

China–Latin America Conference in Mathematics and Applications

Titles and Abstracts

- **Andres Daniel Duarte** (Universidad Nacional Autonoma de Mexico)

Title: A counterexample to Nash’s question on resolution of singularities

Abstract: The Nash blowup of an algebraic variety is a modification that replaces singular points by limits of tangent spaces. It was proposed to resolve singularities by iterating Nash blowups. In this talk we present a counterexample to this question. This is a joint work with Federico Castillo, Maximiliano Leyton and Álvaro Liendo.

- **Yu-Wei Fan** (SIMIS)

Title: Bridgeland stable objects as special Lagrangians

Abstract: The profound link between special Lagrangians and stability conditions, proposed by Thomas and Yau around 2000, has inspired significant developments in symplectic and algebraic geometry. The one-dimensional case was fully established by the seminal work of Haiden, Katzarkov, and Kontsevich in 2017. In this talk, we will discuss higher-dimensional examples where ”stable implies special Lagrangian” can be rigorously proved.

- **Jose Yañez Etcheberry** (Universidad Tecnica Federico Santa Maria)

Title: Calabi-Yau pairs of low complexity

Abstract: The complexity of a Calabi-Yau pair (X, B) is an invariant that relates the dimension of X , the Picard rank of X , and the coefficients of B . It was proven by Brown, McKernan, Svaldi and Zong that the complexity of a Calabi-Yau pair is nonnegative, and a variety X admits a Calabi-Yau pair of complexity 0 if and only if X is toric. In this talk we will discuss the geometry of Calabi-Yau pairs of index one and complexity one or two. Both descriptions are done in terms of cluster type varieties, a generalization of toric varieties. In the case of complexity one, we prove that (X, B) is of cluster type. In the case of complexity two, we give a criterion to decide whether the pair is cluster type or not. This is joint work with Joshua Enwright, Jennifer Li and Joaquin Moraga.

- **Nicolás Martínez Alba** (Universidad Nacional de Colombia-Bogotá)

Title: Jacobi structures: AKSZ theory, Sigma model and more

Abstract: This talk explores the extension of some techniques from Poisson geometry (AKSZ theory and the Sigma model) to Jacobi structures. We aim to adapt the tools from Poisson geometry to this broader context, highlighting potential applications and concluding with ideas on how this framework could lead to quantization.

- **Younes Nikdelan** (Universidade do Estado do Rio de Janeiro, Brazil)

Title: Rankin–Cohen Algebras, Lie algebra $\mathfrak{sl}_2(\mathbb{C})$ and Calabi–Yau (Quasi-)Modular Forms

Abstract: We discuss connections between Rankin–Cohen algebras, the Lie algebra $\mathfrak{sl}_2(\mathbb{C})$, and Calabi–Yau (quasi-)modular forms arising in the context of Calabi–Yau geometry. We observe how canonical Rankin–Cohen algebras naturally embed into standard ones and explain how these structures can be understood through $\mathfrak{sl}_2(\mathbb{C})$ -actions. As an application, we illustrate how this perspective applies to Calabi–Yau quasi-modular forms associated with the Calabi–Yau varieties arising from the Dwork family. Part of the results are based on joint work with H. Movasati and G. Bogo.

- **Gabriela Paola Ovando** (Universidad Nacional de Rosario and CONICET)

Title: On the integrability of the magnetic geodesic flow on Heisenberg nilmanifolds

Abstract: The aim of this work is to present a construction of first integrals for the magnetic geodesic flow on three-dimensional Heisenberg nilmanifolds. In this setting, magnetic fields correspond to left-invariant closed 2-forms. As in the recent work by Bolsinov, Konyaev and Matveev, the integrals are linear and quadratic in the momenta. These integrals are sometimes analytic and sometimes only differentiable. We show that this regularity depends on the magnetic field and that this cannot be improved.

Joint works with M. Subils (Argentina) and A. Moroianu (France).

- **Raquel del Carmen Perales Aguilar** (Centro de Investigación en Matemáticas-University of Vienna)

Title: Riemannian, synthetic and Lorentzian geometry

Abstract: This is an overview of my research work. I will talk about Gromov-Hausdorff limits of manifolds with boundary under uniform Ricci lower bounds. Then I will briefly mention results about RCD spaces. We will discuss how intrinsic flat distance has been used when we consider manifolds with non negative scalar curvature. If time permits, I will discuss null distance for Lorentzian manifolds.

- **Pablo Quijano** (Universidad Nacional del Litoral)

Title: Harmonic Analysis in the Setting of Schrödinger Operators

Abstract: Recent developments in harmonic analysis have focused on extending classical theories to the framework of Schrödinger differential operators. This talk will provide an overview of this active research area, which aims to adapt fundamental tools—such as operators, function spaces, and weight classes—to settings governed by a Schrödinger operator with a nonnegative potential. The main techniques that allow for leveraging classical harmonic analysis in this non-translation-invariant context will be discussed. The presentation will highlight how the properties of the Schrödinger operator shape the corresponding analytic theory and the strategies developed to overcome the inherent challenges.

- **Leonardo Santilli** (SIMIS)

Title: Twisted traces and quantized moduli stacks from 3d $N = 4$

Abstract: Three-dimensional $N = 4$ gauge theory attaches a pair of holomorphic-symplectic varieties to every quiver: a Coulomb branch and a Nakajima quiver variety. I will review a conjecture (proven for hypertoric varieties) about twisted traces on Verma modules over the algebras that quantize these symplectic varieties. The conjecture relies crucially on the assumption that the fixed points of the Hamiltonian action of a torus on the Coulomb branch are isolated. It is however natural from physics to allow for more general settings, in which the assumption fails. I will explain how to extend the twisted trace conjecture. This requires to keep track of strucky structures inherited from symmetries in the physical theory. As a simple and explicit example, I will discuss in detail the case of A_n singularities.

- **Dingxin Zhang** (SIMIS)

Title: Asymptotic Betti bounds for hypersurfaces in a singular variety

Abstract: I will explain how to use Chern-Schwartz-MacPherson classes and perverse sheaves to give sharp upper bounds on the sum of Betti numbers of very ample hypersurfaces inside a projective variety, no matter how singular the ambient variety is. These bounds become asymptotically optimal when the degree of the hypersurface grows. This is a joint work with Xuanyu Pan and Xiping Zhang.

- **William Javier Zuluaga Botero** (CONICET and National University of the Center of Buenos Aires Province)

Title: Categorical and Topological Methods in Algebraic Logic: Why Representation Matters

Abstract: In algebraic logic, a wide variety of non-classical logics give rise to algebraic structures with rich and often intricate behavior. Understanding their internal structure, morphisms, and semantics typically requires tools that go beyond purely syntactic or equational methods.

In this lecture, I will discuss how categorical and topological methods provide a unifying framework to study such algebras through representation and duality phenomena. The guiding idea is that many structural properties of algebras associated with non-classical logics become more transparent once they are viewed through appropriate algebraic or structural lenses.

I will illustrate this perspective with several examples coming from algebraic semantics of non-classical logics, showing how representation theorems and dualities help to clarify decomposition properties, the behavior of operators, and the interaction between algebraic and semantic notions. Rather than focusing on technical details, the emphasis will be on the underlying ideas and on what these methods explain, both in classical and non-classical settings.

The talk aims to provide an accessible overview of why representation matters in algebraic logic, and how categorical and topological approaches contribute to a deeper conceptual understanding of these structures.

- **Arkadij Bojko** (SIMIS)

Title: Virasoro constraints, geometric vertex algebras, and deformations

Abstract: Virasoro constraints for sheaves were originally motivated by transporting the constraints from Gromov-Witten theory. In joint work with Lim and Moreira, we described their independent origin using Joyce's vertex algebra. Since this vertex algebra is constructed on homology, it is natural to study its equivariant refinement. This produces T-deformed vertex algebras, which I will formulate and explain using the example of a one-loop quiver. Virasoro algebra already naturally appears in this example.

- **Martin Mereb** (Universidad de Buenos Aires)

Title: Arithmetic methods in the study of some character varieties.

Abstract: In the study of algebraic varieties, it is useful to compute their cohomology groups and, more precisely, their Hodge structure.

Sometimes arithmetic methods allow us to deduce properties of this structure, especially when the counting of their \mathbb{F}_q -points turns out to be essentially given by a polynomial. A family of spaces where these methods have been successful is that of character varieties.

In this talk, we will take a brief tour of these methods, discussing some known results and potential spin-offs.