Conference on Complex Geometry

IBS Center for Complex Geometry

November 9–November 13, 2026

Speaker: **Rodolf Aguilar Aguilar**

Title: Anchored Rational Curves, Logarithmic Clemens Conjectures, and Conifold Transitions

Abstract: We will introduce anchored rational curves on smooth pairs and then focus on the three-dimensional (anchored) Calabi–Yau case. In this setting, in joint work with Adrian Zahariuc, we proved a logarithmic version of the Clemens conjectures. Following the analogy with the Calabi–Yau setting and as a corollary of our work, we will discuss log conifold transitions. These are smoothings of nodal threefolds that may easily leave the Kähler world but nevertheless have interesting properties: they contain many rational curves and admit pure polarized Hodge structures. Time permitting, I will discuss some open questions and future research directions.

Speaker: **Cong Ding**

Title: On Mok's uniqueness problem of holomorphic isometries from complex unit balls to irreducible boundedsymmetric domains of rank at least two

Abstract: The study of holomorphic isometric embeddings has its origins in the work of Bochner on Hermitian geometry and Calabi on isometric embeddings of complex manifolds. Interest in this problem was renewed by Clozel-Ullmo on the study of modularity of algebraic correspondences on Shimura varieties. For holomorphic isometry between bounded symmetric domains, Hermitian metric rigidity theory of Mok implies total geodesy when the source is irreducible of rank at least two. Thus, for an irreducible source, nonstandard holomorphic isometries can occur only when the source is a complex unit ball. Mok had established a fundamental existence theorem of such nonstandard holomorphic isometric embedding, by considering the intersection of the bounded symmetric domain with the cone of minimal rational curves through a regular boundary point. The embedding is called Mok embedding. Recently, we prove that every holomorphic isometric embedding from a complex unit ball of maximal dimension to a classical irreducible bounded symmetric domain of rank at least two that is not biholomorphic to a Type IV domain is equivalent to Mok embedding,which completely resolves a problem of Mok. This is a joint work with Yuan Yuan.

Speaker: **Cecil Gachet**

Title: On the deformation types of the many Calabi—Yau threefolds birational to the Schoen threefold

Abstract: It is now well-known that two birationally equivalent hyperkähler manifolds must belong to the same deformation family, as complex manifolds. This property is known to fail for other classes of varieties with trivial first Chern class, such as Calabi—Yau threefolds. In this talk, I will report on joint work in progress with Isabel Stenger and Long Wang, where we investigate a rather dramatic failure of that property. I'll introduce a specific Calabi—Yau threefold introduced by Schoen and studied by Namikawa and Grassi—Morrison in the early 90s. I will then recount how this threefold has many non-isomorphic birational models with interesting geometric features. At last, my goal is to explain how these birational geometric features can be used to distinguish between many deformation types.

Speaker: **Jaehyun Hong**

Title: Tangent spaces of smooth Schubert varieties

Abstract: Let G be a connected simple algebraic group and let B be a Borel subgroup of G. Consider the isotropy group action of B on the tangent space of the flag variety G/B at the identity coset. We call a B-submodule under this action a Hessenberg space. For a smooth Schubert variety of G/B, its tangent space at the identity coset is a Hessenberg space. We call a Hessenberg space realizable if it occurs in this way. In type A, every Hessenberg space is known to be realizable. In this talk, we classify all realizable Hessenberg spaces in classical types, giving explicit necessary and sufficient conditions for realizability. We also provide a complete list of realizable Hessenberg spaces in the exceptional types. This is joint work with Donggun Lee and Eunjeong Lee.

Speaker: **Xiaojun Huang**

Title: Rigidity of Domains with Kähler–Einstein Bergman Metrics

Abstract: In one complex variable, a bounded domain in the complex plane carries two natural invariant Hermitian metrics: the Bergman metric and the canonical metric, namely the unique complete Hermitian metric of constant Gaussian curvature. When the boundary of the domain is sufficiently smooth so that the Bergman metric is complete, a special case of a classical theorem of Qi-Keng Lu or Calabi implies that these two metrics coincide if and only if the domain is biholomorphic to the unit disk. In several complex variables, the Bergman metric can be defined analogously for bounded domains. In contrast, the existence of a complete Kähler metric of constant holomorphic sectional curvature is generally exceptional. Instead, Cheng–Yau and Mok–Yau established the existence of a complete Kähler–Einstein metric on bounded pseudoconvex domains. The Bergman metric reflects the function theory and holomorphic geometry of the domain, whereas the Kähler–Einstein metric captures the pluripotential-theoretic and complex-geometric aspects of the domain. In this talk, I will discuss recent joint work with C. Y. Hsiao (National Taiwan University) and X. S. Li (Wuhan University). These works address problems concerning the characterization of domains whose Bergman metric is Kähler–Einstein.

Speaker: **Lucas Kaufmann**

Title: Variations on Skoda's Theorem and Applications

Abstract: Skoda's theorem gives a fundamental exponential integrability estimate for plurisubharmonic functions. In this talk, I will present a number of classical and recent refinements of this estimate, together with new applications to equidistribution problems in complex dynamics.

Speaker: **Yuta Kusakabe**

Title: Every Gromov elliptic domain is meromorphically pseudoconvex

Abstract: We prove that every Gromov elliptic domain in a complex manifold has the following property, which we call meromorphic pseudoconvexity: near each boundary point, the domain becomes Stein after removing a set locally given by finitely many polar sets of meromorphic functions. As a consequence, we show that a regular domain in a Stein manifold is Gromov elliptic if and only if it is both Oka and Stein. We also obtain several non-ellipticity results for familiar Oka domains. Finally, we discuss how these results complement recent joint work with Shin-ichi Matsumura on the ellipticity of weakly pseudoconvex Oka manifolds.

Speaker: **Minseong Kwon**

Title: Legendrian families of lines on nilpotent orbit closures

Abstract: I will report my recent work on the variety of tangent directions of lines at a general point on nilpotent orbit closures. First, I will show that such a variety is an integral subvariety of the contact hyperplane. When a given nilpotent orbit closure admits a Springer resolution, the variety of tangents is moreover a Legendrian subvariety, and I will discuss its geometry using lines on the associated rational homogeneous space. If time permits, I will provide examples where the Legendrian property does not hold.

Speaker: **Shin-ichi Matsumura**

Title: A flatness criterion for pseudo-effective sheaves on compact Kahler spaces

Abstract: In this talk, I will prove that if E is a pseudo-effective sheaf with vanishing first Chern class on a compact klt Kähler space, then, after passing to a finite quasi-etale cover, its reflexive pullback is locally free and flat. This extends the flatness criterion of Horing-Peternell from projective varieties to the Kähler setting. The proof relies on two main ingredients, both of which are new even in the projective case. The first is a flatness theorem for stable sheaves, obtained by combining Hermitian–Einstein theory with the subharmonicity properties of direct image sheaves. The second is an analogue of Simpson's flatness theorem for extensions of locally free Hermitian flat sheaves in the singular Kähler setting. This is a joint work with Junyan Cao and Ya Deng.

Speaker: **Sui-Chung Ng**

Title: On the Classification for Proper Holomorphic Maps between Bounded Symmetric Domains

Abstract: From a recent work of Kim–Mok–Seo, it is known that if f is a proper holomorphic map between two bounded symmetric domains Ω and Ω' of the same type and $rank(\Omega') \leq 2\ rank(\Omega) - 2$, then f must be semi-standard. On the other hand, Seo has constructed non-semi-standard examples in the case $rank(\Omega') = 2\ rank(\Omega) - 1$. In this talk, we will discuss an approach to the classification for proper holomorphic maps in this rank-difference case for type I classical domains. The talk is based on a recent joint work of the speaker with S. Y. Kim and Yun Gao.

Speaker: **Dan Popovici**

Title: Deformations of Holomorphic p-Contact Structures

Abstract: After briefly presenting the notion of holomorphic p-contact structure, that we introduced recently in the scalar case with H. Kasuya and L. Ugarte and in the line-bundle case with K. Broder, we will discuss its behaviour when both the complex structure of the underlying manifold and the holomorphic structure of the underlying line bundle vary. Specifically, we will present three types of results that we obtained very recently. The first one asserts that the existence of a holomorphic p-contact structure is deformation-open when a non-jumping assumption is made on the $\bar{\partial}$-cohomology of bidegree $(p, 0)$. This ought to become a source of further examples of holomorphic p-contact manifolds. The second result is a Berndtsson-type (semi-)positivity theorem for the holomorphic vector bundle over the base induced, as a direct image, by the line bundle on the total space that supports the p-contact structures. Thirdly, we introduce a moduli space of relative holomorphic p-contact structures and we show that it is Hausdorff and open in a certain quotient topological space.

Speaker: **Vasily Rogov**

Title: Nilpotent fundamental groups and higher Albanese manifolds

Abstract: I will discuss an old question of Campana: which nilpotent groups can be realised as fundamental groups of compact K|"ahler manifolds? I will also consider its analogue for complex quasi-projective varieties. After surveying the known restrictions and examples, I will announce some new results, both positive and negative. In the second part of the talk, I will turn to higher Albanese manifolds, a construction due to R. Hain and S. Zucker that naturally generalises the classical Albanese variety. I will explain how the study of their geometry leads to some of these new results, and propose some open questions.

Speaker: **Min Ru**

Title: A birational approach to the Second Main Theorem

Abstract: The Second Main Theorem is a fundamental result in Nevanlinna theory, describing the extent to which a holomorphic curve intersects a collection of divisors. For hypersurfaces in general position in $\mathbb{P}^n$, my previous result of the Second Main Theorem gives the bound $n+1$ for algebraically nondegenerate holomorphic curves. For hyperplanes in N-subgeneral position, the Cartan–Nochka theorem gives the sharp bound $2N-n+1$, together with counting functions truncated at level n. Extending this bound to hypersurfaces in N-subgeneral position is substantially more difficult, owing to the more complicated scheme-theoretic structure of their intersections. The purpose of this talk is to discuss the unified birational approach to these problems, based on a decomposition of the target divisor into its rank and excess components. Our method builds on the birational Nevanlinna theory of Ru and Vojta, and provides a geometric alternative to the classical use of Nochka weights. This is a joint with Zhe Wang.

Speaker: **Aeryeong Seo**

Title: Kähler potentials with constant gradient norm on bounded symmetric domains

Abstract: Any bounded homogeneous domain admits a global Kähler potential of the Bergman metric whose gradient has constant length. In this talk I will discuss to what extent this property characterizes the potential and the domain. First, on a bounded symmetric domain we characterize Kähler potential of the Bergman metric with constant gradient norm. As an application, any biholomorphism from an affine homogeneous domain onto a bounded symmetric domain is the composition of an affine map, a quadratic polynomial map, and the inverse of a Cayley transform. This is a joint work with Kang-Hyurk Lee.

Speaker: **Laurent Stolovitch**

Title: CR singularities and dynamical systems

Abstract: In this talk, we'll survey some recent results done since the seminal work of Moser and Webster about smooth real analytic surfaces in $\mathbb{C}^2$ which are totally real everywhere but at a point where the tangent space is a complex line. Such a point is called a singularity of the Cauchy-Riemann structure. We are interested in the holomorphic classification and the geometry of these surfaces near this singularity. It happens that there is a deep connection with holomorphic classification of some holomorphic dynamical systems near a fixed point so that new results for the later provide new result for the former. In particular, we will present new recent results done in collaboration with Xianghong Gong, Zhiyan Zhao, Martin Klimes on KAM-like theory for holomorphic diffeomorphisms at a fixed point, parabolic dynamics in dimension 2 and integrable holomorphic dynamics in higher dimension.

Speaker: **Sheng-Li Tan**

Title: Modular invariants of a family of curves and applications

Abstract: Modular invariants of a family of algebraic curves come from the moduli spaces of curves. These invariants are very useful in Arakelov geometry. We will introduce some new applications in algebraic equations and complex ordinary differential equations on an algebraic surface. Some related applications are also presented.

Speaker: **Wing-Keung To**

Title: Positivstellensätze via analytic and algebraic approaches

Abstract: In this talk, I will discuss some results on Positivstellensätze in real and Hermitian settings and describe some analytic and algebraic methods used in such study.

Speaker: **Julie Wang**

Title: Greatest Common Divisors and Entire Curves on Projective Varieties

Abstract: GCD estimates in Nevanlinna theory measure how entire curves meet and approach subschemes of codimension at least two. The GCD estimates of Noguchi–Winkelmann–Yamanoi play a key role in their Second Main Theorem for semi-abelian varieties, an analytic analogue of Vojta's *abc* conjecture. Turning to a different approach, I will explain Silverman's blowup argument for deriving GCD estimates from Vojta's main conjecture. I will then discuss joint work with Levin on algebraic tori and with Yasufuku on projective varieties, the latter usingthe Ru–Vojta theorem. I will conclude with recent joint work with Xiao on approach to intersections of boundary divisors, extending the filtration methods of Huang, Levin, and Xiao from surfaces to higher dimensions.

Speaker: **Kwok Kin Wong**

Title: Holomorphic isometry arising from minimal rational curves and its applications

Abstract: We discuss the construction of a nonstandard holomorphic isometric embeddings of some complex unit balls into irreducible bounded symmetric domains of rank at least 2 as given by Mok in Proc. A.M.S. 2016. Via the embedding, we have constructed a holomorphic submersion, called the Cayley projection, from an irreducible bounded symmetric domain of rank at least two to its boundary component of the regular part. The fibre of such submersion is exactly the image of an Mok's isometric embedding. In combination with techniques in ergodic theory and harmonic analysis, the Cayley projection can be used to some rigidity results.
We also discuss how to extend Mok's isometric embedding of balls to Hodge domains that are dual to rational homogeneous manifold of Picard number one. This holomorphic isometric embedding is nonstandard and is therefore not arised from homomorphisms between Lie groups. From the point of view of theory of holomorphic isometry, we have obtained examples of nonstandard holomorphic isometric embeddings of complex unit balls into simply connected homogeneous indefinite Kähler manifolds.

Speaker: **Sai Kee Yeung**

Title: Complex hyperbolicity and almost complex geometry

Abstract: We will discuss some standard problems and conjectures in complex hyperbolicity from the perspective of almost complex geometry. This is related to existence and non-existence of almost complex or entire psudo-holomorphic curves in almost complex and symplectic manifolds.