PKU-KUL Joint Algebraic Geometry Workshop

September 2-4, 2019
Room 77201, Jingchunyuan 78, BICMR, Peking University

FENG HAO (University of Munich/KU Leuven)

Projective threefolds admitting nowhere vanishing holomorphic 1-forms

A celebrated result of Popa and Schnell states that on a smooth complex projective variety of general type any holomorphic 1-form has at least one zero. The existence of a holomorphic 1-form without zeros forces the variety to be of special type. In this talk I will give a full classification of smooth projective threefolds which admit nowhere vanishing holomorphic 1-forms. This is a joint work with S. Schreieder.

HAIDONG LIU (Kyoto University/Peking University)

On the log canonical ring of projective plt pairs with the Kodaira dimension two

We prove that the log canonical ring of projective plt pairs with the Kodaira dimension two is finite generated. We also show some partial results on lc pair cases. It is a first nontrivial step towards the complete solution of the finite generation conjecture (abundance conjecture) for higher dimensional algebraic varieties. This is a joint work with Osamu Fujino.

NGUYEN HUU KIEN (KU Leuven)

Introduction to Igusa's program for local-global principle of forms of higher degree

In this talk, I will introduce the idea of Igusa to generalize local-global principle (Hasse principle) to forms of higher degree. This idea suggest us to have a Poisson summation formula of Siegel-Weil type. Igusa showed that the existence of such Poisson formula can follow by a conjecture on exponential sums modulo p^m. I will introduce some progress on the exponential sum conjecture and some expected results in Hasse principle may be obtained by the program of Igusa.

MARCEL RUBIÓ (KU Leuven/Stockholm University)

Homotopy of singular varieties via L-infinity pairs

In this talk we show that for a complex algebraic variety with no weight-zero 1-cohomology classes, the fundamental group is strongly restricted; in particular, the irreducible components of the cohomology jump loci of rank one local systems containing the constant sheaf are complex affine tori. We prove this by studying the cohomology jump loci (or generalized Brill-Noether loci) via L_∞ pairs: the yoga here being that a deformation problem with cohomology constraints is governed by an L_∞ pair (L, M), consisting of an L_∞ algebra L and an L-module M. The results we obtain are in contrast to the work by Simpson, Kapovich and Kollár, stating that every finitely

presented group is the fundamental group of an irreducible complex algebraic variety with only normal crossings and Whitney umbrellas as singularities. This is joint work with Nero Budur.

DMITRY SUSTRETOV (KU Leuven)

Degenerations of complex curves with a flat metric

Let X_t be a holomorphic family of smooth compact complex curves of genus ≥ 1 over a punctured disc, and let Ω be a relative holomorphic 1-form on the total space of the family. Consider the pseudo-Kähler metric on X_t with the Kähler form $\frac{i}{2}\Omega \wedge \bar{\Omega}$ and further rescale it so that the diameter of X_t is constantly 1. I describe the Gromov-Hausdorff limit of X_t as t tends to 0 in terms of a certain function (weight function) on the dual intersection complexes of models of X over the disc such that the central fibre with the reduced structure is an snc divisor. There are two possibilities: collapsed, when the limit is a metric graph, and non-collapsed, when the limit is a finite number of complex curves with flat metric glued along finitely many points. The weight function is naturally described using the language of non-archimedean geometry; it was introduced by Kontsevich and Soibelman and further studied by Mustaţă, Nicaise and Xu.

ROBIN VAN DER VEER (KU Leuven)

Zero loci of Bernstein-Sato ideals

In this talk I will present recent work with Nero Budur, Lei Wu and Peng Zhou on the relation between Bernstein-Sato ideals and cohomology support loci. We prove a conjecture of Nero Budur relating the Bernstein-Sato ideal of a finite collection of multivariate polynomials with cohomology support loci of rank one complex local systems. This generalizes a classical theorem of Malgrange and Kashiwara relating the b-function of a multivariate polynomial with the monodromy eigenvalues on the Milnor fibers cohomology.

LENA VOS (KU Leuven)

The monodromy conjecture for a space monomial curve with a plane semigroup

This talk discusses a proof of the monodromy conjecture for a space monomial curve that appears as the special fiber of an equisingular family of curves with a plane branch as generic fiber. Roughly speaking, the monodromy conjecture states that every pole of the motivic, or related, Igusa zeta function induces an eigenvalue of monodromy. The determination of the motivic zeta function and its poles is joint work with H. Mourtada and W. Veys; the study of the monodromy eigenvalues and proof of the monodromy conjecture is joint work with J. Martín-Morales and W. Veys.

LEI WU (University of Utah)

Monodromy conjecture of topological zeta-functions

I will review the (weak and strong) monodromy conjecture for topological zeta-functions and discuss some of the known cases, for instance the weaker version for hyperplane arrangements.

Then I will talk about a stronger conjecture for hyperplane arrangements. By a result of Budur-Mustaţă-Taitler, it implies the strong monodromy conjecture for hyperplane arrangements. At last, I will mention some strategy to prove it using relative characteristic cycles.

Enlin Yang (Peking University)

On the characteristic class of a constructible étale sheaf

In this talk, I will first recall some basic properties of relative cohomological characteristic classes of constructible étale sheaves. Then we propose a localization formula, which implies a fibration formula for cohomological characteristic classes. This fibration formula implies that we are able to calculate cohomological characteristic classes in terms of Saito's characteristic cycles. This is a joint work in progress with Yigeng Zhao.

Naizhen Zhang (KU Leuven/Leibniz University Hannover)

Linked flag varieties as quiver Grassmannians and Mustafin varieties

In this talk, I will introduce the notion of linked flag varieties, as a special kind of degeneration of classical flag varieties. They are examples of quiver Grassmannians and we show that in nice situations they can be locally modeled by Mustafin varieties, thus establishing some basic geometric properties of them. I will mention an application towards the study of degeneration of moduli of linear series on curves, which was the original motivation of our project (joint with Xiang He). If time permits, I will also mention an interesting connection with tropical geometry.

Xiaolei Zhao (UC Santa Barbara)

A refined derived Torelli theorem for Enriques surfaces

I will start by recalling results on determining varieties via their derived categories of coherent sheaves. Then I will state a refined derived Torelli theorem for Enriques surfaces, saying that two Enriques surfaces are isomorphic if and only if their Kuznetsov components are Fourier-Mukai equivalent. As an application of our method, we study a conjecture by Ingalls and Kuznetsov about the derived categories of Artin-Mumford quartic double solids. This is based on a joint work with Li, Nuer and Stellari.

Chuyu Zhou (Peking University)

Some criteria for uniform K-stability

I will give a brief introduction to K-stability, including some invariants and some criteria for K-stability by using these invariants. In particular, I will give a criterion for uniform K-stability by using techniques from Birkar's solution to the BAB conjecture. It is a joint work with Ziquan Zhuang.