

SEMINARI DI NATALE 2021

December 20-21, 2021

Location

Aula Dottorato (first floor), Dipartimento di Matematica F. Enriques, Via Cesare Saldini 50, 20133 Milano (Italy).

Schedule

December 20

14:00–14:50 Francesco Denisi

15:00–15:50 Luca Giovenzana

Break

16:30–17:20 Elisa Lorenzo Garcia

December 21

9:15–10:05 Arthur Renaudineau

10:15–11:05 Emma Lepri

Break

11:45–12:35 Camilla Felisetti

Titles and abstracts

Francesco Denisi: *Boucksom-Zariski chambers, volumes, and Newton-Okounkov-type bodies on hyperkähler manifolds.*

In this talk I will provide for the big cone of a projective hyperkähler manifold a decomposition into chambers, in each of which the support of the negative part of the Boucksom-Zariski decomposition is constant. I will show how the obtained decomposition allows to determine the volume function. To conclude, time permitting, I will associate to any big divisor a 2-dimensional convex body, whose (euclidean) geometry is strictly related to both the volume and the variation in the big cone of the divisor itself.

Luca Giovenzana: *Singularities of the perfect cone compactification.*

The search for compactifications of moduli spaces is a central problem in algebraic geometry. Toroidal compactifications were constructed by Mumford to compactify moduli spaces that are locally symmetric varieties. In particular they define compactifications of the moduli space of polarised K3 surfaces with ADE singularities. After recalling the main properties of toroidal compactifications I will present some results about the singularities of a specific one, called perfect cone compactification.

Elisa Lorenzo Garcia: *Reduction type of hyperelliptic curves in terms of the valuations of their invariants.*

In this talk we will first review the classical criteria to determine the (stable) reduction type of elliptic curves (Tate) and of genus 2 curves (Liu) in terms of the valuations of some particular combinations of their invariants. We will also revisit the theory of cluster pictures to determine the reduction type of hyperelliptic curves (Dokchitser's et al.). Via Mumford theta constants and Takase and Tomae's formulas we will be able to read the cluster picture information by looking at the valuations of some (à la Tsuyumine) invariants in the genus 3 case. We will also discuss the possible generalization of this strategy for any genus and some related open questions.

Arthur Renaudineau: *Topology of real algebraic varieties near the tropical limit.*

Describing all the possible topologies of real projective hypersurfaces of fixed degree and dimension is a very difficult problem, going back to Hilbert's sixteenth problem. We will show some progress on this problem when assuming that the variety is closed to some degeneration, called tropical limit. We will recall some basics on real algebraic geometry and tropical geometry and then relate the Betti numbers of a real variety near the tropical limit to the dimension of some tropical homology groups (by the way of a spectral sequence). It is based on joint works with Kris Shaw and Johannes Rau and Kris Shaw.

Emma Lepri: *L-infinity liftings of semiregularity maps.*

The Buchweitz-Flenner semiregularity map, introduced in 1999 and generalising Bloch's semiregularity map, has applications to both the variational Hodge conjecture and deformation theory. The subject of this talk is the construction of a lifting of each component of the Buchweitz-Flenner semiregularity map to an L-infinity morphism between differential graded Lie algebras, which allows to interpret components of the semiregularity map as obstruction maps of morphisms of deformation theories. As a consequence, we obtain that the semiregularity map annihilates all obstructions to deformations of a coherent sheaf on a complex projective manifold. Based on a joint work with R. Bandiera and M. Manetti.

Camilla Felisetti: *Topology of Lagrangian fibrations and $P=W$ phenomena on irreducible symplectic varieties.*

Irreducible holomorphic symplectic (IHS) varieties can be thought as a generalization of hyperkähler manifolds allowing singularities. Among them we can find for example moduli spaces of sheaves on K3 and abelian surfaces, which have been recently shown to play a crucial role in non abelian Hodge theory. After recalling the main features of IHS varieties, I will present several results concerning their intersection cohomology and the perverse filtration associated with a Lagrangian fibration, establishing a compact analogue of the celebrated $P=W$ conjecture by de Cataldo, Hausel and Migliorini for varieties which admit a symplectic resolution. The talk is based on joint works with Mirko Mauri, Junliang Shen and Qizheng Yin.