

International conference «Categorical and analytic invariants in Algebraic geometry 3»

The Coherence of direct images of relative De Rham complex

K. Saito

(12 сентября 2016 г., 11:00)

We show the coherence of direct images of relative De Rham complex for holomorphic map Φ with a suitable boundary condition. When the map Φ is proper, the result is classical and is well-known since the entries of Hodge to De Rham spectral sequence is already coherent. Therefore, our interest is the case for a non-proper (open) map which possesses critical points (not necessarily isolated). Then, the result implies certain finitely generatedness of vanishing cycles for the critical points. For the proof, we develop a new concept of Koszul-De Rham algebra, which seems to be of interest by itself.

Towards logarithmic Hochschild complex

A. I. Efimov

(12 September 2016, 12:20)

We will explain how to reconstruct the log de Rham complex (more precisely, its mixed version) of a smooth algebraic variety from the DG category of perfect complexes. The construction works for an arbitrary DG category and is functorial. It uses non-commutative K-motives. The main ingredient is Quillen's Devissage Theorem. We will also explain how to obtain the weight filtration via Bondarko's weight structures on triangulated categories.

Dimer models with group actions

A. Ishii

(12 September 2016, 15:00)

A dimer model is a graph embedded in the real two torus whose nodes are colored black or white, which satisfies a certain condition. A dimer model determines a lattice polygon called the characteristic polygon. If a dimer model is “consistent”, then it describes (commutative or non-commutative) crepant resolutions of Gorenstein affine toric 3-fold associated with the characteristic polygon. In this talk, we consider the relation between dimer models with finite group action and crepant resolutions of finite quotients of Gorenstein affine toric 3-folds. Further we discuss the existence of consistent dimer models for a given lattice polygon with a finite group action. This is a joint work with Kazushi Ueda and Alvaro Nolla de Celis.

On entropy of autoequivalences of smooth projective varieties

A. Takahashi

(13 September 2016, 11:00)

Entropy for endofunctors of triangulated categories is defined by Dmitrov–Haiden–Katzarkov–Kontsevich. Based on the joint work with Kohei Kikuta, the categorical entropy of a surjective endomorphism of a complex smooth projective variety is shown to be equal to its topological entropy, which is done by DHKK under a certain technical condition.

It is natural to expect a generalization of the fundamental theorem by Gromov–Yomdin: the entropy of an autoequivalence of a complex smooth projective variety should be given by the logarithm of the spectral radius of the induced automorphism of the numerical Grothendieck group. This conjecture holds for elliptic curves (Kikuta’s result) and if the canonical or anti-canonical sheaf is ample.

Automorphisms of positive entropy on some hyper-Kähler manifolds via derived automorphisms of K3 surfaces

G. Ouchi

(13 September 2016, 12:20)

Recently, Amerik and Verbitsky proved the existence of hyperKähler manifolds of Picard number two with automorphisms of positive entropy for a given deformation type of hyperKähler manifolds with the second betti number greater than four. However, explicit constructions of such hyperKähler manifolds are not known. In this talk, I would like to construct examples of automorphisms of positive entropy on hyperKähler manifolds of Picard number two as moduli spaces of stable objects in derived categories of K3 surfaces of Picard number one. Then the automorphisms are induced by autoequivalences of positive entropy on derived categories of K3 surfaces.

Towards tropical mirror symmetry

A. S. Losev

(14 September 2016, 11:00)

We consider the tropical limit of Gromov–Witten theory. We show that for toric variety the counting of tropical curves can be expressed in terms of BCOV action that we will explain in some detail. We conjecture the generalization of this construction to the case of general tropical target manifold.

Mirror symmetry for Fano orbifolds and Laurent inversion

A. Corti

(14 September 2016, 12:20)

I discuss a program to construct Fano/LG pairs in higher dimensions, explain some general features, show an important special case and give some examples.

Frobenius structures on Hurwitz spaces and confluent KZ equations

A. Ikeda

(14 September 2016, 15:00)

The Hurwitz space is the moduli space of meromorphic functions on the Riemann surface. Dubrovin constructed Frobenius structures on Hurwitz spaces by using the theory of K. Saito. In this talk, we give the equivalence between \mathcal{D} -modules of Frobenius structures on Hurwitz spaces and confluent KZ equations. We also discuss the representation of framed braid groups which comes from the monodromy representation of confluent KZ equations.

Generalised braid category

T. Logvinenko

(14 September 2016, 16:20)

I will describe a joint project with Rina Anno: a categorification of generalised braids. These are the braids whose strands are allowed to touch in a certain way. They have multiple endpoint configurations and can be non-invertible, thus forming a category rather than a group. A decade old conjecture states that this category acts on the derived categories of (the cotangent bundles of) full and partial flag varieties.

The basic building blocks of this conjectural action are spherical, P- and (what we expect to be) Grassmanian functors together with the equivalences they induce. I will describe our present progress and future expectations.

Derived categories and homogeneous varieties

A. V. Fonarev

(14 September 2016, 17:40)

We will discuss the structure of the bounded derived categories of coherent sheaves on Grassmannians of type A and the state of the art concerning type C.

On Serre dimension of finite dimensional algebras

A. Elagin

(15 September 2016, 11:00)

It is known that a smooth projective variety is not always uniquely determined by its bounded derived category of coherent sheaves. Still the dimension of the variety is determined uniquely. Indeed, iterations of Serre functor on the derived category “move complexes to the left” with the speed equal to the dimension. This lead to the notion of “Serre dimension” of a good triangulated category. We discuss this notion focusing on derived categories of finite dimensional algebras.

The affine line is a zero divisor in the Grothendieck group

K. Ueda

(15 September 2016, 12:20)

We will discuss an example of a pair (X, Y) of Calabi-Yau 3-folds such that $[X] - [Y]$ is a non-zero element in the Grothendieck ring of varieties annihilated by the class of the affine line. If the time permits, we will also discuss an example of a pair (X, Y) of non-isomorphic derived-equivalent K3 surfaces such that $[X] - [Y]$ is annihilated by a power of the affine line. This is a joint work in progress with Kenji Hashimoto, Daisuke Inoue, Atsushi Ito, Makoto Miura and Shinnosuke Okawa.

Poset filtrations of triangulated categories in algebra and geometry

A. Bodzenta-Skibinska

(15 September 2016, 15:00)

For a finite poset S and a triangulated category \mathcal{D} , I will define an (admissible, strict) S -filtration on \mathcal{D} . I will describe how to glue a t-structure via such a filtration. I will give examples of poset filtrations and the glued t-structures for quasi-hereditary algebras and birational morphisms of smooth surfaces. I will also introduce a generalisation of Ringel duality and describe it in the above examples.

A trichotomy for the autoequivalence groups of derived categories on surfaces

H. Uehara

(15 September 2016, 16:20)

We study the group of autoequivalences of the derived categories on smooth projective surfaces, and show a trichotomy of types of the groups, that is, of K3 type, of elliptic surface type and of general type. We also pose a conjecture on the description of each type of the groups, and prove it in some special cases.

On double covers of quadratic and Lagrangian degeneracy loci

A. G. Kuznetsov

(16 September 2016, 11:00)

A two-dimensional quadratic cone has a smooth double cover ramified only over its vertex. This is a prototypical example of a double cover of a quadratic degeneracy locus. I will discuss a construction of such double covers in a more general setting (including Lagrangian degeneracy loci) via reflexive sheaves.

Noncommutative Hirzebruch surfaces

Sh. Okawa

(16 September 2016, 12:20)

By definition, Hirzebruch surface is a \mathbb{P}^1 bundle over \mathbb{P}^1 . Isomorphism classes of such surfaces are classified by non-negative integers d , and those with the same parity are connected by unobstructed deformations.

Flat deformations of the abelian category of coherent sheaves on Hirzebruch surface, or noncommutative deformations, have been studied by several people. Contrary to the case of del Pezzo surfaces, nc deformations of the d -th Hirzebruch surface are obstructed if $d > 3$. On the other hand, Michel Van den Bergh introduced the notion of sheaf \mathbb{Z} -algebras and proved that any noncommutative deformation of a Hirzebruch surface over a complete Noetherian local ring is obtained from a sheaf \mathbb{Z} -algebra associated to a

locally sheaf bimodule of rank 2 on the projective line. In this talk, I will give some introduction to this subject and explain our result on the geometric classification of locally free sheaf bimodules. I will also explain some results from the point of view of derived categories, including a version of McKay correspondence. My talk will be based on a joint work in progress with Izuru Mori and Kazushi Ueda.

Explicit Dolgachev surfaces, exceptional collections, and phantoms

I. V. Karzhemanov

(16 September 2016, 15:00)

I will describe one explicit construction of a Dolgachev surface, exceptional collection on it, and the so-called “phantom” that appears. If time permits I will also discuss some generalizations of relevant categorical phenomena.

Hantzsche-Wendt manifolds (joint talk on the conference and the Seminar of the Laboratory of Algebraic Geometry at HSE)

A. Szczepanski

(16 September 2016, 17:00)

There are flat Riemannian manifolds of odd dimension n with holonomy group $(\mathbb{Z}_2)^{n-1}$. From Bieberbach theorems its fundamental group G is torsion free and defines a short exact sequence $0 \rightarrow \mathbb{Z}^n \rightarrow G \rightarrow (\mathbb{Z}_2)^{n-1} \rightarrow 0$, where \mathbb{Z}^n is a maximal abelian subgroup in G . This class of manifolds (groups) has many very interesting properties:

- they are rational homology spheres
- they are homology rigid i.e M is diffeomorphic to M' if and only if cohomology rings $H^*(M, F_2)$ and $H^*(M', F_2)$ are isomorphic
- they have no Spin structure