



## AL06

### Algebraic Geometry

### Geometría Algebraica

#### Organizers

#### Organizadores

#### Antolatzaileak

**Alicia Tocino Sánchez**

(Universidad de Málaga)

**Alfonso Zamora Saiz**

(Universidad Politécnica de Madrid)

**Erroxe Etxabarri Alberdi**

(University of Warwick)

#### Description

#### Descripción

#### Deskribapena

*In this parallel session we intend to have presentations by young researchers representing, as far as possible, the diversity of research areas that are either framed in the field of algebraic geometry or make use of its techniques: derived algebraic geometry, moduli spaces, homotopy theory, enumerative geometry, local cohomology of schemes, étale fundamental group, Brill-Noether theory, multilinear algebra and tensor product...*

En esta sesión paralela pretendemos contar con las ponencias de investigadores jóvenes representando, en la medida de lo posible, la diversidad de las áreas de investigación que, o bien están enmarcadas en el campo de la geometría algebraica, o bien hacen uso de sus técnicas: geometría algebraica derivada, espacios de moduli, teoría de homotopía, geometría enumerativa, cohomología local de esquemas, grupo fundamental étale, teoría de Brill-Noether, álgebra multilineal y producto tensorial...

## MSC Codes

## Códigos MSC

## MSC Kodeak

14Dxx

(primary)

14D06; 14D07; 14D20; 14D22; 14D23; 14F08; 14A30; 15A69

(secondary)

## Slots

## Bloques

## Blokeak

1.A (Aula 0.2); 1.B (Aula 0.2); 1.C (Aula 0.2)

## QR Code

## Código QR

## QR Kodea



## Session Schedule

## Horario de la Sesión

## Saioaren Ordutegia

L13 | 17:30-17:50 | 0.2

*On the vanishing of the hyperdeterminant under certain symmetry conditions***Alicia Tocino** (Universidad de Málaga)

L13 | 18:00-18:20 | 0.2

*Local homology and cohomology on Thomason subsets***Raúl Alvite Pazó** (Universidade de Santiago de Compostela)

L13 | 18:30-18:50 | 0.2

*Cohomology of moduli spaces via stacks***Andres Fernandez Herrero** (University of Pennsylvania)

L13 | 19:00-19:20 | 0.2

*Blowing up sheaves to count curves***Alberto Cobos Rabano** (KU Leuven)

M14 | 16:00-16:20 | 0.2

*Brill-Noether Theory of stable bundles on ruled surfaces*

**Irene Macias Tarrío** (Universitat de Barcelona)

M14 | 16:30-16:50 | 0.2

*Automorphisms of Jacobians and a Generic Prym-Torelli Theorem*

**Irene Spelta** (HU Berlin)

M14 | 17:30-17:50 | 0.2

*Galois coverings of algebraic curves.*

**Diego Alba Alonso** (Universidad de Salamanca)

M14 | 18:00-18:20 | 0.2

*Character Varieties in Knot Theory*

**Alejandro Calleja** (UCM-ICMAT)

M14 | 18:30-18:50 | 0.2

*Ultrasolid Geometry and Deformation Theory*

**Sofia Marlasca Aparicio** (University of Oxford)

M14 | 19:00-19:20 | 0.2

*The  $p$ -adic Jaynes Cummings model*

**Luis Crespo** (Universidad de Cantabria)

**Monday 13**

17:30-17:50

[Room 0.2]

**Lunes 13**

17:30-17:50

[Aula 0.2]

**Astelehena 13**

17:30-17:50

[Gela 0.2]

*On the vanishing of the hyperdeterminant under certain symmetry conditions***Alicia Tocino**

(Universidad de Málaga)

Given a vector space  $V$  over a field  $K$  whose characteristic is coprime with  $d!$ , let us decompose the vector space of  $d$ -multilinear forms according to the different partitions of  $d$ , that is. the different representations of the symmetric group of order  $d$ . In this talk we first give a more refined decomposition of it into smaller pieces. We then prove the vanishing of the hyperdeterminant of multilinear forms belonging to some of these slices.

Joint with Enrique Arrondo.

[arXiv:2407.06603](https://arxiv.org/abs/2407.06603)

**Monday 13**

18:00-18:20

[Room 0.2]

**Lunes 13**

18:00-18:20

[Aula 0.2]

**Astelehena 13**

18:00-18:20

[Gela 0.2]

*Local homology and cohomology on Thomason subsets***Raúl Alvite Pazó**

(Universidade de Santiago de Compostela)

Local homology and cohomology supported in a closed subset  $Z$  of a quasi-compact and separated scheme were studied by Alonso, Jeremías and Lipman in 1997, where they introduced weakly proregular sequences as the key concept to relate them. In this talk we extend the results about local cohomology to Thomason subsets by considering suitable topological and algebraic torsion functors. We will also discuss the extension of the completion functor, local homology and duality in this context.

Joint work with Leo Alonso and Ana Jeremías.

**Monday 13****18:30-18:50****[Room 0.2]****Lunes 13****18:30-18:50****[Aula 0.2]****Astelehena 13****18:30-18:50****[Gela 0.2]*****Cohomology of moduli spaces via stacks*****Andres Fernandez Herrero**

(University of Pennsylvania)

If two varieties  $X$  and  $Y$  belong to a smooth projective family over a connected base, then they share many geometric properties. For example, they are homeomorphic and their Hodge numbers agree. Unfortunately, in moduli theory it is common to deal with moduli spaces that are singular, even when they come from GIT quotients of smooth varieties. I will explain how to use local structure theorems for stacks to relate the geometry of two such moduli spaces, even when neither  $X$  nor  $Y$  are smooth.

Joint work with Mark de Cataldo and Andres Ibanez Nunez.

**Monday 13****19:00-19:20****[Room 0.2]****Lunes 13****19:00-19:20****[Aula 0.2]****Astelehena 13****19:00-19:20****[Gela 0.2]*****Blowing up sheaves to count curves*****Alberto Cobos Rabano**

(KU Leuven)

The blow-up of a scheme along an ideal sheaf is a key tool in algebraic geometry due to Hironaka's resolution of singularities. Hugo Rossi introduced a more general construction: from a coherent sheaf on a scheme, it returns a new scheme where the torsion-free part of the sheaf is locally free. We apply this construction in enumerative geometry to define reduced Gromov--Witten invariants of complete intersections in any genus, extending the work of Li-Vakil-Zinger in genus one.

Joint work with Etienne Mann, Cristina Manolache and Renata Picciotto.

arXiv:2310.06727

Tuesday 14

16:00-16:20

[Room 0.2]

Martes 14

16:00-16:20

[Aula 0.2]

Asteartea 14

16:00-16:20

[Gela 0.2]

*Brill-Noether Theory of stable bundles on ruled surfaces***Irene Macías Tarrío**

(Universitat de Barcelona)

Let  $MX, H(r; c_1, \dots, c_s)$  be the moduli space of rank- $r$  stable vector bundles on  $X$  with respect to an ample divisor  $H$  on a projective variety  $X$ , and with fixed Chern classes  $c_i$ . To study the geometry of these moduli spaces, one examines their subvarieties called Brill-Noether loci, whose points correspond to stable vector bundles with at least  $k$  independent sections. The talk focus on new results concerning the non-emptiness of Brill-Noether loci for rank-2 vector bundles on ruled surfaces.

Joint work with Laura Costa Farras.

[arXiv:2401.11578](https://arxiv.org/abs/2401.11578)

Tuesday 14

16:30-16:50

[Room 0.2]

Martes 14

16:30-16:50

[Aula 0.2]

Asteartea 14

16:30-16:50

[Gela 0.2]

*Automorphisms of Jacobians and a Generic Prym-Torelli Theorem***Irene Spelta**

(HU Berlin)

In general, it is very hard to construct explicit families of Jacobian of curves with many (non-polarized) automorphisms. In this talk, we will show how they appear when considering cyclic, unramified, degree  $d$  coverings of hyperelliptic genus  $g$  curves. Via a monodromy argument, we will prove that the generic element  $J_C$  of the family is simple. This describes the endomorphism algebra of  $J_C$ , as well as its units. As a consequence, we prove that certain Prym maps are generically injective.

Joint work with J.C. Naranjo, A. Ortega, and P. Pirola.

Tuesday 14

17:30-17:50

[Room 0.2]

Martes 14

17:30-17:50

[Aula 0.2]

Asteartea 14

17:30-17:50

[Gela 0.2]

*Galois coverings of algebraic curves.***Diego Alba Alonso**

(Universidad de Salamanca)

A. Grothendieck, in the SGA I, presented the algebraic fundamental group of a connected scheme. This object classifies the finite étale covers of the scheme. Almost simultaneously, D.K. Harrison presented an object which classifies the Galois extensions of given group of a commutative ring, later named the Harrison group. The objective of this talk is to present explicitly the relationship between the algebraic fundamental group of a curve and the Harrison group of its function field.

Tuesday 14

18:00-18:20

[Room 0.2]

Martes 14

18:00-18:20

[Aula 0.2]

Asteartea 14

18:00-18:20

[Gela 0.2]

*Character Varieties in Knot Theory***Alejandro Calleja**

(UCM-ICMAT)

Given an algebraic group  $G$  and a knot  $K \subseteq \mathbb{R}^3$ , we define the  $G$ -character variety of  $K$  as the moduli of representations  $\rho : \pi_1(\mathbb{R}^3 - K) \rightarrow G$  of the knot group into  $G$ . The importance of these varieties lies in the fact that their study provides in a natural way many knot invariants. In this talk, we will introduce one of the most important of these invariants, the E-polynomial, exposing the techniques used to study them, as well as the main results known, focusing on the case of torus knots.

Joint work with Ángel González-Prieto.

**Tuesday 14**  
**18:30-18:50**  
**[Room 0.2]**

**Martes 14**  
**18:30-18:50**  
**[Aula 0.2]**

**Asteartea 14**  
**18:30-18:50**  
**[Gela 0.2]**

***Ultrasolid Geometry and Deformation Theory***  
**Sofía Marlasca Aparicio**  
(University of Oxford)

We present the theory of ultrasolid modules over a field (first proposed by Dustin Clausen), which generalises the solid modules over  $\mathbb{Q}$  or  $\mathbb{F}_p$  of Clausen and Scholze. Ultrasolid modules are a notion of complete modules over a discrete field. We build some basic results in ultrasolid commutative algebra, study its derived variants, and finally apply this to the deformation of algebraic varieties.

[arXiv:2406.04063](https://arxiv.org/abs/2406.04063)

**Tuesday 14**  
**19:00-19:20**  
**[Room 0.2]**

**Martes 14**  
**19:00-19:20**  
**[Aula 0.2]**

**Asteartea 14**  
**19:00-19:20**  
**[Gela 0.2]**

***The  $p$ -adic Jaynes Cummings model***  
**Luis Crespo**  
(Universidad de Cantabria)

The notion of classical  $p$ -adic integrable system on a  $p$ -adic symplectic manifold was proposed by Pelayo, Voevodsky and Warren a decade ago in analogy with the real case. In this talk we introduce, from the viewpoint of symplectic geometry and topology, the basic properties of the  $p$ -adic version of the classical Jaynes-Cummings model, which is a fundamental example of integrable system going back to the work of Jaynes and Cummings in the 1960s.

Joint work with Álvaro Pelayo.

[arXiv:2406.18415](https://arxiv.org/abs/2406.18415)