved in a joint paper “The Existence of Pure Free Resolutions” with Eisenbud and Floystad, arXiv:0709.1529 . The other half was done by Eisenbud and Schreyer in the paper “Betti Numbers of Graded Modules and Cohomology of Vector Bundles” arXiv:0712.1843.

A minimal free resolution of a graded module M of finite length over a polynomial ring $A = K[X_1, \dots, X_n]$ is pure if the i -th term F_i of the resolution is a free module generated in one degree d_i . We show using representation theory of general linear group that for every n and for every sequence $\underline{d} = (d_0, \dots, d_n)$ there exists a pure resolution with the i -th term generated in degree d_i for $i = 0, \dots, n$.

Hiraku Nakajima (Kyoto) 5:00-6:00, 939 Evans

(Conjectural) triply graded link homology groups of the Hopf link and Hilbert schemes of points on the plane

Abstract: Gukov et al. suggested triply graded link homology groups via refined BPS counting on the deformed conifold. Through large N duality they identify their Poincare polynomials for the Hopf link as refined topological vertices. I further apply the geometric engineering to interpret them as holomorphic Euler characteristics of natural vector bundles over Hilbert schemes of points on the affine plane. Then they perfectly make sense mathematically.

This work is very preliminary, but I hope it could be developed further.

Most of time, I will give expository explanation of backgrounds, which I hope to be understandable to non-experts, and then finally state my result.

Pizza 6:15 - 7:15 (location TBA)

Mikhail Kapranov (Yale) 7:15-8:15, 939 Evans

Noncommutative differential operators, unparametrized paths and Hodge structures

Abstract: A noncommutative differential operator (NCDO) on a manifold X is a compatible system of linear differential operators acting in all vector bundles with connections on X . The ring of such operators can be seen as a highly noncommutative version of the mildly noncommutative ring of usual differential operators: the partial derivatives are replaced by formal covariant derivatives which no longer commute and account for the curvature data. The talk will explain the relation of NCDO with the space of formal germs of unparametrized paths. In particular, we will make precise the statement that a connection is uniquely defined, up to a formal germ of isomorphism, by all the higher covariant derivatives of the curvature evaluated at one point. This relation allows us to give a “gauge-theoretic” description of the category of mixed Hodge structures.

The Berkeley-Stanford Algebraic Geometry Colloquium covers the full range of topics in algebraic geometry, and is intended for a broader audience than a typical research seminar. Graduate students and researchers in nearby fields are particularly welcome. Each meeting features two speakers chosen for their contributions to the field and their expository ability.

To organize transportation from Stanford to Berkeley, please contact Ravi Vakil, Jun Li, Sam Payne, or Dragos Oprea.

<http://math.stanford.edu/ag/joint/>