The 5th Korea-France Conference in Mathematics
Institut de Mathématique de Bordeaux
July 15-18 2025

Abstracts:
Algebraic-Analytic Geometry / Topology

Tuesday 5:15 – 16:00 **Cho, Ye-Won Luke**

Affiliation: Gyeongsang National University

Title: Gromov Kähler hyperbolicity and eigenvalue estimates on bounded symmetric domains

Abstract: In 1991, Gromov introduced the notion of Kähler hyperbolic manifolds which in particular generalizes Kähler manifolds with Riemannian sectional curvature negatively pinched from above. Gromov's basic estimate on such manifolds yields a vanishing theorem for harmonic forms and also a lower bound for the eigenvalues of the Laplacian of the given Kähler metric. The bound is determined by a uniform constant and the so-called 'Kähler hyperbolicity length' of the metric. In this talk, I shall explain a method to obtain eigenvalue estimates for the Laplacian of the complete Kähler-Einstein metrics on bounded symmetric domains using the aforementioned estimate. The method in particular provides the optimal eigenvalue estimate on the complex hyperbolic space (and polydiscs) which is sharper than McKean's estimate(1970). This is joint work with Young-Jun Choi and Kang-Hyurk Lee.

Thursday 14:00 – 15:00 **Choi, Young-Jun**

Affiliation: Pusan National University

Title: A characterization of the unit ball via the Kahler-Einstein potential and towards bounded symmetric domains

Abstract: Characterizing the universal coverings of negatively curved compact Kähler manifolds is a longstanding problem in complex geometry. Wong and Rosay proved that if the universal covering is a bounded smooth domain, then it must be biholomorphic to the unit ball. On the other hand, Frankel showed that if the universal covering is a bounded convex domain, then it is necessarily a bounded symmetric domain. Both results rely on the scaling method, a powerful technique that is not easily applicable to general complete Kähler manifolds.

In this talk, we will discuss a characterization of the unit ball via the Kähler-Einstein potential and consider how this approach can be extended to bounded symmetric domains. This is based on joint work with Kang-Hyurk Lee and Aeryeong Seo.

Thursday 8:30 – 9:30 **Claudon, Benoît**

Affiliation: Université de Rennes

Title: Projectivity criteria for morphisms

Abstract: We will explain natural generalizations in the relative setting of two classical projectivity criteria for Kähler manifolds, namely the Kodaira and the Moishezon criteria. This is a joint work with Andreas Höring.

Wednesday 16:30 – 17:30 **Delcroix, Thibaut**

Affiliation: University of Montpellier

Title: Canonical metrics in weighted Kähler geometry

Abstract: In weighted Kähler geometry, we consider Kähler manifolds equipped with a torus action, and a fixed positive function on the moment polytope. I will introduce this setting, as well as the notions of canonical metrics in weighted Kähler geometry: weighted solitons and weighted cscK metrics. I will then review some results on existence of such metrics, and applications to the more classical Kähler-Einstein metrics, Kähler-Ricci solitons and Calabi's extremal Kähler metrics.

Tuesday 14:00 – 15:00 **Floris, Enrica**

Affiliation: University of Poitiers

Title: On algebraic subgroups of the Cremona group

Abstract: The study of connected algebraic subgroups of the Cremona group is a classical way of deepening the understanding of the Cremona group.

Via the Weil regularisation theorem and the Minimal Model Program, to such a group we associate a rational Mori fibre space on which it acts regularly.

In this talk, we will discuss the notion of maximal connected algebraic subgroups of the Cremona group, and its relation with the geometry of the associated Mori fibre spaces.

This is a work in collaboration with A. Fanelli and S. Zimmermann.

Thursday 15:15 – 16:00 **Fu, Kai**

Affiliation: University of Bordeaux

Title: Siegel–Veech Measures of Convex Flat Cone Spheres

Abstract: A convex flat cone sphere is a Riemann sphere equipped with a conformal flat metric with conical singularities, all of whose cone angles are less than 2π. Classical results of Siegel concern the asymptotic count of lattice points in bounded subsets of $\mathbb{R}^n$. Inspired by this, Veech introduced an analogous counting formula for geodesics on translation surfaces, now known as the Siegel–Veech formula.

In this talk, I will present a generalization of the Siegel–Veech theory to convex flat cone spheres. I define a Siegel–Veech measure associated with their moduli space, and show that it is absolutely continuous and piecewise real analytic. This provides a new framework for studying counting problems for geodesics in the setting of convex flat cone spheres.

Wednesday 8:30 – 9:30 **Kim, Dano**

Affiliation: Seoul National University

Title: L2 extension of holomorphic functions and log canonical places

Abstract: The theory of L2 extension theorems is a central topic in several complex variables with numerous applications to complex geometry and complex analysis. They are analogous to vanishing theorems in algebraic geometry and often serve as a stronger analogue with applications in algebraic geometry as in the proof of Siu's invariance of plurigenera. In this talk, in the opposite direction, I will discuss how ideas from algebraic geometry are crucially used in understanding some very general L2 extension theorems via the theory of log canonical pairs. This talk is partly based on joint work with Xu Wang (Trondheim).

Wednesday 11:00 – 12:00 **Kim, Sung Yeon**

Affiliation: Center for Complex Geometry, IBS

Title: Proper holomorphic maps between bounded symmetric domains with small rank differences

Abstract: In this talk, we study the rigidity of proper holomorphic maps $f\colon \Omega \to \Omega'$ between irreducible bounded symmetric domains Ω and Ω' with small rank differences: $2 \leq \operatorname{rank}(\Omega') < 2\operatorname{rank}(\Omega) - 1$. More precisely, if either Ω and Ω' have the same type or Ω is of type III and Ω' is of type I, then up to automorphisms, f is of the form $f = \imath \circ F$, where $F = F_1 \times F_2 \colon \Omega \to \Omega'_1 \times \Omega'_2$. Here Ω'_1, Ω'_2 are bounded symmetric domains, the map $F_1 \colon \Omega \to \Omega'_1$ is a standard embedding, $F_2 : \Omega \to \Omega'_2$, and $\imath \colon \Omega'_1 \times \Omega'_2 \to \Omega'$ is a totally geodesic holomorphic isometric embedding. As a consequence, $f : \Omega \to \Omega'$ is a holomorphic totally geodesic isometric embedding with respect to Kobayashi metrics. Moreover we show that, under the rank condition above, there exists no proper holomorphic map $f : \Omega \to \Omega'$ if Ω is of type I and Ω' is of type III, or Ω is of type II and Ω' is either of type I or III. This is a joint work with N. Mok and A. Seo.

Tuesday 16:30 – 17:30 **Koziarz, Vincent**

Affiliation: University of Bordeaux

Title: On the rigidity of complex hyperbolic lattices

Abstract: In this talk, I will start by explaining why Margulis' superrigidity fails in the complex hyperbolic setting. I will then review a number of results that show that complex hyperbolic lattices nevertheless possess rigidity properties. I will also mention some open questions.

Thursday 9:45 – 10:30 **Kwon, Minseong**

Affiliation: KAIST & IBS-CCG

Title: Algebraic hyperbolicity of adjoint line bundles on spherical varieties

Abstract: Algebraic hyperbolicity was introduced by Demailly as an algebro-geometric analogue of Kobayashi hyperbolicity. It is well known that on a smooth complex projective variety, a sufficiently positive line bundle is algebraically hyperbolic, in the sense that zero loci of its very general sections are algebraically hyperbolic. Recently, Moraga and Yeong conjectured an optimal degree bound for adjoint line bundles which guarantees algebraic hyperbolicity, and proved the conjecture for toric varieties. In this talk, I will consider spherical varieties, which form a large class of almost homogeneous varieties, including toric varieties. Namely, I will give a positive answer to the question of Moraga and Yeong for spherical varieties with smooth orbit closures. This talk is based on a joint work with Haesong Seo.

Wednesday 9:45 – 10:30 **Lapuyade, André**

Affiliation: University of Poitiers

Title: Classification of horospherical divisorial contraction of rank 2 toward a fixed point.

Abstract: This talk classifies equivariant divisorial contractions on rank 2 horospherical varieties that contract a divisor to a fixed point. Inspiered by Kawakita's theorem on 3-folds contractions, we show that such contractions are weighted blow-ups, and give a combinatorial criterion for terminality based on the weights.

Wednesday 14:00 – 15:00 **Lee, Nam-Hoon**

Affiliation: Hongik University

Title: Some examples of Calabi–Yau threefolds with $h^{1,1} = h^{1,2} = 1$

Abstract: The talk is a report on the discovery of a certain collection of Calabi–Yau threefolds with $h^{1,1} = h^{1,2} = 1$. They are Moishezon and have rational maps to $\mathbb{P}^3$ of degree two. These examples are made by smoothing normal crossing varieties.

Friday 8:30 – 9:30 **Park, Kyeong-Dong**

Affiliation: Gyeongsang National University

Title: Deformation rigidity of the double Cayley Grassmannian

Abstract: The double Cayley Grassmannian is a unique smooth equivariant completion with Picard number one of the 14-dimensional exceptional complex Lie group, and it parametrizes eight-dimensional isotropic subalgebras of the complexified bi-octonions. In this talk, I will explain the rigidity of the double Cayley Grassmannian under Kähler deformations. This means that for any smooth projective family of complex manifolds over a connected base of which one fiber is biholomorphic to the double Cayley Grassmannian, all other fibers are biholomorphic to the double Cayley Grassmannian. This talk is based on joint works with Shin-young Kim.

11:00 – 12:00 **Thursday Seo, Aeryeong**

Affiliation: Kyungpook National University

Title: Geometry of Kähler Manifolds with Kähler Potentials of Constant Gradient Norm

Abstract: In this talk, I will discuss the geometry of Kähler manifolds that admit Kähler potentials with constant gradient norms, modeled on unit balls in complex Euclidean spaces. More precisely, the Kähler potential of the unit ball is unique up to automorphisms among Kähler potentials whose differentials have constant norms. As an application, if a domain in Cn that is biholomorphic to a unit ball is affine homogeneous, then it is affine equivalent to the Siegel domain Hn. If time permits, I will also discuss the universal covering of a compact Kähler manifold with an ample canonical bundle, which admits a global potential function for the Kähler-Einstein metric whose gradient length is a minimal constant.

15:15 – 16:00 **Wednesday Sha, Zehao**

Affiliation: Institut Fourier

Title: The Kähler-Ricci Soliton on Bounded Pseudoconvex Domains

Abstract: In this short talk, I will show that on bounded pseudoconvex domains in $\mathbb{C}^n$, a gradient Kähler-Ricci soliton of C^1-bounded geometry with the Ricci curvature negatively pinched outside a compact subset must reduce to a Kähler-Einstein metric. Furthermore, I will give an analogue of Cheng's conjecture for the Bergman Kähler-Ricci soliton based on Huang-Xiao's work. If time permits, I will also characterise some model domains endowed with a K ähler-Ricci soliton.

11:00 – 12:00 **Friday Voisin, Claire**

Affiliation: Sorbonne Université

Title: Smoothing cycle classes of small dimension

Abstract: The cycle class of a closed analytic subset of codimension c in a compact complex manifold X of dimension n was constructed by Borel and Haefliger in 1962. They asked in the same paper if the group of cycle classes can be generated by classes of smooth closed analytic subsets, when X is projective. Counterexamples to this statement have been constructed by Hartshorne-Rees-Thomas, an then Debarre, Benoist... in the case where c is smaller than or equal to n-c (so the dimension of the cycle is greater than or equal to half the dimension of X). I proved in joint work with Kollár that the answer to Borel-Haefliger's question is yes in the remaining case, when the dimension of the cycle is smaller than half the dimension of X. I will sketch the proof of this result.

Friday 9:45 – 10:30 **Weibel, Laurine**

Affiliation: University of Bretagne Occidentale

Title: Finiteness results for hyperbolic orbifold pairs

Abstract: In 1913, De Franchis proved that the number of surjective holomorphic maps from X to Y is finite when X and Y are compact Riemann surfaces and Y has genus at least 2. This result was extended to higher dimensions by Noguchi for hyperbolic varieties, and Campana established an analogous statement for hyperbolic orbifold curves. In this talk, we will introduce various notions related to hyperbolicity and orbifolds in order to understand certain finiteness properties of holomorphic maps

between hyperbolic varieties or between hyperbolic orbifold pairs, thus generalizing the De Franchis theorem.

Thursday 16:30 – 17:30 **Xie, Zhixin**

Affiliation: Université de Lorraine

Title: On the relative cone conjecture for families of hyperkähler manifolds

Abstract: The Kawamata-Morrison cone conjecture predicts the geometry of the nef cone and the movable cone of a variety with trivial canonical class. In this talk, we will discuss families of varieties with trivial canonical class and vanishing irregularity. We will study the relative nef cone and the relative movable cone of such families, using machinery from the Minimal Model Program. As application, we will show the relative cone conjecture for families whose very general fibre is a projective hyperkähler manifold of one of the known deformation types. This is joint work with Andreas Höring and Gianluca Pacienza.