

# Title and Abstract

## **Kento Fujita**

**Title:** Toward criteria for K-stability of log Fano pairs

**Abstract:** We survey recent progresses for "a valuative criterion" for (uniform) K-stability of log Fano pairs.

## **Jingjun Han**

**Title:** Boundedness of singularities admitting an epsilon-PLT blow-up

**Abstract:** Every klt singularity has a plt blow up. In this talk, we will study the singularities admitting an epsilon-plt blow-up. These singularities include smooth points, exceptional singularities and fixed klt germs. As an application of BAB conjecture which was proved by Birkar, we will show that Cartier index of any Weil divisor is bounded for such singularities. As corollaries, we will show that for exceptional singularities, ACC for the minimal log discrepancies, ACC for normalized volumes and ACC for a-log canonical thresholds hold. This is an ongoing joint work with Jihao Liu and Vyacheslav V. Shokurov.

**Qifeng Li**

**Title:** Fano deformation rigidity of some rational homogeneous spaces

**Abstract:** A Fano manifold is said to be rigid under Fano deformation if any deformation of it, which is also a Fano manifold, must be biholomorphic to itself. The deformation rigidity property of rational homogeneous spaces are get attentions since the series works of J.-M. Hwang and N. Mok on Picard number one cases (whose deformations are automatically Fano manifolds). Fano deformation rigidity of rational homogeneous spaces becomes more interesting since counterexamples of special cases with small Picard numbers are found. In this talk, I will present a program to verify the Fano deformation rigidity of a homogeneous space via that property of homogeneous submanifolds. Then the Fano deformation rigidity of complete flag manifolds, almost complete flag manifolds and some other cases will be checked.

**Jie Liu**

**Title:** Positivity of the second Chern class of Fano manifolds

**Abstract:** A projective manifold is called Fano if its anticanonical divisor is ample. Fano manifolds are of great interest in numerous parts of mathematics such as birational/algebraic geometry, differential geometry, arithmetic geometry, etc, due to the fascinating symmetries they possess. Moreover, if  $X$  is Fano manifold of Picard number one, it is conjectured that the tangent bundle of  $X$  should be stable, and then the famous Bogomolov inequality holds for  $X$ . In this talk, I will explain how to get a weaker version of Bogomolov inequality for Fano manifolds with Picard number one using rational curves without assuming the stability of tangent bundles. If time allows, I will show how this inequality can be applied to the study of the explicit geometry of Fano manifolds of coindex four.

**Ruochuan Liu**

**Title:** Compatibility of de Rham comparison

**Abstract:** We show that over smooth algebraic variety over  $p$ -adic fields, the de Rham comparison for étale  $Z_p$ -local systems is compatible with Poincaré duality.

## **Yuchen Liu**

**Title:** Openness of uniform K-stability in families of Q-Fano varieties

**Abstract:** K-stability is the algebraic notion which is supposed to characterize whether a Fano variety admits a Kähler-Einstein metric. One important feature of the notion of K-stability is that it is supposed to give a nicely behaved moduli space. To construct the K-moduli space of Q-Fano varieties as an algebraic space, one important step is to prove the openness of K-(semi)stable locus in families. In this talk, I will explain the proof of openness of uniform K-stability in families of Q-Fano varieties. This is achieved via showing the lower semi-continuity of delta-invariant, an interesting invariant introduced by Fujita and Odaka similar to Tian's alpha-invariant. This is a joint work with Harold Blum.

## **Xin Lv**

**Title:** Slope of fibred surfaces and its applications

**Abstract:** For a fibred surface  $f: S \rightarrow B$ , its slope  $\lambda_f$  is heavily related to the geometrical properties of both the fibers of  $f$  and the surface  $S$  itself. In this talk, I will concern about the lower bound of the slope, and its applications. This is a joint work with Prof. Kang Zuo.

## **Mao Sheng**

**Title:** Decomposition theorem with intersection condition

**Abstract:** One of major achievements of Ogus-Vologodsky in their nonabelian Hodge theory in positive characteristic is the generalization of the decomposition theorem of Deligne-Illusie to the case with coefficients. In this talk, I am going to report our recent work on the decomposition theorem with intersection condition, which generalizes the previous decomposition theorems in a natural way. The intersection condition arises naturally in the treatment of singularities coming from a normal crossing divisor. In Hodge theory in large, this can be traced back to the notion of perversity due to Beilinson-Berstein-Deligne in their work on  $\mathbb{Q}$ -adic sheaves. Ours is its reflection on crystals in positive characteristic. As application, we prove that the Hodge spectral sequence of the intersection de Rham complex, attached to a strict  $\mathbb{Q}$ -torsion logarithmic Fontaine module, degenerates at  $E_1$ . We establish also a new Kodaira-Saito type vanishing theorem for intersection cohomologies. This is a joint work (in progress) with my student Zhang Zebao.

**Sho Tanimoto**

**Title:** Thin exceptional sets in Manin's Conjecture

**Abstract:** Manin's conjecture predicts the asymptotic formula for the counting function of rational points of bounded height on a Fano variety after removing the contribution from the exceptional set. In this talk we propose a conjectural description of exceptional sets using binational geometry and prove that our proposed set is small (thin) using the MMP (especially BAB conjecture) and Hilbert Irreducibility Theorem. This is joint work with Brian Lehmann and Akash Sengupta.

**Jian Xiao**

**Title:** Hodge-index type inequalities, hyperbolic polynomials and complex Hessian equations

**Abstract:** It is noted that using complex Hessian equations and the concavity inequalities for elementary symmetric polynomials implies a generalized form of Hodge index inequality. Inspired by this result, using Garding's theory for hyperbolic polynomials, we obtain a mixed Hodge-index type theorem for classes of type  $(1,1)$ . The new feature is that this Hodge-index type theorem holds with respect to mixed polarizations in which some satisfy particular positivity condition, but could be degenerate and even negative along some directions.

**Songyan Xie**

**Title:** Hyperbolicity properties of general complete intersections

**Abstract:** We survey some recent results around hyperbolicity properties of general complete intersections.

**Hang Xue**

**TBA**

**Xinyi Yuan**

**Title:** Weak Lefschetz theorems for Brauer groups

**Abstract:** In this talk, I will introduce some Lefschetz-type theorems for Brauer groups of hyperplane sections of smooth projective varieties. This is more or less known when the dimension of the hyperplane section is at least 3, but we will also introduce a version which lowers the dimension from 3 to 2. As a consequence, I will reduce the Tate conjecture for divisors on smooth projective varieties from general dimensions to dimension 2, and thus prove a result of Morrow by a different method.

**Ziquan Zhuang**

**Title:** Birational superrigidity is not an open property

**Abstract:** A Fano variety is said to be birationally superrigid if every birational map from it to a Mori fiber space is an isomorphism. In this talk, we investigate whether there exists a nice moduli for this very special class of Fano varieties. Such moduli would exist if birational superrigidity is an open property in family. We show that this naive approach doesn't work by providing a counterexample.