Poster Session
Harmonies in Moduli Spaces
in occasion of Lucia Caporaso's birthday

June 9, 2025, Aula Adalberto Libera, starts at 16:30

Giusi Capobianco (*Università di Roma Tor Vergata, IT*)

Title. The moduli space of double covers of hyperelliptic curves of genus g and its tropical counterpart

Abstract. Given a smooth hyperelliptic curve C of genus g it is possible to construct all the distinct etale double covers of C by subdividing the branch locus B of the hyperelliptic map into two distinct and non-empty subsets B_1 and B_2. Construct two hyperelliptic curves C_2 and C_2 branched over B_1 and B_2 respectively and the fibred product of C_1 and C_2 over $\mathbb{P}^1$ is exactly the source curve of the cover. We prove that a similar construction can be developed in the tropical setting for free double covers of hyperelliptic graphs. Moreover, the source curve/graph is not necessarily hyperelliptic and we recall the notion of h-hyperellipticity in order to describe the locus of the double covers of curves/graphs inside the moduli space R_g of double covers of curves (resp tropical curves).

Wei Chen (*Roma Tre, IT*)

Title. Algebraic Exceptional Set of a Three-Component Curve on Hirzebruch Surfaces

Abstract. We study the algebraic exceptional set of a three-component curve B with normal crossings on a Hirzebruch surface $\mathbb{F}_e$. If $K_{\mathbb{F}_e} + B$ is big and no component of B is a fiber or the rational curve with negative self-intersection, we prove that the algebraic exceptional set is finite, and in most cases give it an effective bound. We also prove that the algebraic exceptional set coincides with the set of curves that are hyper-bitangent to B.

Lycka Drakengren (*ETH Zurich, CH*)

Title. A self–intersection of the Torelli map

Abstract. The Torelli map defines a cycle $T_g := t_*[\mathcal{M}_g^c] \in CH^*(\mathcal{A}_g)$, referred to as the Torelli cycle. The study of the image $t(\mathcal{M}_g^c)$ inside $\mathcal{A}_g$, i.e. determining which abelian varieties are (products of) Jacobians, is the famous Schottky problem, which is solved for $g = 4$ but open for $g \geq 5$. We study the cycle $T_4 \in CH^*(\mathcal{A}_4)$ by pulling it back to the class t^*T_4 on $\mathcal{M}_4^c$. Our aim is to calculate t^*T_4 using only the geometry of the fiber product of two Torelli maps.

Tommaso Faustini (*University of Warwick, UK*)

Title. Del Pezzo Surfaces and Bitangents in Characteristic Two

Abstract. We revisit the classical correspondence between Del Pezzo surfaces of degree two and smooth plane quartics via the 28 bitangents, emphasizing the moduli-theoretic perspective over fields of characteristic not equal to two. This identification breaks down in characteristic two, where the bitangent configuration and moduli structures degenerate. We present the resulting pathologies and sketch ideas for a possible reinterpretation in positive characteristic, aiming to recover aspects of the classical theory.

Marco Fava (*University of Liverpool, UK*)

Title. V-compactified Jacobians for families of reduced curves

Abstract. In order to approach the classical problem of constructing functorial compactifications for Jacobian varieties, we give the abstract definition of a compactified Jacobian for a family of singular curves. By means of combinatorial V–stability conditions, we introduce the new notion of relative V–compactified Jacobians of families of reduced curves, and we show that they strictly include all the compactified Jacobians appearing in the classical literature. In particular,V–compactified Jacobians completely solve the classification problem in both the cases of a nodal curve over a point and of the universal curve over the moduli stacks of pointed stable curves. This is based on a joint work with N. Pagani and F. Viviani.

Andres Jaramillo-Puentes (*Tuebingen, DE*)

Title. Caporaso-Harris Formulae for Motivic Gromov-Witten Invariants

Abstract. Recently, Kass–Levine–Solomon–Wickelgren proved the invariance of the motivic count of curves on del Pezzo surfaces, defining a Gromov-Witten-type invariant valued in the Grothendieck–Witt group of an arbitrary base field. In this poster, I will present a resursive formula inspired on Caporaso-Harris original recursive formula for plane Gromov-Witten invariants. This new formula allows to compute the motivic curve-counting invariants when all point conditions are k-rational. This is joint work with Hannah Markwig, Sabrina Pauli, and Felix Röhrle.

Violeta Lopez Lopez (*University of St Andrews, UK*)

Title. Tropical Brill—Noether general graphs

Abstract. In 2012, Cools, Draisma, Payne, and Robeva provided a new proof of the Brill–Noether Theorem using tropical geometry by exhibiting a tropical curve that is Brill–Noether (BN) general. Although tropical BN theory has become an important field, only two families of tropical curves are known to be BN general. My research focuses on finding a new family of BN general graphs.

Martina Miseri (*Roma Tre, IT*)

Title. The Prym-canonical Clifford index

Abstract. Given a smooth curve C, we define a new Clifford index computed with respect to the Prym-canonical bundle, that is $\omega_C \otimes \eta$, where η is a 2-torsion nontrivial line bundle. Inspired by the theory about the classic Clifford index, we state a Clifford's Theorem that guarantees the non negativity of this new index and describes the curve when it is zero. We classify curves with low Prym-canonical Clifford index and we compute it for general curves. Finally, we consider the case of hyperelliptic curves where the Prym-canonical Clifford index keeps track of the geometry of the curve, as it depends on the nontrivial 2-torsion line bundle chosen on C.

Siao Chi Mok (*University of Cambridge, UK*)

Title. Logarithmic Fulton—MacPherson configuration spaces

Abstract. The Fulto–MacPherson configuration space is a well–known compactification of the ordered configuration space of a projective variety. We extend the construction to the logarithmic setting: it is a compactification of the configuration space of points on a projective variety X away from a simple normal crossings divisor D, and is constructed via logarithmic geometry. Moreover, given a simple normal crossings degeneration of X, logarithmic geometry similarly enables a logarithmically smooth degeneration of the Fulto–MacPherson space of X. Both constructions parametrise point configurations on certain target degenerations arising from both logarithmic geometry and the original Fulton–MacPherson construction. The degeneration satisfies a "degeneration formula" – each irreducible component of its special fibre can be described as a proper birational modification of a product of logarithmic Fulton–MacPherson configuration spaces.

Piotr Oszer (*University of Warsaw, PL*)

Title. The Gorenstein locus of the Hilbert scheme of points is non-reduced

Abstract. We show explicit examples of non-reduced points in the Gorenstein locus of the Hilbert scheme of 4n+3 points on A^n. We do that by¿ employing a refined version of techniques developed to prove non-reduces of the Hilbert scheme, namely Białynicki-Birula decomposition of deformation functors. We present the associated Gorenstein algebra as the apolar algebra of sum of certain polynomials. The main application of the result comes from the study of tensors and cactus varieties.

Simone Pesatori (*Roma Tre, IT*)

Title. Rational curves on Enriques surfaces

Abstract. We explore the geometry of the Severi varieties of curves on Enriques surfaces and on their K3 covers, particularly focusing on rational curves and elliptic pencils. On an Enriques surfaces, the natural expectation is that each linear system contains a finite number of curves of geometric genus 1 and no rational curves. We show some results about the existence of nodal rational curves of arbitrarily large arithmetic genus lying on some particular Enriques surfaces living in a countable set of divisors in the moduli space of all Enriques surfaces. Moreover, we prove the existence of rational curves of arbitrarily large arithmetic genus in the general Enriques surface, positively answering a question posed by Galati and Knutsen about rational curves on Enriques surfaces.

Thibault Poiret (*University of St Andrews, UK*)

Title. Spaces of roots of Universal Bundles

Abstract. Let L be a relative line bundle on the universal n-marked smooth curve $\mathcal{C}_{g,n} \to \mathcal{M}_{g,n}$. The space $\mathcal{S}(L)$ parametrizing r-th roots of L is a finite group torsor over $\mathcal{M}_{g,n}$. Spaces of roots are interesting in their own right, but have have also been used to better understand $\mathcal{M}_{g,n}$ itself, and in particular the tautological ring of its Deligne-Mumford compactification $\overline{\mathcal{M}}_{g,n}$ parametrizing stable curves. In order to use intersection theory and degeneration techniques on $\mathcal{S}(L)$, one must extend it to a meaningful cover of $\overline{\mathcal{M}}_{g,n}$. Many such compactifications are known, but none of them remains a finite group torsor over $\overline{\mathcal{M}}_{g,n}$. This is related to the fact that the universal Jacobian over $\mathcal{M}_{g,n}$ cannot be extended to a smooth and proper group over $\overline{\mathcal{M}}_{g,n}$. On the other hand, a smooth and proper group model for the Jacobian *does* exist in the category of logarithmic schemes, giving rise to a compactification $\overline{\mathcal{S}}(L)$ of $\mathcal{S}(L)$ with a torsor structure. This work is about describing some aspects of the geometry of $\overline{\mathcal{S}}(L)$. The stratification of $\overline{\mathcal{M}}_{g,n}$ by stable graphs induces a stratification with connected strata of $\overline{\mathcal{S}}(L)$ and of other compactifications of $\mathcal{S}(L)$ by the same complex of combinatorial objects, denoted $\mathcal{S}^{\mathrm{trop}}(L)$. We compute $\mathcal{S}^{\mathrm{trop}}(L)$ explicitly, give a moduli interpretation for it in terms of discrete geometric invariants, and describe its interplay with the torsor structure on $\overline{\mathcal{S}}(L)$. This is joint work with Margarida Melo.

Vincenzo Reda (*Trinity College Dublin, UK*)

Title. Universal piecewise (quasi)polynomiality for counting curves in toric surfaces.

Abstract. Inspired by piecewise polynomiality results of double Hurwitz numbers, Ardila and Brugallé introduced an enumerative problem which they call double Gromov–Witten invariants of Hirzebruch surfaces. These invariants serve as two dimensional analogue and satisfy a similar piecewise polynomial structure. More precisely, they introduced the enumeration of curves in Hirzebruch surfaces satisfying point conditions and tangency conditions on the two parallel toric boundaries. These conditions are stored in four partitions and the resulting invariants are piecewise polynomial in their entries. Moreover, they found that these expressions also behave polynomially with respect to the parameter determining the underlying Hirzebruch surfaces. We extended this result to the case of toric surfaces corresponding to h-transverse polygons. Furthermore, Ardila and Brugallé proposed a similar problem for tropical Welschinger invariants: in this case the invariants should behave as piecewise quasipolynomials.

Luca Rizzi (*IBS Center for Geometry and Physics, Kr*)

Title. Supported deformations and birational isotriviality

Abstract. Consider a family of complex projective varieties such that the associated Kodaira-Spencer classes are supported on a divisor, i.e. they can be represented, as cohomology classes, by a current with support on this divisor. In a recent work with Prof. Francesco Zucconi we study conditions to show that the general members of the family are birational. This result can be seen as a continuation of the so-called Volumetric theorem by Pirola and Zucconi.

Elena Sammarco (*Roma Tre, IT*)

Title. Some new nonspecial divisors in the moduli space of cubic fourfolds

Abstract. The study of cubic hypersurfaces in $\mathbb{P}^{n+1}$ is still one of the focal points of Algebraic Geometry because, classically, they have represented the first obstacle in the study of rationality. In particular, the first cubics about which we still cannot say anything in general about the problem of rationality are the cubic fourfolds: there is a conjecture due to Kuznetsov locating the rational ones in the union of special divisors in the moduli space of cubic fourfolds, defined by Hassett. It is therefore interesting to study the locus of cubic fourfolds outside of special divisors. Also, before our work, only three nonspecial divisors were known and described in the literature. We construct a divisor in the moduli space of cubic fourfolds, union of five irreducible components, that we call Severi divisor and which we prove to be nonspecial. It would be interesting to study the intersection locus of the Severi divisor with the special divisors or even repeat a similar construction to obtain other nonspecial divisors. It would be even more interesting to be able to use the very explicit properties of the cubic fourfolds parametrized by the points of this divisor to say something about rationality.

Saverio Andrea Secci (*SISSA, IT*)

Title. Fano fourfolds with large anticanonical base locus

Abstract. A famous theorem of Shokurov states that a general anticanonical divisor of a smooth Fano threefold is a smooth $K3$ surface. In a joint work with Andreas Höring, we proved that for four-dimensional Fano manifolds the behaviour is completely opposite: if the base locus is a normal surface, and hence has codimension two, all the anticanonical divisors are singular. The poster will include the main result and the illustration of the known examples in dimension ≤ 4.

Hao Sun (*Brown University, USA*)

Title. Derived Equivalences of K3 Surfaces Realized by Birational Maps

Abstract. We describe a birational automorphism of the quadric fourfold $Q \subseteq \mathbb{P}^5$ such that the base loci of this map and its inverse are birational to $K3$ surfaces. These two $K3$ surfaces are known to be derived equivalent. We show that they are not isomorphic to each other.

Roberto Vacca (*Università di Roma Tor Vergata, IT*)

Title. Ulrich bundles on some double coverings of $\mathbb{P}^3$

Abstract. Ulrich bundles have been intensively studied in the last 25 years due to their connection with many aspects of both algebraic geometry, such as determinantal representations of Chow forms and the minimal resolution conjecture for ideal of points, and commutative algebra, e.g. Boij–Soderberg theory and matrix factorisation. In this poster I will present part of the work done in my PhD thesis regarding existence and properties of Ulrich bundles on cyclic coverings of projective spaces. For double coverings of $\mathbb{P}^3$ branched along a surface of degree $m = 4, 6, 8$ we can prove existence of rank 2 Ulrich bundles and compute the dimension of their moduli spaces, through the study of special curves inside those 3-folds. Moreover, in the Fano case ($m = 4, 6$) we are able to construct and study higher rank Ulrich bundles.