PROGRAMME: YOUNG WOMEN IN ALGEBRAIC GEOMETRY

Monday	Tuesday	Wednesday
9:45 - 10:15 Registration		
10:15 - 11:15 Floris	10:00 - 11:15 Huber–Klawitter	10:00 - 11:00 Jiménez
		Coffee
Coffee	Coffee	11:30 - 12:30 Poster
11:45 - 12:45 Casimiro	11:45 - 12:45 Srinivasan	
		12:30 - 14:00 Lunch
12:45 - 14:30 Lunch	12:45 - 14:30 Lunch	
		14:00 - 15:00 Pieropan
14:30 - 15:45 Huber–Klawitter	14:30 - 15:45 Huber–Klawitter	
		Coffee
		15:30 - 16:30 Pham
Coffee	Coffee	
16:00 - 17:00 Poster	16:15 - 17:15 Ramadas	
19:00 - *??* Dinner		

Annette Huber-Klawitter

Periods and Motives

Periods are complex numbers defined by integrating rational differential forms. The period algebra contains such interesting elements as $\log(2)$, $\zeta(2)$, π. They have generated a lot of interest because they show up in many different context, from number theory to mathematical physics. Their transcendence properties are the object of longstanding deep conjectures. Their structural properties are best understood in the context of mixed motives, a conjectural universal abelian tensor category attached to algebraic varieties. The aim is to discuss peridods, but also a bit of the general theory of motives during the minicourse.

The plan is to introduce periods and their basic properties in the first lecture. The second lecture will introduce one candidate for the category of mixed motives, Nori motives. By construction the relation between periods and motives is particularly obvious in this case. The last lecture will introduce Voevodsky's triangulated category of geometric motives, a canidate for the derived category of mixed motives.

Ana Cristina Casimiro

Moduli spaces of free group representations in reductive groups

Let G be a reductive algebraic group and H be a finitely generated group. Moduli spaces of representations of H into G, the so-called G-character varieties of H, play important roles in hyperbolic geometry, the theory of bundles and connections, knot theory and quantum field theories. Let K be a maximal compact subgroup of G, and let F be a rank r freegroup. We show that the space of closed orbits in $\mathrm{Hom}(F, G)/G$ admits a strong deformation retraction to the orbit space $\mathrm{Hom}(F, K)/K$. In particular, all such spaces have the same homotopy type. We compute the Poincaré polynomials of these spaces for some low rank groups G. We also compare, for real G, the real moduli spaces to the real points of the corresponding complex moduli spaces, and describe the geometry of many examples.

Enrica Floris

Invariance of Plurigenera for foliations on surfaces

Recently, Brunella and McQuillan proved some of the main results in birational geometry in the setting of holomorphic foliations on surfaces. In this talk, after giving some preliminary results and definitions, we will discuss to what extent the theorem of Invariance of Plurigenera can be generalized to foliations on surfaces.

Leslie Jiménez

On the group algebra decomposition of a Jacobian variety

Given a compact Riemann surface X with an action of a finite group G, the group algebra $\mathbb{Q}[G]$ provides an isogenous decomposition of its Jacobian variety JX, known as the group algebra decomposition of JX. In my PhD thesis I have obtained a method to concretely build a decomposition of this kind. This method allows to study the geometry of the decomposition. For instance, the idea is building several decompositions in order to determine which one has kernel of smallest order. In this talk I will describe this method and I will show some applications of this to families of trigonal curves.

Thuy Huong Pham

Mather-Yau Theorem in Positive Characteristic

The well-known Mather–Yau theorem says that the isomorphism type of the local ring of an isolated complex hypersurface singularity is determined by its Tjurina algebra. It is also well known that this result is wrong as stated for power series f in $K[[x]]$ over fields K of positive characteristic. In this talk we will see that, however, also in positive characteristic the isomorphism type of an isolated hypersurface singularity f is determined by an Artinian algebra, namely by a "higher Tjurina algebra" for sufficiently high index, for which we give an effective bound. We also prove a similar version for the "higher Milnor algebra" considered as $K[[f]]$-algebra. This is a joint work with Gert-Martin Greuel.

Rohini Ramadas

Hurwitz Correspondences on $\mathcal{M}_{0,n}$

We consider Hurwitz spaces $\mathcal{H}$ parametrizing maps between smooth marked genus zero curves, with prescribed ramification. $\mathcal{H}$ defines a correspondence between the moduli spaces $\mathcal{M}_{0,n_1}$ and $\mathcal{M}_{0,n_2}$, parametrizing the source and target curves, respectively. For given compactifications X_1 and X_2 of $\mathcal{M}_{0,n_1}$ and $\mathcal{M}_{0,n_2}$, this induces maps of homology groups $H_k(X_2) \to H_k(X_1)$. We show that this correspondence satisfies a desirable stability condition on the Deligne-Mumford compactifications $\overline{\mathcal{M}}_{0,n}$, and find a natural filtration of the homology groups of $\overline{\mathcal{M}}_{0,n}$ that is preserved. We use this filtration to find an alternate modular compactification of $\mathcal{M}_{0,n}$ on which the Hurwitz correspondence is stable for half of the homology groups, and prove that no analogous result is possible for the other half. We finally discuss the connection to complex dynamics on the Riemann sphere, and applications to computing dynamical degrees of a certain class of rational self-maps. This project is advised by S. Koch and D. Speyer.

Marta Pieropan

Generalized Cox rings over arbitrary fields

The relations between Cox rings and universal torsors for varieties over algebraically closed fields of characteristic 0 are well known (see, for example, the book "Cox rings" by Arzhantsev, Derenthal, Hausen and Laface, 2015). Universal torsors are certain torsors under quasi-tori that have been introduced by Colliot-Thélène and Sansuc in the 1970s for varieties over arbitrary fields. After recalling the basics of Cox rings and torsors, this talk presents recent joint work with U. Derenthal, where we introduce a notion of generalized Cox rings associated to torsors under quasi-tori that extends the usual notion of Picard graded Cox rings. We define the generalized Cox rings from an axiomatic point of view, we discuss their classification and their existence over nonclosed fields, and we present an arithmetic application.

Padmavathi Srinivasan

Conductors and minimal discriminants of hyperelliptic curves

Conductors and minimal discriminants serve as measures of degeneracy of the singular fiber in a family of generically smooth hyperelliptic curves. In the case of elliptic curves, the Ogg-Saito formula shows that the Artin conductor equals the naive minimal discriminant. In the case of genus two curves, equality no longer holds in general, but the two invariants are related by an inequality. Lower bounds on the Artin conductor give upper bounds on the number of components of the singular fiber, and this has applications to the study of rational points via Chabauty's method. Deligne gave a different definition of a discriminant and Saito proved that the Artin conductor equals the Deligne discriminant up to sign. We show that for hyperelliptic curves satisfying certain hypotheses, the Deligne discriminant is bounded above by the naive minimal discriminant.