AL01

Finite and Profinite Groups

Grupos Finitos y Profinitos

Talde Finitu eta Profinituak

Organizers **Organizadores** **Antolatzaileak**

Cristina Acciarri
(Università di Modena e Reggio Emilia)

Matteo Vannacci
(UPV/EHU)

Andoni Zozaya
(Universidad de Liubliana)

Description **Descripción** **Deskribapena**

This session will bring together researchers in various areas of Group Theory. It will explore aspects of finite group theory, such as characters, cohomology, and associated rings. Additionally, it will address profinite topological groups as well—specifically, topological groups that are projective limits of finite groups.

Esta sesión reunirá a investigadores en distintas áreas de la Teoría de Grupos. Se explorarán aspectos de la teoría de grupos finitos, como los caracteres, la cohomología o los anillos asociados. También se tratarán grupos topológicos profinitos —a saber, grupos topológicos que son límites proyectivos de grupos finitos.

Sesio honek Talde Teoriaren hainbat eremutako adituak bilduko ditu. Talde finituetako alde ugari eztabaidatuko dira; adibidez, karaktereak, koomologia eta talde eraztunak. Horiez gain, talde topologiko profinituez arituko da; hau da, talde finituen alderantzizko limiteak diren talde topologikoak.

MSC Codes **Códigos MSC** **MSC Kodeak**

20-XX

(primary)

20C15; 20J06; 16S34; 22D05

(secondary)

Slots **Bloques** **Blokeak**

1.A (Aula 0.1); 1.B (Aula 0.1)

QR Code **Código QR** **QR Kodea**

Session Schedule **Horario de la Sesión** **Saioaren Ordutegia**

L13 | 17:30-17:50 | 0.1
Beyond BHZ: Exploring New "Heights"
Mandi A. Schaeffer Fry (University of Denver)

L13 | 18:00-18:20 | 0.1
Characters and normal Sylow subgroups
J. Miquel Martínez (Universitat de València)

L13 | 18:30-18:50 | 0.1
Decomposition numbers and Sylow normalisers
Noelia Rizo (Universitat de València)

L13 | 19:00-19:20 | 0.1
Tensor factorisations of group algebras
Diego García Lucas (Universidad Rey Juan Carlos)

M14 | 15:00-15:20 | 0.1
Lie algebraic methods in Galois theory
Simone Blumer (University of Vienna)

M14 | 15:30-15:50 | 0.1
Representation growth of compact p-adic analytic groups
Margherita Piccolo (Heinrich-Heine-Universität Düsseldorf)

M14 | 16:00-16:20 | 0.1
A Stallings-Swan-Dunwoody theorem for t.d.l.c. groups
Bianca Marchionna (Heidelberg University)

M14 | 16:30-16:50 | 0.1
The multiplicities of class sizes recognise hypercentral Hall subgroups
Víctor Sotomayor (Universitat Politècnica de València)

Monday 13
17:30-17:50
[Room 0.1]

Lunes 13
17:30-17:50
[Aula 0.1]

Astelehena 13
17:30-17:50
[Gela 0.1]

Beyond BHZ: Exploring New "Heights"

Mandi A. Schaeffer Fry
(University of Denver)

In joint work with Navarro, Malle, and Tiep, we completed the proof of Brauer's Height Zero Conjecture (BHZ), one of the longest-standing conjectures in the representation theory of finite groups. This now-theorem says that all characters in a block of a finite group have height zero if and only if the block has abelian defect groups. In this talk, I'll discuss several extensions of the BHZ. This includes joint work with G. Malle, A. Moretó, N. Rizo, and various combinations of the four of us.

Joint work with G. Malle, A. Moretó, and N. Rizo.

arXiv:2406.06428
arXiv:2402.08361
arXiv:2209.04736

Monday 13
18:00-18:20
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[Gela 0.1]

Characters and normal Sylow subgroups

J. Miquel Martínez
(Universitat de València)

Let G be a finite group, let p a prime dividing the order of G and let P by a Sylow p-subgroup of G. Recently, G. Malle, G. Navarro and P. H. Tiep have proposed a new way of determining the normality of P in G in terms of the p-Brauer characters, different in nature from the previously known characterizations of normal Sylow subgroups in character-theoretical terms. In this talk, we report on the progress on this conjecture.

Joint work with Z. Feng, A. A. Schaeffer Fry and D. Rossi.

Monday 13
18:30-18:50
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18:30-18:50
[Aula 0.1]

Astelehena 13
18:30-18:50
[Gela 0.1]

Decomposition numbers and Sylow normalisers

Noelia Rizo
(Universitat de València)

Let G be a finite group and p a prime. We can write the restriction of any irreducible character of G to the set of elements of G of order not divisible by p as a non-negative integer combination of irreducible p-Brauer characters. These non-negative integers are called p-decomposition numbers, and they are fundamental in linking characteristic 0 and positive characteristic representations. We explore their relation to the p-local structure of G for height-zero characters in the principal block.

Joint work with Gunter Malle.

arXiv:2405.08723

Monday 13
19:00-19:20
[Room 0.1]

Lunes 13
19:00-19:20
[Aula 0.1]

Astelehena 13
19:00-19:20
[Gela 0.1]

Tensor factorisations of group algebras

Diego García Lucas
(Universidad Rey Juan Carlos)

We study the problem of whether every factorisation as a tensor product of a group algebra comes from a factorisation as a direct product of the undelying group basis, and, consequently, it is unique up to isomorphism and reordering. For the case when the group basis is a finite p-group and the ring of coefficients is a field of characteristic p, this problem was already studied by Carlson and Kovacs in 1995 in the commutative case. We extend their result to some non-commutative cases.

Joint work with Taro Sakurai and Ángel del Río.

arXiv:2408.09036

Tuesday 14	**Martes 14**	**Asteartea 14**
15:00-15:20	**15:00-15:20**	**15:00-15:20**
[Room 0.1]	**[Aula 0.1]**	**[Gela 0.1]**

Lie algebraic methods in Galois theory

Simone Blumer
(University of Vienna)

An aim of modern Galois theory is to determine which profinite groups can occur as absolute Galois groups. Since the 2011 proof of the Bloch-Kato conjecture, which confirmed the quadratic nature of the cohomology of certain maximal pro-p Galois groups, new conjectures have emerged, refining our understanding of these cohomology rings. By linearizing pro-p groups, one defines Lie algebras, enabling the exploration of Lie algebraic approaches to Galois theoretic conjectures.

Tuesday 14	**Martes 14**	**Asteartea 14**
15:30-15:50	**15:30-15:50**	**15:30-15:50**
[Room 0.1]	**[Aula 0.1]**	**[Gela 0.1]**

Representation growth of compact p-adic analytic groups

Margherita Piccolo
(Heinrich-Heine-Universität Düsseldorf)

The representation growth of a group measures the asymptotic distribution of its irreducible representations. When the growth is polynomial, a key invariant in this context is the "minimal" degree of growth. In the realm of compact p-adic analytic groups, explicit results have been achieved only for groups of small dimensions. I will provide an overview of the main concepts in this area and report on recent work aimed at expanding the class of groups for which we have explicit results.

Joint work with Jan Moritz Petschick.

Tuesday 14	**Martes 14**	**Asteartea 14**
16:00-16:20	**16:00-16:20**	**16:00-16:20**
[Room 0.1]	**[Aula 0.1]**	**[Gela 0.1]**

A Stallings-Swan-Dunwoody theorem for t.d.l.c. groups

Bianca Marchionna
(Heidelberg University)

A famous theorem due to Stallings-Swan-Dunwoody asserts that finitely generated groups of rational cohomological dimension at most 1 are exactly the finitely generated groups that are virtually free or, equivalently, that act properly and cocompactly on a tree. We show that an analogous result holds within the more general class of unimodular t.d.l.c. groups. We then rephrase the result in terms of the notion of accessibility on the group, a key notion in geometric and profinite group theory.

Joint work with I. Castellano and T. Weigel.

arXiv:2201.10847

Tuesday 14	**Martes 14**	**Asteartea 14**
16:30-16:50	**16:30-16:50**	**16:30-16:50**
[Room 0.1]	**[Aula 0.1]**	**[Gela 0.1]**

The multiplicities of class sizes recognise hypercentral Hall subgroups

Víctor Sotomayor
(Universitat Politècnica de València)

The aim of this contribution is to survey some results concerning how much information about the algebraic structure of a group can be obtained from the sizes of its conjugacy classes and their frequencies. In particular, some recent progress in this research line will be shown, from a local point of view.

doi:10.1007/s40840-024-01752-x