

First Joint Meeting Brazil Italy of Mathematics
Special Session: *Classification of Projective Varieties
and Related Topics*

Rio de Janeiro, August 29 - September 02, 2016

Title: Enriched tropical curves and their relation with enriched curves

Speaker: Alex Abreu (Universidade Federal Fluminense)

Abstract: In her Ph.D. thesis, Mainò introduced the notion of enriched structure on stable curves and constructed their moduli space. In this talk we give a tropical notion of enriched structure on tropical curves and construct a moduli space parametrizing these objects. Moreover, we use this construction to give a toric description of the scheme parametrizing enriched structures on a fixed stable curve.

Title: Secant-exceptional linear series via elliptic chains

Speaker: Ethan Cotterill (Universidade Federal Fluminense)

Abstract: In the 1950's, Macdonald computed formulas for the classes of tuples along an embedded smooth projective curve that span linear subspaces of fixed incidence and dimension. These formulas are both highly nonexplicit and not manifestly positive, since they arise from the evaluation of determinants. In this talk we will describe work in progress with Melody Chan and Naizhen Zhang aimed at recovering explicit and positive counts in cases where the class is zero-dimensional and the curve is general in moduli. Our basic tool is an analysis of limit linear series along chains of elliptic curves.

Title: Flat parabolic vector bundles on elliptic curves

Speaker: Thiago Fassarella (Universidade Federal Fluminense)

Abstract: In this talk we will investigate the geometry of moduli spaces of rank 2 logarithmic connections on an elliptic curve minus 2 points with fixed spectral data. This is a work in progress with Frank Loray.

Title: On totally geodesic and Shimura subvarieties contained in the Torelli locus

Speaker: Paola Frediani (Università di Pavia)

Abstract: I will explain some results on totally geodesic subvarieties of A_g contained in the Torelli locus, obtained through the study of the second fundamental form of the Torelli map. I will also discuss some geometrical properties of the second fundamental form that are of independent interest. Finally I will describe some examples of Shimura subvarieties in the Torelli locus in low genus, given by families of jacobians of Galois coverings of the projective line and of elliptic curves

Title: Smooth double covers of K3 surfaces

Speaker: Alice Garbagnati (Universit Statale di Milano)

Abstract: The aim of this talk is to describe the geometry of smooth double covers X of K3 surfaces S . If the branch locus of the double cover consists of rational curves, X is a blow up either of an Abelian surface or of a K3 surface. Here we describe the other cases. In particular we observe that, if there is a curve of genus at least 2 contained in the branch locus, then $h^{2,0}(X) > 1$. So the transcendental part of the middle cohomology of X carries an Hodge structure which is not of K3 type, However, it contains a sub Hodge structure of K3 type which induces the ones of S . In particular if $h^{2,0}(X) = 2$, the Hodge structure of X splits in two sub Hodge structures of K3 type: the one related with S and its orthogonal. In certain specific cases we explicitly and geometrically describe the K3 surface W , which is related with the second sub Hodge structure of K3 type.

Title: On higher Hessians and the Lefschetz properties

Speaker: Rodrigo Gondim (Universidade Federal Rural de Pernambuco)

Abstract: We deal with a generalization of a Theorem of P. Gordan and M. Noether on hypersurfaces with vanishing (first) Hessian. We prove that for any given $N \geq 3$, $d \geq 3$ and $2 \leq k < \frac{d}{2}$ there are infinitely many irreducible hypersurfaces $X = V(f) \subset \mathbb{P}^N$, of degree $\deg(f) = d$, not cones and such that their Hessian of order k , Hess_f^k , vanishes identically. The vanishing of higher Hessians is closely related with the Strong (or Weak) Lefschetz property for standard graded Artinian Gorenstein algebra, as pointed out J. Watanabe. As an application we construct for each pair $(N, d) \neq (3, 3), (3, 4)$ infinitely many standard graded Artinian Gorenstein algebras A , of codimension $N + 1 \geq 4$ and with socle degree $d \geq 3$ which do not satisfy the Strong Lefschetz property, failing at an arbitrary step k with $2 \leq k < \frac{d}{2}$. We also prove that for each pair (N, d) , $N \geq 3$ and $d \geq 3$ except $(3, 3), (3, 4), (3, 6)$ and $(4, 4)$ there are infinitely many standard graded Artinian Gorenstein algebras of codimension $N + 1$, with socle degree d , with unimodal Hilbert vectors which do not satisfy the Weak Lefschetz property.

Title: Unobstructed deformation problems

Speaker: Donatella Iacono (Università di Bari)

Abstract: In this talk we focus our attention on some deformation problems that are unobstructed. In particular, we study infinitesimal deformations of pairs (X, D) , where

D is a smooth divisor in a smooth projective variety X . Using differential graded Lie algebras, we are able to prove the unobstructedness in some cases.

Title: On quotients of product of two curves

Speaker: Roberto Pignatelli (Università di Trento)

Abstract: Constructing surfaces by taking the quotient of a product of two curves by the action of a finite group is a very old method, but it has been extensively used only in the last decade, producing several new examples of surfaces of general type, filling holes in the geography, and contributing to the answer of some classical questions. I will report on the results about the different cases of group construction considered (surfaces isogenous to a product, product-quotient surfaces, quasi-tale quotients, semi-isogenous surfaces), and describe in detail a very recent example (this is a joint work with F. Polizzi) and its deformations.