Pacific Rim Complex and Symplectic Geometry Conference

July 29 - August 2, 2024

Speaker: **Dongwook Choa** (KIAS)

Title: *Unit normal correspondence for a smooth divisor complement*

Abstact: For a Liouville domain given by a complement of a Donaldson divisor which is monotone and smooth, we investigate a functor from a wrapped Fukaya category of the complement and a monotone Fukaya category of the divisor itself given by a unit normal correspondence. Then I consider a deformation of the wrapped Fukaya category by inverting a canonical Hamiltonian orbits of S^1 action on the boundary. I will explain how the unit normal correspondence is extended to the deformation which turned out to be a quasi-isomorphism in favorable situations. Several examples and non-examples will be discussed. This is an ongoing joint work with Hanwool Bae, Cheol-Hyun Cho, and Wonbo Jeong.

Speaker: **Young-Jun Choi** (Pusan National Univ.)

Title: *Continuity of singular Kähler-Einstein potential*

Abstact: In 2009, Eyssidieux-Guedj-Zeriahi proved that any compact normal Kähler variety with trivial or ample canonical line bundle admits a singular Kähler-Einstein metric, generalizing the Aubin and Yau's solution for the Calabi conejcture. A singular potential giving the singular Kähler-Einstein metric is locally Hölder continuous on the regular locus of the variety but only little is known about its behavior near the singular locus.

In this talk, we discuss the continuity of singular Kähler-Einstein potential on the whole variety. This is the joint work with Ye-Won Luke Cho in Gyeongsang National University.

Speaker: **Siarhei Finski** (École Polytechnique)

Title: *Semiclassical study of Hermitian Yang-Mills functionals*

Abstact: For a polarized family of complex projective manifolds, we study the Hermitian Yang-Mills functionals on the sequence of vector bundles over the

base of the family associated with direct image sheaves of the tensor powers of polarization. We make a connection between the asymptotic minimization of these functionals and the minimization of the so-called Wess-Zumino-Witten functional defined on the space of all relatively Kähler (1, 1)-forms on the fibration. We establish the sharp lower bounds on the latter functional, and give some applications towards an asymptotic converse to the Andreotti-Grauert theorem conjectured by Demailly.

Speaker: **Hervé Gaussier** (Univ. Grenoble-Alpes)

Title: *Kobayashi hyperbolicity in Riemannian manifolds*

Abstact: In recent papers, F. Forstnerič-D. Kalaj and B. Drinovec-Drnovšek-F. Forstnerič defined and studied properties of the Kobayashi-Royden metric in $\mathbb{R}^n$, endowed with the standard Euclidean metric. I will present some generalization in the context of Riemannian manifolds. This is part of joint works with Alexandre Sukhov.

Speaker: **Masafumi Hattori** (Kyoto Univ.)

Title: *Positivity of CM line bundle and specially K-stable varieties*

Abstact: Fujiki-Schumacher shows that a moduli space parametrizing projective manifolds with a constant scalar curvature metric admits an ample line bundle that is so-called the CM line bundle, which was named by Paul-Tian. As an algebro-geometric counterpart, Odaka conjectured that one can construct moduli space of K-polystable varieties and the CM line bundle of this moduli is ample. Recently, his conjecture was completely solved for the Fano case. In this talk, I will discuss the positivity of the CM line bundle for specially K-stable case. I will also explain the application to projectivity of all proper subspaces of the moduli space parametrizing "K-stable" Calabi-Yau fibrations over curves, which was constructed by Hashizume and I.

Speaker: **Siqi He** (AMSS, Beijing)

Title: *Hitchin morphism for projective varieties*

Abstact: The Hitchin morphism is a map from the moduli space of Higgs bundles to the Hitchin base, which is generally not surjective when the dimension of the variety is greater than one. Chen-Ngo introduced the concept of the spectral base, which is a closed subscheme of the Hitchin base. They conjectured that the Hitchin morphism is surjective to the spectral base and also proved that the surjectivity is equivalent to the existence of finite Cohen-Macaulayfications of the spectral varieties. For rank two Higgs bundles, we will discuss an explicit construction of the Cohen-Macaulayfication of the spectral variety. In addition, we will discuss several applications using the spectral base to the topology of projective variety. This talk is based on some collaborative work with J. Liu and N. Mok.

Speaker: **Ludmil Katzarkov** (Univ. Miami)

Title: *Theory of Atoms*

Abstract: In this talk we will introduce new birational invariants. Many applications and possible generalizations will be considered.

Speaker: **Yusuke Kawamoto** (ETH, Zurich)

Title: *Quantitative Floer theory and coefficients*

Abstract: Floer homology theory is one of the most powerful methods in modern symplectic topology. In the talk, I will give a quick overview of it and present some new phenomena that are specific to particular coefficients. The material is based on a joint work with Egor Shelukhin. The talk is designed to be accessible without any knowledge of symplectic geometry.

Speaker: **Takayuki Koike** (Osaka Metropolitan Univ.)

Title: $\overline{\partial}$ *cohomology of the complement of a semi-positive anticanonical divisor of a compact surface*

Abstract: Let X be a non-singular compact complex surface such that the anticanonical line bundle admits a smooth Hermitian metric with semi-positive curvature. For a non-singular hypersurface Y which defines an anticanonical divisor, we investigate the $\partial\overline{\partial}$ cohomology group $H^1(M, \mathcal{O}_M)$ of the complement $M = X \smallsetminus Y$.

Speaker: **Yu-Shen Lin** (Boston Univ.)

Title: *Special Lagrangian 3-Spheres near Adiabatic Limits*

Abstract: Special Lagrangian submanifolds, introduced by Harvey and Lawson, are an important class of minimal submanifolds in Calabi-Yau manifolds. In this talk, I will explain a gluing construction of special Lagrangian in Calabi-Yau manifolds with K3-fibrations when the K3-fibres are collapsing. Furthermore, these special Lagrangians converge to an interval or loop of the base of the fibration at the adiabatic limit. This phenomenon is similar to holomorphic curves collapsing to tropical curves in special Lagrangian fibrations and is only a tip of iceberg of the Donaldson-Scaduto conjecture. This is a joint work with Shih-Kai Chiu.

Speaker: **George Marinescu** (Univ. Köln)

Title: *Fubini-Study metrics induced by Toeplitz operators*

Abstract: We generalize a well-known theorem of Tian by proving the convergence of the Fubini-Study metrics induced by Toeplitz-Kodaira maps. These maps are constructed using the action of a Toeplitz operator on the space of holomorphic sections of the powers of a positive line bundle. Furthermore,

we present applications to the distribution of zeros of random holomorphic sections. These results were obtained in a joint work with Alexander Drewitz and Bingxiao Liu.

Speaker: **Yuichi Nohara** (Meiji Univ.)

Title: *String basis for $SL(3)$ and Floer homology*

Abstact: Each irreducible representations of a semisimple Lie group admits a canonical basis parametrized by a convex polytope. In this talk I will discuss the relationship between string bases on irreducible representations of $SL(3)$ and Floer homologies of Lagrangian submanifolds in the Landau-Ginzburg mirror of the flag manifold of $SL(3)$.

Speaker: **Semon Rezchikov** (Princeton Univ.)

Title: *Cyclotomic Structure in Symplectic Topology*

Abstact: The symplectic cohomology is a fundamental invariant of a symplectic manifold M with contact type boundary that is defined in terms of dynamical information and counts of pseudoholomorphic genus zero curves, and carries algebraic structures that parallel the algebraic structures on the Hochschild (co)homology of the Fukaya category of M. We show, under natural topological assumptions, that the symplectic cohomology is the homology of a genuine p-cyclotomic spectrum in the sense of Nikolaus-Scholze. The cyclotomic structure arises geometrically from the map which sends loops in M to their p-fold iterates. The data of this refinement is expected to produce many new algebraic structures of an arithmetic nature on symplectic cohomology, analogously to the way that prismatic cohomology refines the de Rham cohomology of a variety. We will discuss the new methods used in the construction, which are generally applicable to Floer theoretic problems involving equivariance, and some concrete ways of interpreting the meaning of this refined invariant.

Speaker: **Harish Seshadri** (Indian Inst. Science)

Title: *Recent developments in the comparison geometry of positively curved Kahler manifolds*

Abstact: I will discuss Kahler analogues of the Bishop volume comparison theorem and Bonnet-Myers-Cheng diameter theorem. A part of the talk is my joint work with Ved Datar.

Speaker: **Rasul Shafikov** (Univ. Western Ontario)

Title: *Rational and meromorphic convexity*

Abstact: Rational convexity of compact subsets of complex Euclidean spaces is important in the approximation theory. I will discuss generalizations of

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rational convexity to Stein and projective manifolds. I will then give a characterization of this type of convexity for a certain class of compacts in the spirit of Duval-Sibony, Guedj, and Nemirovski. This is joint work with B. Boudreaux and P. Gupta.

Speaker: **Li-Sheng Tseng** (U.C. Irvine)

Title: *Mapping Cone of the Symplectic Structure*

Abstact: The complex structure can be defined as a map on the tangent bundle. In this talk, we consider the symplectic structure also as a map, between de Rham complexes. This leads to the notion of a mapping cone complex and a differential graded algebra for symplectic manifolds. We explore the implications of such a perspective including introduce a special type of Morse theory and Yang-Mills theory for symplectic manifolds. This talk is based on joint works with David Clausen, Xiang Tang, and Jiawei Zhou.

Speaker: **Seungook Yu** (Postech)

Title: *Canonical generating function of Legendrian submanifolds in the one-jet bundle*

Abstact: This presentation will cover our formulation of a contact analogue to Weinstein's observation within the one-jet bundle $J^1 B$. We identify an action functional on the space of Hamiltonian-translated horizontal curves, known as the Carnot path space, and demonstrate its role in generating functions for Hamiltonian isotopes of the zero section. Additionally, we outline a canonical construction of the Legendrian generating function, paralleling Laudenbach-Sikorav's work for the cotangent bundle. This is a joint work with Yong-Geun Oh.

Speaker: **Jihun Yum** (Gyeongsang National Univ.)

Title: *Bergman local isometris are biholomorphisms*

Abstact: Let Ω_1 and Ω_2 denote bounded domains in $\mathbb{C}^n$ equipped with the Bergman metrics g_{B1} and g_{B2}, respectively. If a biholomorphism $f : \Omega_1 \to \Omega_2$ exists, then according to the transformation formula for the Bergman kernels, it is well-established that f induces an isometry with respect to the Bergman metric, i.e., $f^* g_{B2} = g_{B1}$. In this talk, we explores the converse implication. The main theorem is the following.

Let Ω_1 and Ω_2 be bounded domains in $\mathbb{C}^n$. For a proper holomorphic map $f : \Omega_1 \to \Omega_2$, if $f^* g_{B2} = \lambda g_{B1}$ holds on an open subset $U \subset \Omega_1$ for some constant $\lambda > 0$, then f is a biholomorphism.

The proof of the main theorem relies on a novel method grounded in Information Geometry theories: the Factorization Theorem for sufficient statistics and the result ([1]) established by G. Cho and myself.

[1] G. Cho and J. Yum, *Statistical Bergman geometry*, preprint arXiv:2305.10207 (2023).

Speaker: **Ruobing Zhang** (Princeton Univ.)

Title: *Collapsing geometry and degenerations of Calabi-Yau manifolds*

Abstact: This talk summarizes recent developments in the studies of the collapsing geometry of Calabi-Yau manifolds. We will particularly focus on the Calabi-Yau manifolds with small complex structure degenerations. Our results give an accurate and complete characterization of the metric structures. This result is novel even for complex two dimensions, i.e., the type II degeneration of K3 surfaces.

Speaker: **Andrew Zimmer** (Univ. Wisconsin)

Title: *Smooth equivalence of families of strongly pseudoconvex domains*

Abstact: In this talk I will discuss regularity results for families of biholomorphisms between smooth families of strongly pseudoconvex domains. This is joint work with H. Gaussier and X. Gong.