WORKSHOP IN ALGEBRAIC GEOMETRY

SCHEDULE

December 19, 2016

10:30–11:25 Anna Barbieri
11:30–12:25 Florian Bouyer
Lunch
14:00–14:55 Stefan Schreieder
15:00– 15:50 Mattia Ornaghi

December 20, 2016
10:30–11:25 Carmelo Di Natale
11:30–12:25 Olaf Schnürer
Lunch
14:00–14:55 Riccardo Moschetti
15:00– 15:50 Diletta Martinelli

TITLES AND ABSTRACTS

A construction of Frobenius manifolds from stability conditions

Anna Barbieri

Given a suitable quiver Q there is an associated CY3 category $\mathcal{D}(Q)$ with a finite distinguished heart $\mathcal{A}$ with well-defined invariants counting semistable objects. We show that these data endow the space of stability conditions supported on $\mathcal{A}$ with a formal Frobenius type structure. Under restrictive assumptions, the Frobenius type structure can be pulled back to a family of genuine Frobenius manifold structures. The motivating examples is the quiver A_n. For $n < 6$ we can also verify that mutation-equivalent quivers give rise to structures which are different branches of the same semisimple Frobenius manifold. Joint work with J.Stoppa and T.Sutherland.

The Picard Group of a family of quartic K3 surfaces

Florian Bouyer

This talk starts with a family of quartic K3 surface, whose general member contains 320 conics. In algebraic geometry we sometimes want to study the Picard group of surfaces, so we explain how we found the Picard group of a general member of this family. If times allows it, along the way we will take a detour to briefly look at the Monodromy group of 320 conics.

Hodge Theory and Deformations of Affine Cones of Subcanonical Projective Varieties

Carmelo di Natale

We investigate the relation between the Hodge theory of a smooth subcanonical n-dimensional projective variety X and the deformation theory of the affine cone A_X over X. We start by identifying $H^{n-1,1}_{\text{prim}}(X)$ as a distinguished graded component of the module of first order deformations of A_X, and later on we show how to identify the whole primitive cohomology of X as a distinguished graded component of the Hochschild cohomology module of the punctured affine cone over X. In the particular case of a projective smooth hypersurface X we recover Griffiths isomorphism between the primitive cohomology of X and certain distinguished graded components of the Milnor algebra of a polynomial defining X. The main result of the article can be effectively exploited to compute Hodge numbers of smooth subcanonical projective varieties. We provide a few example computation, as well a SINGULAR code, for Fano and Calabi-Yau threefolds. This is a joint work with Enrico Fatighenti and Domenico Fiorenza.

Rational curves on fibered Calabi-Yau manifolds.

Diletta Martinelli

Calabi-Yau manifolds are of interest in both algebraic geometry and theoretical physics. In particular the problem of determining whether

Calabi-Yau manifolds do contain rational curves has big relevance in string theory. Moreover, a folklore conjecture in algebraic geometry predicts the existence of rational curves on every Calabi-Yau manifolds. There are several positive answers in dimension three but very little is known in higher dimension. I will talk about a joint work with Simone Diverio and Claudio Fontanari where we prove the existence of rational curves on Calabi-Yau manifolds of any dimension that admit an elliptic fibration. If time permits, I will show how to use this result to produce rational curves on Calabi-Yau manifolds that admit a fibration onto a curve whose fibers are abelian varieties.

Twisted derived categories in the case of cubic fourfolds containing a plane

Riccardo Moschetti

Kuznetsov proved that a component of the derived category of a generic cubic fourfold containing a plane is equivalent to the twisted derived category of a certain K3 surface. The original purpose of his work was to formulate a conjecture concerning the rationality of cubic fourfolds; then it has become clear that twisted derived categories play a central role in the study of the moduli space of cubic fourfolds. The whole theory is very rich from both the geometrical point of view and the side of derived categories and it allows several new directions which are worth further analysis. I will talk about some applications of the study of the derived category of a non generic cubic fourfold containing a plane.

A comparison between pretriangulated A_∞-categories and ∞-stable categories.

Mattia Ornaghi

In this talk we will prove that the A_∞-nerve of two quasi-equivalent A_∞-categories are weak-equivalent in the Joyal model structure. A consequence of this fact is that the A_∞-nerve of a pretriangulated A_∞-category is ∞-stable. Moreover we will give a comparison between the notions of pretriangulated A_∞-categories, pretriangulated dg-categories and ∞-stable categories.

DG enhanced six functor formalism and applications

Olaf Schnürer

We explain that Grothendieck-Verdier-Spaltensteinß six functor formalism for derived categories of sheaves on topological spaces can be lifted to dg enhancements, as soon as we work with ringed spaces over a base field. Some applications of this dg enhanced formalism are given.

Generic vanishing and minimal cohomology classes on abelian fivefolds

Stefan Schreieder

We classify generic vanishing subschemes of principally polarised abelian varieties in dimension five, showing that they exist only on Jacobians of curves and intermediate Jacobians of cubic threefolds, and confirming a conjecture of Pareschi and Popa in this case. Our result is implied by a more general statement about subvarieties of minimal cohomology class whose sum is a theta divisor. This is joint work with Casalaina-Martin and Popa.