



XVII Coloquio Latinoamericano de Álgebra

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Conferencias Plenarias

Conferencistas

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Tame and wild automorphisms of free algebras

IVAN SHESTAKOV

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Horario: Lunes 11:30-12:30

RESUMEN. Let A_n be an algebra of polynomials or a free associative algebra over a field F of characteristic 0 on generators x_1, \dots, x_n and $Aut A_n$ be its group of automorphisms. An automorphism $\phi \in Aut A_n$ is called *elementary* if it is of the form

$$\phi : (x_1, \dots, x_i, \dots, x_n) \rightarrow (x_1, \dots, \lambda x_i + f, \dots, x_n)$$

where $0 \neq \lambda \in F$ and the element f belongs to the subalgebra generated by $x_1, \dots, x_i - 1, x_i + 1, \dots, x_n$. The subgroup generated by all elementary automorphisms is denoted by $Tame A_n$; its elements are called tame automorphisms.

In 1942 Jung proved that, for the case of polynomials, $Aut A_2 = Tame A_2$. In the beginning of 70-s, Makar-Limanov and Czerniakiewicz proved the same result for free associative algebras. In both cases, it remained an open question whether the same is true for $n \geq 3$.

In 1972 Nagata constructed an automorphism of the algebra of polynomials A_3 which he suggested to be non-tame (wild). Later Anick provided a candidate for a wild automorphism in the free associative algebra on 3 generators.

In 2004, Shestakov and Umirbaev solved the problem of wild automorphisms in the algebra of polynomials A_3 by proving that the Nagata automorphism is wild. Recently, Umirbaev has proved that the Anick automorphism is wild as well.

In our talk, we will give some ideas and methods of the proofs of these results and will formulate some new results and conjectures. In particular, we present a wild automorphism in the free Jordan algebra on three generators.

Resolucion y Multiplicidad de Interseccion

LE DUNG TRANG

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Horario: Lunes 12:30-13:30

RESUMEN. Vamos dar una presentación geométrica de un trabajo antiguo de C.P. Ramanujam que da una manera de calcular la multiplicidad de un ideal primario por el ideal maximal de un anillo local analítico. Por eso usamos la significación geométrica de la explosión normalizada del ideal.

Thompson's group F and the Associative Law

ROSS GEOGHEGAN

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Horario: Lunes 15-16

RESUMEN. A remarkable finitely generated group, discovered forty years ago by Richard Thompson and an object of much study in the meantime, governs the notion of associativity all over mathematics. I will explain this (joint work with Fernando Guzmán) after giving a general introduction to this group.

A combinatorial moduli space for polynomials of degree n

FRANÇOIS BERGERON

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Horario: Martes 9-10

RESUMEN. The purpose of this talk is to present a new combinatorial classification of the pairs of curves corresponding to the respective zeros of the real and imaginary parts of degree n polynomials over \mathbb{C} . A decomposition of the resulting moduli space is given in term of forests of non intersecting special trees. Many special families are considered.

Cubiertas de gráficas y álgebras: conceptos y aplicaciones

JOSE ANTONIO DE LA PEÑA

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Horario: Martes 15-16

RESUMEN. Dada un álgebra de dimensión finita sobre un campo k de la forma $A = kQ / I$, donde Q es una gráfica orientada finita (=carcaj), se define el concepto de cubierta de A . Este concepto fue introducido en los años 70's por Riedtmann y Gabriel y tiene muchas aplicaciones en Teoría de Representaciones de Álgebras. Estudiaremos este concepto como generalización de las cubiertas en teoría de gráficas, prestando especial atención al caso en que la cubierta está definida por la acción de un grupo.

Groups of combinatorial series and quantum fields

ALESSANDRA FRABETTI

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Horario: Miércoles 8:30-9:15

RESUMEN. Renormalization in perturbative quantum field theory is nowadays known to be related to commutative Hopf algebras on Feynman graphs or trees. We will describe the groups dual to the Hopf algebras

on planar binary trees appearing in quantum electrodynamics, their meaning in the physical context and some mathematical generalizations based on operads.

Low complexity normal elements in finite fields

DANIEL PANARIO

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Horario: Miércoles 9:20-10:05

RESUMEN. Let \mathbb{F}_q be a finite field of any characteristic and \mathbb{F}_{q^n} an extension of \mathbb{F}_q . For $\alpha \in \mathbb{F}_{q^n}$, a normal basis of \mathbb{F}_{q^n} over \mathbb{F}_q is a basis of the form

$$N = \{\alpha, \alpha^q, \dots, \alpha^{q^{n-1}}\}$$

In this case, we say that α is a normal element of \mathbb{F}_{q^n} , and that α generates the normal basis N . Normal bases are widely used in applications of finite fields in areas such as coding theory and cryptography.

Let $\alpha_i = \alpha^{q^i}$ for $0 \leq i \leq n-1$, and let $T = (t_{ij})$ be the $n \times n$ matrix given by

$$\alpha \alpha_i = \sum_{j=0}^{n-1} t_{ij} \alpha_j, \quad 0 \leq i \leq n-1, \quad t_{ij} \in \mathbb{F}_q$$

The complexity of the normal basis N , denoted by c_N , is the number of non-zero entries in T . Mullin, Onyszchuk, Vanstone and Wilson (1988) proved that $c_N \geq 2n-1$. The normal basis N is optimal when $c_N = 2n-1$.

Optimal normal bases over finite fields were completely characterized in a paper due to Gao and Lenstra (1992). In particular, optimal normal bases do not exist for all finite fields and all extensions. When no optimal normal basis exists, it is useful to have normal elements of low complexity.

In this talk, we first review the basic properties of normal elements, and we briefly comment on the characterizations of optimal normal elements by Gao and Lenstra. Then, we provide recent constructions of normal elements with low complexity. Finally we give some open problems related to low complexity normal elements and to the distribution of the complexity of normal elements.

Model Theory of Logarithms on Lie Groups

ANGUS MACINTYRE

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Horario: Jueves 9-10

RESUMEN. I discuss the nature of sets definable using the logarithms of some of the classical Lie groups, and relate the decidability of these groups, with their logarithms, to Schanuel's Conjecture and Andre's Conjecture on periods of 1-motives.

Polynomial Identities and Asymptotic Methods

ANTONIO GIAMBRUNO

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Horario: Jueves 15-16

RESUMEN. The polynomial identities satisfied by an algebra are a T-ideal of the free algebra i.e., an ideal invariant under endomorphisms.

In characteristic zero, by the well-known polarization process, every polynomial identity is equivalent to a finite set of multilinear ones. Then one can slice any T-ideal into subspaces of polynomials in a given fixed set of variables, and the function defined by the codimensions of these spaces is the growth function associated to the given T-ideal. Since T-ideals are invariant under endomorphisms, the permutation action of the symmetric group turns each space into a module and the representation theory of the symmetric group, which is well-understood in characteristic zero, can be successfully applied.

The starting point in the investigation of the growth of T-ideals is a theorem of Regev stating that the codimension sequence of a proper T-ideal is exponentially bounded. In recent years it has been proved that the exponent of the growth rate for a proper T-ideal is an integer called the exponent of the T-ideal. Having at hand an integer scale provided by the exponent, the theory has developed in the last years towards the classification of T-ideals according to the asymptotic behavior of their sequence of codimensions and in this talk we shall give an account of these results.

On polyzeta values

OLIVIER MATHIEU

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Horario: Viernes 9-10

RESUMEN. We describe a formula for the developpment of polyzeta values.

Por anunciar

ADRIAN OCNEANU

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Horario: Viernes 15-16

RESUMEN.

Hensel's Lemma and the representation theory of $SL(2)$

CARLOS JULIO MORENO

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Horario: 17:30-18:30

RESUMEN. A discussion of the classical Hensel Lemma in the number theoretic context of exponential sums (Kloosterman Sums) and their connection with the (traces of) representations of the group $SL(2)$ over finite rings will be discussed.

Cursos Escuela de Álgebra

Cursillistas

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Teoría clásica de invariantes. El 14 problema de Hilbert.

WALTER FERRER

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Horario: Martes-Miércoles-Jueves 8:30-10:00 (SALON C)

RESUMEN. La teoría clásica de invariantes se planteaba dos grandes problemas fundamentales. El primer problema de la teoría de invariantes es el siguiente: ¿existe una cantidad finita de invariantes fundamentales?. El segundo problema se pregunta: ¿ existe una cantidad finita de relaciones fundamentales entre los invariantes?. Para el caso de acciones lineales del grupo especial lineal, el primer problema fue resuelto por Hilbert en forma general con una respuesta afirmativa. En dicho trabajo –que apareció a fines del siglo XIX y que revolucionó la teoría clásica de invariantes– también resolvió el segundo para grupos cualesquiera.

En la lista de problemas que presentó Hilbert en su ponencia Sobre los problemas futuros de la matemática (Congreso Internacional de matemáticos, Paris, 1900) aparece el siguiente problema con el número 14 –que formulamos en lenguaje moderno–

Problema 14. Si A es un álgebra conmutativa finitamente generada definida sobre un cuerpo algebraicamente cerrado, y G es un grupo algebraico que actúa racionalmente en A , ¿es el álgebra de invariantes finitamente generada?

En nuestro curso, haremos algunas consideraciones generales sobre la teoría de invariantes y mencionaremos respuestas positivas y negativas al problema 14 formulado por Hilbert.

Programa

Primera clase 1.30 hs.

Acciones de grupos en conjuntos, acciones lineales. Acciones en álgebras y álgebras de invariantes. Ejemplos. Acciones y representaciones.

Segunda clase 1.30 hs.

Grupos lineales algebraicos. Acciones racionales. Ejemplos. Integrales, invariantes y operadores de Reynolds.

Tercera clase 1.30 hs.

Ejemplos y contraejemplos al 14 problema de Hilbert. Grupos reductivos. Introducción a la teoría geométrica de invariantes.

Campos Finitos y Aplicaciones

DANIEL PANARIO

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Horario: Martes 16:30-18:30 (SALON E)

Viernes 10:30-12:30 (SALON A)

RESUMEN. En este minicurso veremos algunos resultados fundamentales de la teoría de cuerpos finitos así como algunas de sus innumerables aplicaciones. Primero comentaremos brevemente sobre algunos resultados básicos que caracterizan la estructura de cuerpos finitos, así como haremos una revisión de polinomios irreducibles y primitivos que juegan un papel muy importante en aplicaciones.

Luego nos concentraremos en como representar y operar con elementos en cuerpos finitos. Nuestro foco será en las dos representaciones más típicas de elementos en campos finitos: vía polinomios irreducibles y vía elementos normales.

Finalmente cubriremos algunas de las aplicaciones de los campos finitos, especialmente a la teoría de códigos y a la criptografía.

Dirigido a:

Esta dirigido a alumnos avanzados de pregrado o maestría. Sería bueno que los alumnos hayan tenido algún curso de “álgebra abstracta” y algoritmos pero no es fundamental.

Técnicas Criptográficas Modernas: Algoritmos y Protocolos

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Horario: Martes-Miércoles-Jueves-Viernes 8-10 (SALON B)

Objetivos: El objetivo principal es presentar una visión general sobre las técnicas criptográficas (algoritmos y protocolos) más importantes para la construcción de sistemas de seguridad de la información. En este cursillo, inicialmente, presentaremos un resumen de las principales técnicas criptográficas modernas. En seguida, describiremos, con algún detalle, los principales algoritmos (simétricos y asimétricos) actualmente utilizados, y que forman la base de los protocolos criptográficos de autenticación y establecimiento de claves criptográficas entre dos o más entidades. Daremos preferencia para los protocolos ya bien establecidos y depurados. Finalizaremos con una breve discusión sobre nuevos paradigmas de criptografía.

Dirigido a: Ingenieros y/o Tecnólogos en sistemas y/o computación, estudiantes de informática, matemáticas, computación y telecomunicaciones.

Temas

1. Introducción a la Seguridad de la Información.
2. Fundamentos Matemáticos (Resumen).
3. Técnicas Criptográficas (cifras, códigos de autenticación, firma digital).
- 4 Algoritmos Asimétricos (RSA, DSA, ECC).
5. Protocolos Criptográficos.
6. Ejemplos.

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- [4] Guide to Elliptic Curves Cryptography, Darrel Hankerson, Alfred Menezes y Scott Vanstone, Springer Verlag, 2004.

Álgebras de Lie semisimples en característica $p > 0$

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Horario: Lunes 16:30-18:30 (SALON G)

Miércoles 10:30-12:30 (SALON D)

Jueves 16:30-18:30 (SALON G)

RESUMEN. El curso trata acerca del estado del arte en el campo de la clasificación de las álgebras de Lie semisimples en característica p . Se incluyen las álgebras de Lie clásicas, las álgebras de Lie filtradas y algunos casos especiales como las álgebras de Melikian.

Álgebra Conmutativa y Geometría Algebraica

Coordinadores: M M , L D T

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An algorithm that determines when the toric ideal of an affine monomial curve is a complete intersection

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Horario: Martes 10:30-11:30

RESUMEN. Let K be an arbitrary field and $\{d_1, \dots, d_n\}$ a set of positive integers. The aim of this work is to obtain and implement an algorithm for determining whether the toric ideal of the affine monomial curve $\{(t^{d_1}, \dots, t^{d_n}); t \in K\} \subset A_K^n$ is a complete intersection. Our contribution can be seen as a generalization of the classical Herzog's result for $n = 3$. This is a joint work with I. Garcia-Marco and J.J. Salazar-Gonzalez.

Integrabilidad de Sistemas Dinámicos Via La Teoría Galois Diferencial

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Horario: Martes 11:30-12:30

RESUMEN. En esta charla se tratará de dar una visión general de los desarrollos y resultados en los últimos veinte años sobre métodos de tipo Galoisiano diferencial para el estudio de la integrabilidad de sistemas dinámicos, es decir, para estudiar su resolución por cuadraturas. Uno de los resultados principales, obtenido en colaboración con Ramis, consiste en un criterio de no integrabilidad de sistemas Hamiltonianos, mediante el grupo de Galois de la ecuación en variaciones a lo largo de una curva integral particular: si la componente de la identidad del grupo de Galois de la ecuación en variaciones no es conmutativa, el sistema Hamiltoniano no es integrable mediante integrales primeras meromorfas.

On certain curves of genus three

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Horario: Martes 12:30-13:30

RESUMEN. We study curves of genus 3 over algebraically closed fields of characteristic 2 with the canonical theta characteristic totally supported in one point. We compute the moduli dimension of such curves and focus on some of them which have two Weierstrass points with Weierstrass directions towards the support of the theta characteristic. We answer questions related to order sequence and Weierstrass weight of Weierstrass points and the existence of other Weierstrass points with similar properties.

Algunas aplicaciones de las bases de Gröbner en álgebra homológica

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Horario: Martes 16:30-17:30

RESUMEN. In this talk we present some computations in homological algebra using Gröbner bases for modules over polynomial rings with coefficients in a Noetherian commutative ring. In particular, we show easy procedures for computing the Ext and Tor modules.

Key words and phrases. Gröbner bases, syzygies, finite presentation of a module, free resolutions, Ext, Tor.

2000 *Mathematics Subject Classification.* Primary: 13P10. Secondary: 13D02, 13D07.

Teoría Cohomológica de la Intersección

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Horario: Martes 17:30-18:30

RESUMEN. Presentamos la construcción de una teoría de la intersección para esquemas algebraicos completos usando herramientas cohomológicas. La construcción depende del comportamiento de la característica de Euler de unas ciertas sheaves en nuestro esquema. Esta teoría de la intersección generaliza la teoría clásica válida para superficies no-singulares. Algunas de sus aplicaciones incluyen una versión del criterio de Nakai-Moishezon para amplitud y una prueba de que las superficies no-singulares completas son proyectivas.

Polar Syzygies in Characteristic Zero: The Monomial Case

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Horario: Jueves 10:30-11:30

RESUMEN. Given a set of forms $f = f_1, \dots, f_m$ in $R = k[x_1, \dots, x_n]$ of degree 2, where k is a field of characteristic zero, we focus on the first syzygy module Z of the transposed Jacobian module $D(f)$, whose elements are called differential syzygies of f . There is a distinct submodule P of Z coming from the polynomial relations of f through its transposed Jacobian matrix, the elements of which are called polar syzygies of f . We say that f is polarizable if equality $P = Z$ holds. This paper is concerned with the situation where f are monomials, in which case one can naturally associate to them a graph $G(f)$ with loops and translate the problem into a combinatorial one. A main result is a complete combinatorial characterization of polarizability in terms of special configurations in this graph. As a consequence, we show that polarizability implies

normality of the subalgebra $k[f]$ of R and that the converse holds provided the graph $G(f)$ is free of certain degenerate configurations. One main combinatorial class of polarizability is the class of polymatroidal sets. We also prove that if the edge graph of $G(f)$ has diameter at most 2 then f is polarizable. We establish a curious connection with birationality of rational maps defined by monomial quadrics. This is a joint work with Isabel Bermejo (Universidad de La Laguna, Tenerife, Spain) and Aron Simis (Universidade Federal de Pernambuco, Recife, Brazil).

Submódulos Primos y Bases de Gröbner

SANDRA PATRICIA BARRAGÁN MORENO

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Horario: Jueves 11:30-12:30

RESUMEN. Considérese R un anillo Noetheriano con identidad, $A = R[x_1, \dots, x_n]$ y N un submódulo de A^s como A -módulo. Se dice que N es *submódulo primo* de A^s si $N \neq A^s$ y siempre que $r \in A$ y $\mathbf{m} \in A^s$ con $r\mathbf{m} \in N$, entonces $r \in (N : A^s)$ ó $\mathbf{m} \in N$. Se utilizará la técnica de las bases de Gröbner para determinar si N es un submódulo primo o no, a través de un algoritmo.

Polinomios de Permutación en Varias Variables sobre Algebras Modulares

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Horario: Jueves 12:30-13:30

RESUMEN. Se estudian los polinomios de permutación en varias variables con coeficientes en $\mathbb{F}_q/(P(X))^v$ donde $P(X) \in \mathbb{F}_q[X]$ es un polinomio irreducible.

Problemas de factorización en el grupo modular, fibraciones elípticas y la conjetura de Szpiro

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Horario: Jueves 16:30-17:30

RESUMEN. En esta conferencia nos proponemos discutir algunos problemas de factorización en el grupo modular y mostrar su importancia en el estudio de las fibraciones elípticas. En particular, discutiremos cómo la Conjetura para campos de funciones y campos numéricos puede ser reformulada como un problema de factorización en los grupos modulares correspondientes.

A symbolic procedure for solving sparse polynomial equation systems

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Horario: Jueves 17:30-18:30

RESUMEN. The Bernstein-Kushnirenko-Khovanskii theorem asserts that the number of isolated solutions in $(\mathbb{C}^*)^n$ of a polynomial system of n equations in n unknowns is bounded above by the mixed volume of the family of Newton polytopes of the system. For sparse systems, this number can be significantly lower than the upper bound given by the classical Bézout theorem in terms of the degrees of the polynomials and so, the complexity of their resolution is expected to be lower than that for the general case.

We will present a symbolic procedure for solving sparse zero-dimensional polynomial equation systems whose running time can be expressed mainly in terms of invariants related to the combinatorial structure underlying the problem. Assuming the combinatorics is known, the algorithm combines the polyhedral deformation introduced by Huber and Sturmfels with symbolic techniques relying on the Newton-Hensel lifting procedure in order to compute a geometric solution of the zero set of the input system within a complexity which is linear in the input size and quadratic in certain associated mixed volumes. (Joint work with Guillermo Matera, Pablo Solernó and Ariel Waissbein).

On Nash blow-up of orbifolds

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Horario: Viernes 10:30-11:30

RESUMEN. Results and survey on the limits of tangent spaces and its applications to singularities, in particular orbifolds and toric varieties.

Algebras Asociadas a Grafos y Complejos Simpliciales

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RESUMEN. In this paper, we study simplicial complexes as higher dimensional graphs, following mainly some ideas of Sara Faridi. The idea is to extend to facet ideals some construction introduced by R. H. Villarreal, focus to characterize Cohen-Macaulay graphs. The main result is a new proof of Faridi's Theorem: Every grafted facet complex is Cohen-Macaulay.

Varieties of minimal degree, p-regular ideals

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Horario: Viernes 12:30-13:30

RESUMEN. Del Pezzo, Castelnuovo, Bertini discover that if V is an irreducible variety then the degree of V is at least the codimension of V plus one, so they have studied and classified the irreducibles varieties of minimal degree. Later this subject had many developpements, extending it to the case of a union of finite irreducible varieties and also asking not only about the geometric problem but also about the algebraic part, that is what can we say about the generators of the corresponding ideals, this was qualified of mysteriuos by De Concini, Eisenbud, and Processi. M. Barile and me have solved this problem and I will explains further developpements of this question.

On Basic Rational Surfaces

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Horario: Viernes 16:30-17:30

RESUMEN. In 1960, Masayoshi Nagata showed that the monoid of effective divisor classes of a smooth projective rational surface may fail to be finitely generated. This phenomenon began to be studied in detail in the 80s, beginning with work by Rosoff in 1980 and Harbourne in 1985. The aim of this seminar is to discuss some complementary work regarding this problem.

Álgebras de Hopf y Métodos Matemáticos Aplicados a la Física

Coordinadores: Matías Graña, Sylvie Paycha

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Un contraejemplo a la existencia de una estructura de Poisson en un algebra de grupo torcida

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Horario: Lunes 16:30-17:30

RESUMEN. Crawley-Boevey introdujo la definición de una estructura de Poisson no conmutativa en un algebra asociativa A que extiende la noción del bracket de Poisson usual. Sea (V, ω) una variedad symplectica y G un grupo finito de symplectimorfismos de V . Considérese el algebra de grupo torcida $A = \mathbb{C}[V]\#G$. Se exhibira un contraejemplo para mostrar que no siempre es posible definir una estructura de Poisson no conmutativa en $A = \mathbb{C}[V]\#G$ que extienda al bracket de Poisson en $\mathbb{C}[V]^G$.

Grupos Diedros como grupos de Galois de Ecuaciones

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Horario: Lunes 17:30-18:30

RESUMEN. La teoría de Galois diferencial es la teoría de Galois en el contexto de las ecuaciones diferenciales lineales. En particular, toda ecuación diferencial de segundo orden con coeficientes funciones racionales tiene como grupo de Galois a un subgrupo del grupo lineal 2×2 (matrices 2×2 con elementos complejos y determinante no nulo). En esta conferencia se aborda el problema inverso, tomando como caso particular los grupos diedros (finitos e infinitos) y se construyen ecuaciones diferenciales lineales de segundo orden que tengan como grupo de Galois uno de estos grupos.

Finite linear quotients of the braid group B_3

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Horario: Martes 10:30-11:30

RESUMEN. Aside from being objects of interest in algebra and topology in and of themselves, representations of the braid group naturally appear in the study of braided tensor categories and more specifically of modular categories. Topological quantum computing is one application that has motivated the study of modular categories in recent years. In this context, the matrices in the image of the braid representation given by the braiding of the modular category are the actual tools of encoding a quantum algorithm. Therefore it is interesting to ask what this image is as it directly relates to the question of universality of the quantum computer. The desirable outcome is if the image of the braid representation is dense among unitary matrices. In this case, any physically realistic computation can be approximated to arbitrary precision. In this talk, I

will address the undesirable outcome when this image is finite and characterize the finite linear quotients of the braid group B_3 . This is joint work with Eric Rowell at Texas A & M.

Braid group representations from twisted quantum doubles of finite groups

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Horario: Martes 11:30-12:30

RESUMEN. In joint work with Etingof and Witherspoon, we investigate the braid group representations arising from categories of representations of twisted quantum doubles of finite groups. For these categories, we show that the resulting braid group representations always factor through finite groups, in contrast to the categories associated with quantum groups at roots of unity. We also show that in the case of p -groups, the corresponding pure braid group representations factor through a finite p -group, which answers a question of Drinfeld.

If time permits, I will discuss some open questions and applications of these results. A preprint can be found at: <http://arxiv.org/abs/math.QA/0703274>

Compuertas Cuánticas Universales via Yang-Baxterization desde álgebras generalizadas de trenzas: El caso del álgebra BH (Braid-Hecke)

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Horario: Martes 12:30-13:30

RESUMEN. El proceso de Yang-Baxterización es aplicado al álgebra de trenzas generalizada BH con el propósito de obtener compuertas cuánticas universales de acuerdo con la metodología Zhang-Kauffman-Ge inicialmente realizada solamente en el caso del algebra de trenzas de Artin. Las soluciones unitarias de la ecuación Yang-Baxter cuántica (QYBE) son consideradas como operadores cuánticos generadores tanto de compuertas cuánticas como de hamiltonianos para la evolución de las compuertas. Los referentes físicos para la implementación de las compuertas cuánticas obtenidas resultan ser del tipo de reticulados de spin generalizado y sistemas anyonicos cuya estadística cuántica y sus propiedades de fusión son descritos por representaciones de álgebras generalizadas de trenzas.

PBW-bases for quantum groups

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Horario: Martes 16:30-17:30

RESUMEN. There are many publications on the construction of PBW-basis for quantum groups. M. Rosso (1989), and independently of him H. Yamane (1989) have constructed the PBW-basis for Drinfeld-Jimbo algebras of type A_n . Then G. Lusztig in his fundamental works(1990) has found the PBW-bases for arbitrary Drinfeld-Jimbo and Lusztig quantum enveloping algebras. These bases and their modifications have been considered in a number of ensuing papers: J. Towber(1995), F. Gavarini (1999), V.Chari and N. Xi(1999), M. Reineke(2001), B. Leclerc(2004). Let us mention an original approach based on the Ringel-Hall algebras, C.Ringel(1996), B.Deng, J.Du(2005). The author by means of a combinatorial method based on the Lyndon-Shirshov standard words has shown(1999) that every character Hopf algebra does have a PBW-basis. The class of character Hopf algebras, the Hopf algebras generated by skew-primitive semi-invariants, includes quantum enveloping algebras of KacMoody algebras, all their generalizations, the bosonizations of quantum symmetric (bitensor, external, Nichols)algebras related to diagonal braidings, and so on. To some extent this class of Hopf algebras can be treated as the abstractly defined class of all quantum universal enveloping algebras.

Also in the lecture we are going to present some new results on the structure of the right coideal subalgebras in the character Hopf algebras .

THEOREM 1. *Let H be a character Hopf algebra. Every right coideal subalgebra that contains all group-like elements has a PBW-basis which can be extended up to a PBW-basis of H .*

One of the reasons one-sided coideal subalgebras became more and more important is that quantum groups do not have “enough” Hopf subalgebras. The very one- sided comodule subalgebras, but not the Hopf subalgebras, turn out to be the Galois objects in the Galois theory for Hopf algebra actions(A.Milinski,1995). In particular, the Galois correspondence theorem for the actions on free algebra set up a one to one correspondence between right coideal subalgebras and intermediate free subalgebras(V.O.Ferreira,L.S.I.Murakami, andA.Paques,2004).

By means of Theorem 1 we are going to classify all right coideal subalgebras in the quantum group $U_q(\mathfrak{sl}_n)$.

On a factorization of graded Hopf algebras using Lyndon words

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Horario: Martes 17:30-18:30

RESUMEN. We find a generalization of the restricted PBW basis for pointed Hopf algebras over abelian groups constructed by Kharchenko. We obtain a factorization of the Hilbert series for a wide class of graded Hopf algebras. These factors are parametrized by Lyndon words, and they are the Hilbert series of certain graded Hopf algebras. This is joint work with I. Heckenberger.

Bifrobenius Algebras

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Horario: Miércoles 10:30-11:30

RESUMEN. The notion of bifrobenius algebra has been introduced by Y. Doi and M. Takeuchi in 2000 and generalizes both hopf algebras of finite dimension and Bosne-Mesner algebras.

In this talk, we will introduce the definition and some simple examples and we will present some recent results.

More precisely, we will treat the existence of bifrobenius algebra whose antipode is the convolution inverse of the identity and some properties of these algebras.

References:

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Dynamical Twists in Finite-Dimensional Hopf Algebras

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Horario: Miércoles 11:30-12:30

RESUMEN. I will explain a classification of dynamical twists in finite-dimensional Hopf algebras generalizing previous results by Etingof and Nikshych on group algebras. More concretely, I will show a bijective correspondence between gauge equivalence classes of dynamical twists in a finite-dimensional Hopf algebra H based on a finite Abelian group A and equivalence classes of pairs $(K, \{V_\lambda\}_{\lambda \in \widehat{A}})$, where K is an H -simple left H -comodule semisimple algebra and $\{V_\lambda\}_{\lambda \in \widehat{A}}$ is a family of irreducible representations satisfying certain conditions.

As a consequence of this correspondence we construct a one parameter family of dynamical twists over the Taft Hopf algebras.

Subgrupos cuánticos de un grupo cuántico simple

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RESUMEN. Esta charla se basa en un trabajo en colaboración con Nicolás Andruskiewitsch [1]. Sea G un grupo algebraico complejo simple, conexo y simplemente conexo y sea ϵ una raíz ℓ -ésima primitiva de 1, siendo ℓ impar y $3 \nmid \ell$ si G es de tipo G_2 . Se mostrará cómo se determinan *todos* los cocientes de álgebras de Hopf del álgebra de funciones cuantizada $O_\epsilon(G)$. Este problema fue considerado primero por P. Podleś [3] para los grupos cuánticos $O_q(SU(2))$ y $O_q(SO(3))$. La caracterización de todos los cocientes de álgebras de Hopf de *dimensión finita* de $O_q(SL_N)$ fue obtenida por Eric Müller [2].

Este trabajo se puede ver como una continuación de una larga tradición en el estudio de subgrupos de un grupo algebraico simple. De hecho, nuestro resultado principal asume el conocimiento de tales subgrupos. Uno de los resultados que se desprenden del teorema principal de [1] es la construcción de nuevos ejemplos de álgebras de Hopf de dimensión finita. Éstos vienen dados por extensiones no triviales de grupos cuánticos finitos por grupos finitos.

Referencias:

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Módulos simples sobre grupos cuánticos de dos parámetros

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Horario: Jueves 12:30-13:30

RESUMEN. En el 2003, David Radford introdujo un nuevo método para construir módulos simples sobre el doble de Drinfeld de ciertas álgebras de Hopf graduadas de dimensión finita. Dada un álgebra de Hopf H , Radford estableció una correspondencia entre las clases de isomorfismos de módulos simples sobre el doble de Drinfeld, $D(H)$ y los elementos de tipo grupo de $D(H)$. El grupo cuántico restringido de dos parámetros, $u_{r,s}(\mathfrak{sl}_n)$, es un doble de Drinfeld bajo ciertas condiciones en los parámetros r y s . Utilizamos el método de Radford y el programa de álgebra computacional SINGULAR::PLURAL para construir los módulos simples sobre $u_{r,s}(\mathfrak{sl}_3)$ para diferentes valores de r y s .

Deformaciones simple de grupos finitos

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RESUMEN. En un trabajo previo [C. Galindo and S. Natale, *Simple deformation of finite groups*, aceptado en Math. Res. Lett. Preprint math.QA/0608734] construimos dos familias de álgebras de Hopf semisimples simples, las cuales son deformaciones de álgebras de grupo, de grupos finitos no simples. Estas álgebras de Hopf dan respuesta negativa a una serie de preguntas abiertas.

Monoidal categories, Joyal's species, and combinatorial Hopf algebras

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Horario: Viernes 10:30-11:30

RESUMEN. We provide a categorical framework for the construction and study of combinatorial Hopf algebras. Two central notions are Joyal's species and bilax monoidal functors. A species is a combinatorial version of a graded vector space. A good example of a bilax monoidal functor arises in topology, in the context of simplicial sets and chain complexes: the bilax structure is afforded by the Alexander-Whitney and Eilenberg-Zilber maps. We discuss analogous functors in the context of species and graded vector spaces that form the basis for our applications to combinatorial Hopf algebras. The categorical approach yields uniform deformations and higher DIMENSIONAL generalizations of these objects. We encounter at this point a remarkable connection between species and combinatorial Hopf algebras on one hand, and quantum groups and the classification theory of abstract Hopf algebras on the other. This is part of joint work with Swapneel Mahajan.

 $sl(3)$ module - categories and higher Coxeter - Dynkin systems.

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Horario: Viernes 11:30-12:30

RESUMEN. We describe module-categories over $sl(3)$ modular categories, their associated McKay graphs (which, for $sl(2)$ would be the usual ADE Dynkin diagrams), and the associated finite dimensional quantum groupoids (or weak Hopf algebras) with their two rings of characters : the fusion ring and the Ocneanu algebra of quantum symmetries. Compatibility between the two structures is encoded by a family of matrices with non negative integer entries interpreted in quantum field theories in terms of partition functions

for $sl(3)$ boundary conformal field theories on a torus. We illustrate these concepts by giving an explicit description of several exceptional module-categories possessing a monoidal structure and relate them with appropriate conformal embeddings of affine Lie algebras.

Invariant theory from a relative viewpoint

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Horario: Viernes 12:30-13:30

RESUMEN. Geometric invariant theory establishes a deep interaction between the following mathematical concepts: the structure of the category of all rational representations of an affine algebraic group, the algebraic structural properties of the group and the geometry of the actions of the group on arbitrary varieties. In the relative viewpoint we propose, we view the above interaction restricted to the concepts above. We restrict our attention to a subcategory of the category of all rational representations of the group we look to restricted structural properties of the group, we study the geometry of the actions of the group on certain varieties related to the subcategory mentioned above. From this point of view, many well known results can be reinterpreted. For example, the results that relate the affineness of a homogeneous space of the form G/H with the exactness of the induction functor from H modules to G modules, can be viewed as a relative version of the classical absolute result that relates the linear reductivity of a group L with the existence of an affine quotient of an action of L on an arbitrary affine variety.

Combinatoria, Teoría de Números y Aplicaciones

Coordinadores: F A , C J M , A
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Sistemas automorfos algebraicos

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RESUMEN. Las ecuaciones que admiten un principio de superposición de soluciones, pueden genéricamente ser modeladas como sistemas automorfos [Vessiot] sobre grupos algebraicos. En estos sistemas no hay diferencia entre el concepto de solución general y solución particular. Esto los convierte en el marco adecuado en el que una teoría de Galois Diferencial puede desarrollarse de forma simple. Damos una generalización de la teoría de Picard-Vessiot, y la construcción explícita de las extensiones fuertemente normales [Kolchin] sobre las cuales se resuelven los sistemas automorfos. Damos algunos ejemplos y aplicaciones a problemas de mecánica.

On sums of figurate numbers by using techniques of representations of posets

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Horario: Lunes 17:30-18:30

RESUMEN. The Fermat's theorem of polygonal numbers (proved by Cauchy in 1813) states that *every number is a sum of at most three triangular numbers, four squares, five pentagonal numbers and so on*, where the k -th polygonal number of order n is given by the formula

$$p_k^n = \frac{1}{2}[(n-2)k^2 - (n-4)k].$$

Concerning the Fermat's theorem of polygonal numbers and sums of cubes R. Guy (in [1,2,3]) proposes several unsolved problems in number theory. The first one asks what theorems are there, stating that all numbers of a suitable shape are expressible as the sum of three (say) squares of numbers of a given shape?

Particularly R. Guy (in [1,3]) asks if every sufficiently large number $8n + 3$ can be expressible as the sum of three squares of numbers of the form $4r - 1$ with r positive or if every sufficiently large number of shape $24n + 3$ is expressible as the sum of three squares of numbers of shape $6r - 1$. Another question of this type asks if every number of shape $40n + 27$ can be expressible as a sum of three squares of the form $(10r \pm 3)^2$, (problems C20,D3 in [3]).

With respect to cubes R. Guy asks, if all numbers which are not of the form $9n \pm 4$ are the sum of three cubes or if every number is the sum of four cubes with two of them equal [2,3], (problem D5 in [3]).

In the last decades algorithms of differentiation of posets have been the most useful tool in the theory of representation of posets. They have been used to obtain criteria of representation type finite, tame, and finite growth of posets both ordinary and with additional structures [4-10].

In this talk we will describe how we can use the ideas of differentiation algorithms of posets in order to obtain solutions of the problems mentioned above about figurate numbers. Additionally we will give some advances to the problems concerning the number of representations of a number n as the sum of polygonal numbers [1], and the Dedekind's problem on the number of antichains in the power set \mathcal{P}_n of an n -element set (ordered of course by inclusion) [7].

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Heights in Algebraic Dynamics

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Horario: Martes 10:30-11:30

RESUMEN. The present Talk is an exposition on heights and their importance in the study of algebraic dynamics. Algebraic dynamics is the study of self-maps on algebraic varieties. The more common examples of such maps are found in projective spaces and tori . Canonical height functions were introduced to measure the complexity of points and cycles under iteration .The Neron-Tate height on elliptic curves is an example

of a canonical height. In this case, the Neron-Tate height is associated to any of the maps $[n] : E \rightarrow E$ on an Elliptic curve E . Some examples of maps and their associated canonical heights will be presented. Also we will mention some new development on p-adic analytic spaces that allow us to represent canonical height functions as sum of integrals.

Complete intersection toric ideals of oriented graphs

ISIDORO GITLER

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Horario: Martes 11:30-12:30

RESUMEN. Let $G = (V, E)$ be a graph, where $V = \{x_1, \dots, x_n\}$ is the vertex set of G . Let O be an orientation of the edges of G , i.e., an assignment of a direction to each edge of G . Thus $D = (G, O)$ is an oriented graph, and $E(D) = \{y_1, \dots, y_m\}$ is the set of oriented edges of D . Let ϕ be the graded homomorphism of k -algebras $\phi : k[y_1, \dots, y_m] \rightarrow k[x_1, \dots, x_n]$ induced by $\phi(y_i) = \frac{x_k}{x_j}$ where $y_i = (x_k, x_j)$. The kernel of ϕ , denoted by P_D , is called the toric ideal associated to D . We want to study when P_D is a complete intersection. In this direction, in the talk, we will give some necessary conditions on G for P_D to be a complete intersection. In particular we will prove that if G is a complete graph, then P_D is a complete intersection.

Some links between combinatorial optimization properties of clutters and blowup algebras

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Horario: Martes 12:30-13:00

RESUMEN. Some combinatorial properties of clutters, such as the max-flow min-cut property or the packing property, will be interpreted in terms of algebraic properties (such as the normality or reducedness) of Blowup algebras of square-free monomial ideals. We will present some applications to commutative algebra and state some optimization problems in algebraic terms.

Vanishing properties of dual canonical basis elements

MARK SKANDERA

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Horario: Martes 13:00-13:30

RESUMEN. Just as the determinant vanishes on matrices with repeated rows or columns, dual canonical basis elements vanish on matrices whose rows and columns satisfy certain repetition conditions. These conditions lead to a family of filtrations of the space of n by n immanants, with each filtration corresponding to a chain

in the dominance order of integer partitions of n . We show how several bases of the space of immanants fit into these filtrations. This is joint work with Brendon Rhoades.

Técnicas para el cálculo de funciones zeta locales de Igusa

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Horario: Martes 16:30-17:00

RESUMEN. Se pretende exponer brevemente dos técnicas usadas para el cálculo explícito de funciones zeta locales de Igusa, el poliedro de Newton y la fórmula de la fase estacionaria. Se presentaran los resultados relevantes y se hará una comparación entre los resultados de Zuñiga y Denef relativos a las técnicas mencionadas.

Espacio Vectorial N-dimensional de las secuencias de ADN sobre el campo de Galois del Código Genético

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Horario: Martes 17:00-17:30

RESUMEN. En esta Conferencia se exponen los resultados obtenidos en la construcción del Modelo Teórico del Campo de Galois de Código Genético tomando como punto de partida una estructura conocida de Álgebra de Boole de las cuatro bases del ADN. Se estableció una función biyectiva entre el conjunto de los codones y el Campo de Galois de 64 elementos ($GF(64)$) teniendo en cuenta las propiedades fisicoquímicas de las bases del ADN y la importancia de éstas en el codon, lo que permitió dotar al conjunto de los codones del Código Genético de estructura de Campo de Galois y de Espacio Vectorial unidimensional sobre $GF(64)$, esto permitió extender esta última estructura a Espacio Vectorial N-dimensional en el conjunto de las 64^N secuencias de ADN con N codones. Para lograr lo anteriormente expuesto hubo que realizar gran cantidad de operaciones con polinomios de grado 5 y 6 lo que indujo a que se obtuvieran métodos y medios de cálculo computacionales que facilitan notablemente las operaciones entre ellos dentro de $GF(64)$.

El Modelo obtenido tiene gran significación biológica, pues la biyección definida permitió establecer un orden de los codones, las mutaciones en los genes pudieron ser consideradas transformaciones en el Espacio N - dimensional definido (Endomorfismos diagonales o traslaciones pares) En resumen, mediante la investigación logramos, a través de métodos y recursos algebraicos de la Teoría de Grupos y Campos Finitos, la descripción de las relaciones cuantitativas que determinan los cambios evolutivos de las proteínas, ubicando las mismas en un Espacio Vectorial N-dimensional sobre el Campo de Galois de 64 elementos. Nuestros resultados sugieren que en el origen del Código Genético la asignación de aminoácidos a los codones no fue un proceso al azar, pues la ruta seguida en su origen estuvo regida por reglas deterministas.

Old hypergeometric mysteries and new toric algebra

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RESUMEN. In the 1940s, Erdélyi discovered sporadic solutions to Horn's hypergeometric systems. In work with Alicia Dickenstein and Laura Matusevich from 2006, we explain these extra solutions as consequences of binomial primary decomposition, which we describe combinatorially in terms of lattice points.

An extension of the Foata map to standard Young tableaux

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Horario: Miércoles 10:30-11:30

RESUMEN. We define an inversion statistic on standard Young tableaux. We prove that this statistic has the same distribution over $SYT(\lambda)$ as the major index statistic by exhibiting a bijection on $SYT(\lambda)$ in the spirit of the Foata map on permutations.

A bijection between 2-triangulations and pairs of non-crossing Dyck paths

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Horario: Miércoles 11:30-12:30

RESUMEN. Triangulations of a convex polygon are known to be counted by the Catalan numbers. A natural generalization of a triangulation is a k -triangulation, which is defined to be a maximal set of diagonals so that no $k + 1$ of them mutually cross in their interiors. It was proved by Jakob Jonsson that k -triangulations are enumerated by certain determinants of Catalan numbers, that are also known to count k -tuples of non-crossing Dyck paths.

There are several simple bijections between triangulations of a convex n -gon and Dyck paths. However, no bijective proof of Jonsson's result is known for general k . In this talk I will give a bijective proof for the case $k = 2$, that is, I will present a bijection between 2-triangulations of a convex n -gon and pairs (P, Q) of Dyck paths of semilength $n - 4$ so that P never goes below Q . The bijection is obtained by constructing isomorphic generating trees for the sets of 2-triangulations and pairs of non-crossing Dyck paths.

Invariants and coinvariants of the symmetric group in noncommuting variables

NANTEL BERGERON

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 Horario: Jueves 10:30-11:30

RESUMEN. We introduce a natural Hopf algebra structure on the space of noncommutative symmetric functions which was recently studied as a vector space by Rosas and Sagan. The bases for this algebra are indexed by set partitions. We show that there exist a natural inclusion of the Hopf algebra of noncommutative symmetric functions studied the Marne la Valle school (France) in this larger space. We also consider this algebra as a subspace of noncommutative polynomials and use it to understand the structure of the spaces of harmonics and coinvariants with respect to this collection of noncommutative polynomials and conclude two analogues of Chevalley's theorem in the noncommutative setting.

Noncommutative Q-Schur functions and applications

LUIS SERRANO
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 Horario: Jueves 11:30-12:30

RESUMEN. We present a type B analogue of the noncommutative Schur functions introduced by Fomin and Greene. This leads to a generalization of the type-B Littlewood-Richardson-Stembridge rule for certain symmetric functions, such as the stable Schubert polynomials of type B.

Some new results in Kronecker products

ERNESTO VALLEJO
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 Horario: Jueves 12:30-13:00

RESUMEN. Even though the representation theory of the symmetric group S_n over the field of complex numbers is well understood, it is still unknown a satisfactory way to compute or describe the multiplicity of an irreducible character of S_n in the Kronecker product of other two irreducible characters of S_n . We call these multiplicities "Kronecker coefficients". In this talk we reinterpret an old method for computing Kronecker coefficients in a purely combinatorial way and use it to obtain some new results. First we show that the multiplicity of an irreducible character in the square of another irreducible character can be computed by evaluating a polynomial with rational coefficients in variables indexed by connected skew diagrams. Second, we prove a new stability property for Kronecker squares that generalizes a stability property observed a long time ago by F. Murnaghan.

Cyclotomic Solomon algebras

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RESUMEN. In this talk we introduce a subalgebra of the group algebra of the complex reflection group. Like Solomon's descent algebra, our algebra is defined to be the \mathbb{R} -span of certain sets of 'distinguished coset representatives', i.e. coset representatives of minimal length. We give an explicit formula for the multiplication rule in terms of double coset representatives. The structure constants are polynomials with nonnegative coefficients. This allows us to define a q -analogue of the Solomon descent algebras. We have shown that our algebra is free as an \mathbb{R} -module of rank $2 \cdot 3^{n-1}$. If time permits we will describe some of its representation theory. We would also remark that our algebra are not isomorphic to the Mantaci-Reutenauer algebra. The exposition throughout will be combinatorial using colored words and tableaux. This is joint work with Andrew Mathas.

Modelos de Cuerpos Finitos para Redes Genéticas

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 Horario: Jueves 16:30-17

RESUMEN. Un modelo clásico para redes genéticas es el modelo booleano. En este modelo un gen tiene solamente dos niveles de expresión, o está activo o no. Es muy natural generalizar este modelo a un cuerpo finito arbitrario para permitir varios niveles de expresión. En esta charla presentamos algunos resultados y algunos problemas abiertos relacionados al modelo multivariable, al univariable y la relación entre los dos. También mostramos dos algoritmos nuevos para la multiplicación en cuerpos finitos y algunos resultados al respecto a los problemas de punto fijo y de reverse engineering".

Lehmer Problem

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 Horario: Jueves 17:30-18:30

RESUMEN. The classical still open Lehmer Problem can be stated as follows: there exists a real number $c > 0$ such that for every $\alpha \in \bar{\mathbb{Q}}^*$, such that α is not a root of unity then $h(\alpha) \geq \frac{c}{[\mathbb{Q}(\alpha):\mathbb{Q}]}$, where h is the usual logarithmic Weil height.

It has been solved in many particular cases and the best known result is due to Dobrowolski (1978) who solved it up to an ϵ ". This conjecture can be generalized in higher dimension to points in abelian varieties

or multiplicative torus. There are again some particular cases where the conjectures have been solved and some results that approximates the general problems.

In this lecture I'll survey what have been recently done on these questions. If time permits, I will also cover some new results for CM abelian varieties.

Lógica y Álgebra

Coordinador: Xavier Caicedo

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Algebrización de lógicas definidas por LPP-matrices

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RESUMEN. En este trabajo se demuestra que las lógicas definidas a partir de las LPP-matrices, definidas en publicaciones anteriores del autor, son algebrizables. Se presentan condiciones necesarias y suficientes para que la lógica definida por una cierta familia de LPP-matrices sea finitamente algebrizable. Finalmente se estudia la semántica algebraica de las lógicas definidas por ciertas LPP-matrices minimales.

Lógica Algebraica y Lógica Coalgebraica

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Horario: Martes 11:30-12:30

RESUMEN. En esta charla trataremos la dualidad entre álgebra y Coalgebra. Presentaremos la Lógica Modal Coalgebraica como una generalización de la lógica modal básica. Hablaremos de cómo las formulas de la Lógica Modal Coalgebraica se pueden representar por medio de un algebra inicial. Esta representación nos permite construir modelos algebraicos que generalizan los modelos algebraicos para la lógica modal básica. Finalizaremos mostrando como usando herramientas lógicas se puede describir los objetos terminales en categorías de coalgebras.

Resolution of Algebraic Systems of Equations in the Variety of Cyclic Post Algebras

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Horario: Martes 12:30-13:30

RESUMEN. There is a constructive method to define a structure of simple k -cyclic Post algebra of order p , $L_{p,k}$, on a given finite field $F(p^k)$, and conversely. There exists an interpretation Φ_1 of the variety $V(L_{p,k})$ generated by $L_{p,k}$ into the variety $V(F(p^k))$ generated by $F(p^k)$ and an interpretation Φ_2 of $V(F(p^k))$ into $V(L_{p,k})$ such that $\Phi_2\Phi_1(B)=B$ for every $B \in V(L_{p,k})$ and $\Phi_1\Phi_2(R)=R$ for every $R \in V(F(p^k))$.

In this talk we show how we could solve an algebraic system of equations in the variety of cyclic Post algebras using the above interpretation and algorithms programmed in Maple 10.

References:

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[Serfati] M. Serfati, *On Postian Algebraic Equations*, Discrete Math. **152**, (1996), 269-285.

Implicit operations in abelian ℓ -groups and MV-algebras

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Horario: Martes 16:30-17:30

RESUMEN. We consider operations defined implicitly by systems of functional equations on a variety of algebras, giving particular attention to the varieties of Heyting algebras, abelian lattice ordered groups, and MV-algebras. We obtain some results on the structure of these operations and ensuing applications to algebraizable logics. To wit, Rational Łukasiewicz logic is shown not to admit new connectives univocally determined by axiom schemes. Stronger results hold for classical logic and finitely valued Łukasiewicz logic.

Cardinales compactos débiles y módulos κ -sin torsión

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RESUMEN. Sea κ un cardinal infinito. Un R -módulo M es sin torsión si puede encajarse en un producto directo de copias R . Un R -módulo M es κ -sin torsión si cada R -submódulo N de M de cardinalidad $< \kappa$ es sin torsión. Claramente, cada módulo M sin torsión es κ -sin torsión. Se prueba en esta plática que el ultraproducto de una familia de R -módulos es sin torsión cuando κ es medible. Se prueba un resultado similar para una familia de R -módulos κ -sin torsión. Se prueba el siguiente resultado que es el más importante de esta plática : si M es un R -módulo κ -sin torsión, donde κ es débilmente compacto, $|M| = \kappa$ and $|R| < \kappa$, entonces M es sin torsión. Se construye un ejemplo de un R -módulo κ -sin torsión de cardinalidad κ que es sin torsión, donde κ no es débilmente compacto.

Sobre un problema de Julia Robinson

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Horario: Jueves 10:30-11:30

RESUMEN. En mi presentación hare algunas observaciones sobre el siguiente problema (Julia Robinson 1959): Demuestre que para cualquier campo de numeros algebraicos totalmente reales existe un intervalo con , que contiene infinitos enteros algebraicos de y a sus conjugados y es minimo con esta propiedad.

Grupos definibles en el campo de los reales y expansiones o-minimales

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Horario: Jueves 11:30-12:30

RESUMEN. En esta charla definiremos ciertas expansiones del campo real y hablaremos de ciertas invariantes de los grupos definibles en dichas estructuras que provienen de un estudio modelo teórico de los mismos.

Representaciones de Álgebras y Métodos Homológicos

Coordinador: J A P ~

Conferencistas

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On the homogeneous biquadratic matrix problem

ALEXANDER G. ZAVADSKIJ

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Horario: Lunes 16:30-17:30

RESUMEN. Let F be a field admitting quadratic extensions G, G' in its algebraic closure. A classification of representations of the natural (G, G') -bimodule $W = G \otimes_F G'$ leads to the (unsolved in general) biquadratic matrix problem.

We are interesting mainly in the homogeneous biquadratic problem corresponding to the case $G = G'$. It reduces naturally to representations of semilinear pencils [1] and (more generally) pseudolinear bundles [3].

The homogeneous problem is used in the representation theory when classifying indecomposables. For, the problem solved in [2] and some problems arising in [4] are equivalent to the homogeneous biquadratic problem over the classical pair of fields $(F, G) = (\mathbb{R}, \mathbb{C})$.

We obtain a simplified canonical form of indecomposables (with respect to the standard base of the bimodule W) for an arbitrary homogeneous problem in characteristic not 2. The construction involves a special technique of transformations of polynomials on the base of some integer matrix sequence. Possible applications to the representation theory of equipped posets (in the ghost of [4]) are observed as well.

References

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Subdirectly irreducible additive categories, and Birkhoff's theorem

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Horario: Lunes 17:30-18

RESUMEN. We prove Birkhoff's theorem for additive categories: For every skeletally small preadditive category A , there exists a subdirect embedding of A into a direct product of subdirectly irreducible preadditive

categories. For the category $\text{Mod-}R$, where R is a ring we get: Let S be a set of representatives of the simple right R -modules up to isomorphism, and M the set of all minimal nonzero ideals of $\text{Mod-}R$. Then:

- (1) Every nonzero ideal of $\text{Mod-}R$ contains an element of M .
- (2) There is a one-to-one correspondence between S and M .

If T is a right R -module in S , the corresponding ideal in M is the ideal of $\text{Mod-}R$ generated by any morphism f of the regular right R -module R into the injective envelope $E(T)$ of T with $f(R) = T$.

We give a natural subdirect representation of $\text{Mod-}R$ into subdirectly irreducible additive categories.

Grupoides y Modelos de Gelfand

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Horario: Martes 10:30-11:30

RESUMEN. Mackey's theory of induced representations may be described in intrinsic, more geometric terms, by associating a representation of a group G not to a representation of a subgroup H of G but to a G -set X and a representation σ of the so called *motion groupoid* $M(G, X)$ associated to the G -set X . We call these, *geometric induced representations*. We conjecture, in particular, that *Gelfand Models* for a (finite) group G , i.e. complex linear representations isomorphic to the multiplicity-free direct sum of all irreducible representations of G , are just geometric induced representations associated to suitable (non transitive!) G -sets. This has been proved for the case of symmetric groups up to now.

Hochschild-Mitchell cohomology of a locally bounded category

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Horario: Martes 11:30-12:00

RESUMEN. Hochschild cohomology of finite dimensional algebras has been extensively studied. Being a Morita invariant, we may consider algebras of the form $B = kQ/I$, where kQ is the path algebra associated to a finite quiver Q and I is an admissible ideal. An important construction associated to these kind of algebras is the universal Galois covering $F : A \rightarrow B$, where A is defined as a k -linear category and F is a functor stable under the free action of a group G of automorphisms of A which induces an equivalence $A/G \cong B$.

To deal with k -linear categories, rather than algebras, Cibils and Redondo considered the Hochschild-Mitchell cohomology (defined by Mitchell), instead of Hochschild cohomology which is only defined for algebras. They proved that given a Galois covering $F : A \rightarrow B$ defined by a group G , there is a spectral sequence $H^*(G, H^*(A, LM))$ converging to $H^*(B, M)$, for any B -bimodule and where LM is the lifted A -bimodule.

In this work we consider the problem of computation of $H^*(A, N)$ where A is a k -linear category, connected, locally bounded and with no directed cycles and can be approximated by finite convex subcategories, and N is any A -bimodule.

One-parameter 3-equipped posets

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Horario: Martes 12:00-12:30

RESUMEN. Representation theory of posets is an important branch of the modern representation theory of algebraic structures. It has its roots in the representation theory of finite-dimensional algebras (see for instance [1]). Its main ideas were developed by the Kiev's representation theory school, beginning in the 1970s.

More recent research on the topic concern problems of representation theory of posets with additional structures, in particular, equipped posets [3]. Their representations determine some matrix problems of mixed type over a quadratic field extension, investigated primarily in the case of the classical extension $\mathbb{R} \subset \mathbb{C}$.

In this work, we extend the ideas of [3] introducing representations and corepresentations of 3-equipped posets (i.e. equipped with order relations of three kinds) and considering matrix problems of mixed type over cubic field extensions $F \subset G$. We describe the one-parameter 3-equipped posets and completely classify their indecomposable representations over an arbitrary purely inseparable extension in characteristic 3 (the representation-finite case was solved earlier in [2] in another context).

Referencias:

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Graded Lie algebras and q -commutative parameters

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RESUMEN. We study a graded Lie algebra whose transformation parameters are graded q -commutative. We verify that the cohomology of the q -function is not trivial. We show then that there is a real and faithful basis with such q -commutativity. We use this basis to perform a transformation on the graded Lie algebra that removes the q -commutativity of its parameters while maintaining the group grading.

Irreducible morphisms of categories of complexes

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Horario: Martes 16:30-17:30

RESUMEN. We study irreducible morphisms of complexes of modules (though in a more general setting). In particular, we show that the irreducible morphisms having one irreducible square fall into three canonical forms and give necessary and sufficient conditions for a given morphism of that type to be irreducible.

Corepresentations of equipped posets, their differentiation and properties

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Horario: Martes 17:30-18:00

RESUMEN. Representations of posets, both ordinary and with additional structures form an essential part of the modern representation theory [1]. Recall that in the papers [3,4] there were defined and investigated representations of equipped posets, whose classification leads to some matrix problems of mixed type over the pair (\mathbb{R}, \mathbb{C}) of fields of the real and complex numbers. In particular, the one-parameter and tame equipped posets were described there on the base of elaborating some differentiation functors, among them the differentiation algorithm VII and the completion operation (see details in [4]).

In the present work, we introduce and study matrix problems of mixed type which are in some intuitive sense dual to those mentioned above but are not reduced formally to them. The new problems are expressed in terms of corepresentations of equipped posets and are considered over a more general pair of fields (\mathbb{F}, \mathbb{G}) where \mathbb{G} is a quadratic extension of \mathbb{F} in characteristic not 2.

To deal with corepresentations of equipped posets, one has to develop the differentiation technique for them. We define the functors of Differentiation VII* and Completion for corepresentations and establish their main properties. This pair of reduction functors is sufficient, in particular, for complete description of corepresentations of one-parameter equipped posets (the work in progress). Notice that a solution to the

representation-finite case (both for representations and corepresentations) follows from an earlier result of [2] on schurian vector space categories. Some important properties of corepresentations of critical equipped posets are established as well.

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Algebras Toupie

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Horario: Martes 18:00-18:30

RESUMEN. Las álgebras toupie son una generalización de las álgebras canónicas [R]. En esta comunicación se expondrá un resumen de los trabajos [GL] y [AGL] donde se determinan los grupos de cohomología de Hochschild de estas álgebras y se clasifican según el tipo de representación (finita, mansa o salvaje) mediante parámetros combinatorios asociados al carcaj.

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Álgebras graduadas, construcciones geométricas y geometría noconmutativa

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Horario: Miércoles 10:30-11:30

RESUMEN. Dada un álgebra graduada finitamente generada $A = \bigoplus A_n$ es posible asociar a esta, de manera canónica, una tripleta $T = (Y, \sigma, \mathcal{L})$ en donde Y es una variedad proyectiva, σ un automorfismo de Y y \mathcal{L}

un haz de línea sobre Y . Esta construcción desarrollada por Artin, Tate y Van den Bergh facilita el estudio estructural del álgebra A mediante un homomorfismo de álgebras graduadas entre el álgebra A y un álgebra definida a partir de secciones de haces de línea definidos como productos tensoriales de imágenes inversas de \mathcal{L} a lo largo del automorfismo σ .

Recientemente Connes y Dubois-Violette demostraron que un refinamiento de esta construcción es posible en el caso de álgebras cuadráticas definidas sobre \mathbb{C} permitiendo en algunos casos controlar la norma de las representaciones del álgebra A y construir álgebras de operadores asociadas a esta. El estudio de álgebras cuadráticas en este contexto constituye una instancia de la relación entre la geometría álgebraica noconmutativa y la geometría diferencial noconmutativa.

Por anunciar

JUAN TIRAO

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Horario: Jueves 10:30-11:30

RESUMEN.

Comparison morphisms for resolutions of truncated quiver algebras

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Horario: Jueves 11:30-12:00

RESUMEN. In this talk we present a joint work with G. Ames and P. Tirao in which we explicitly give comparison morphisms, in both directions and for all degrees, between the minimal resolution and the bar resolution of an arbitrary truncated quiver algebra over a field of characteristic zero.

We are then able to understand the Yoneda product for the Hochschild cocomplex associated to the minimal resolution. Since the Hochschild cohomology groups have been described by Locateli in terms of pairs of paths using minimal resolutions we obtain a description of the Yoneda product at the cohomology level.

As applications, we exhibit examples of non cycle truncated quiver algebras with non trivial Yoneda product in positive cohomological degree. We point out that, by Locateli's results, cohomology classes of positive cohomological degree are all nilpotent if the field is of characteristic zero.

In contrast we prove that the Yoneda product is zero in positive cohomological degrees for two large classes of truncated quiver algebras.

As a final application we produce, for general truncated quiver algebras, many explicit non zero cohomology classes in the bar resolution. In the particular case of the algebra of truncated polynomials in one variable, we exhibit a basis of the cohomology consisting of classes in the bar resolution.

Por anunciar

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Horario: Jueves 12:00-12:30

RESUMEN.

Sistemas Estratificantes

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Horario: Jueves 16:30-17:30

RESUMEN. En esta ponencia, hablará sobre las propiedades homológicas básicas de los sistemas estratificantes y sus conexiones con las álgebras estandarmente estratificadas y quasi-hereditarias.

Teoría de Anillos, Álgebra y Anillos no asociativos

Coordinadores: C P M , I P. S

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The Brauer group of a field and some of its subgroups

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Horario: Lunes 16:30-17:30

RESUMEN. Let $Br(k)$ be the Brauer group that of the field k . This group has two basic descriptions, one by means of equivalent classes of k -central simple algebras and one by means of Galois cohomology. There are subgroups of $Br(k)$ that may be defined by means of algebras (e.g. all central simple k -algebras that appear as homomorphic images of group algebras) and a natural question is to determine these subgroups by means of Galois cohomology (in the case of homomorphic images of group algebras, this is Brauer-Witt theorem). In the lecture I'll explain these concepts and present several results obtained in the last 15 years, including some recent ones. (joint work with J.Sonn, A. Wadsworth, A. del Rio)

Simetrías de sistemas no-integrables

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RESUMEN. Aunque el grupo G de simetrías de una distribución no-integrable es genéricamente trivial, hay excepciones en Geometría Algebraica real y compleja donde G es un grupo de Lie simple interesante. En algunos casos las consecuencias de la acción de G son claras, en otros no tanto. La exposición estará concentrada en un de éstos, donde G es excepcional de tipo G_2 .

Sobre clases de Álgebras de Lie solubles de dimensión finita

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RESUMEN. En este trabajo se estudiarán las álgebras de Lie desde un punto de vista algebraico, haciendo especial énfasis en las álgebras de Lie solubles y nilpotentes de dimensión finita.

Uno de los objetivos centrales es la extensión de los argumentos clásicos sobre existencia y conjugación de las subálgebras de Cartan de una álgebra de Lie soluble de dimensión finita. Además presentamos un cambio en la terminología clásica, teniendo como fundamento la terminología moderna de las clases de grupos solubles finitos.

Por último, se demuestra que los \mathfrak{N} -proyectores de una álgebra de Lie soluble de dimensión finita coinciden con sus subálgebras de Cartan, donde \mathfrak{N} es la clase de todas las álgebras de Lie nilpotentes.

Palabras y frases claves: Álgebra de Lie, álgebras de Lie nilpotente, subálgebra de Cartan, clases de álgebras de Lie y \mathfrak{N} -proyectores.

Diferencias geométricas entre el uso de álgebras y superálgebras de Lie

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RESUMEN. Sea V un espacio vectorial con una descomposición en suma directa $V = U \oplus W$. Es bien conocido que $End(U \oplus W)$ tiene estructura de álgebra de Lie y estructura de superálgebra de Lie. Si tenemos geometrías $B_U : U \times U \rightarrow C$ y $B_W : W \times W \rightarrow C$ podemos definir una geometría B en V via $B_U \oplus B_W$. En esta charla determinaremos cuando es mejor usar la estructura de álgebra de Lie ó la estructura de superálgebra de Lie de $End(U \oplus W)$ considerando funciones lineales que preserven B . Veremos que si incluimos funciones no triviales $U \rightarrow W$ y $W \rightarrow U$ obtenemos restricciones en las geometrías B_U y B_W . También ilustraremos como elegir una geometría en V , bajo la condición adicional de $U \simeq W$, en la cual U y W sean isotrópicos.

Partial Actions And Enveloping Actions

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Horario: Miércoles 10:30-11:30

RESUMEN. Partial actions of groups on algebras have been recently defined and studied by M. Dokuchaev and R. Exel, using partial actions. In this lecture we recall some of their results with emphasis in enveloping actions. We discuss some situations in which a class of rings has an enveloping actions which is in the same class. Relations with the partial skew group ring are also discussed

Varieties of algebras of almost polynomial growth

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RESUMEN. Let G be the infinite dimensional Grassmann algebra over a field F of characteristic zero and UT_2 the algebra of 2×2 upper triangular matrices over F . The relevance of these algebras in PI -theory relies on the fact that they generate the only two varieties of almost polynomial growth, i.e., they grow exponentially but any proper subvariety grows polynomially. We classify, up to PI equivalence, the associative algebras A such that A belongs to $var(G)$ or $var(UT_2)$.

Construction of central polynomials of matrices over the Grassmann algebra

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Horario: Jueves 10:30-11:30

RESUMEN. We present a method for computing an independent generating set for the multilinear central polynomials of matrices over the Grassmann algebra. This is a joint work with Sandra Alves.

Álgebras cuasi-Jordan

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RESUMEN. A mediados de los años 80, del siglo pasado, el matemático francés Jean-Louis Loday, estudiando fenómenos de obstrucción en K-teoría, introduce dos nuevas estructuras algebraicas: las álgebras de Leibniz y las álgebras diasociativas (diálgebras). Estas dos estructuras son generalizaciones de las álgebras de Lie y las álgebras asociativas respectivamente, las cuales mantienen la misma relación existente entre ellas, es decir que toda diálgebra genera un álgebra de Leibniz por medio del producto

$$[x, y] := x \dashv y + y \vdash x, \quad \forall x, y \in D,$$

para toda diálgebra (D, \dashv, \vdash) , y el álgebra envolvente universal de un álgebra de Leibniz tiene la estructura de una diálgebra. En esta charla mostraremos una nueva estructura algebraica de tipo Jordan, introducida recientemente por R. Velásquez y R. Felipe. Esta nueva estructura, llamada álgebras cuasi-Jordan, surgen del estudio del producto

$$x \triangleleft y := \frac{1}{2}(x \dashv y + y \vdash x),$$

donde x, y son elementos en una diálgebra (D, \dashv, \vdash) . Las álgebras cuasi-Jordan son una nueva generalización de las álgebras de Jordan, donde la conmutatividad del producto es cambiada por la conmutatividad por factor a derecha y una forma especial de la identidad de Jordan se mantiene. Mostraremos algunos resultados sobre la relación que existe entre álgebras de Jordan y álgebras cuasi-Jordan. Además, compararemos las álgebras cuasi-Jordan con algunas estructuras conocidas. En particular, probaremos una relación especial con las álgebras de Leibniz. En este sentido, se construye un álgebra cuasi-Jordan a partir de un elemento ad-nilpotente cualquiera, con índice de nilpotencia a lo sumo 3, en un álgebra de Leibniz.

Group codes from subgroups

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RESUMEN. Error correcting codes can be defined in several ways and several authors have noted that many of the codes actually in use can be defined as ideals in group algebras. We shall consider codes that arise from semisimple group algebras, which can be defined as ideals generated by idempotents, and discuss the following: Group algebras and group codes. Semisimplicity and idempotents. Constructions of idempotents from subgroups. Minimal Cyclic and Abelian codes. Minimal Dihedral and Quaternion two-sided codes. Coding and decoding with dihedral codes.

References:

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On higher derivations and higher homomorphisms of prime rings

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RESUMEN. Let R be a ring not necessarily with an identity element. A well known result proved by I.N Herstein concerning derivations in prime rings have been extensively studied by many authors like: M. Bresar, N.M Shammu and M. Ashraf and N. Rehman. Also, C. Haetinger and M. Ferrero extended this result to higher derivations. The main purpose of this work is:

- (i). Extend N.M Shammu's theorem to higher N -derivations by giving the concept of higher N -derivation;
- (ii). We answer the question of C. Haetinger and W. Cortes whether the result of C. Haetinger and M. Ferrero is also true for Jordan generalized triple higher derivations;
- (iii). We introduce the concept of (U, R) -derivations and generalized (U, R) -derivations. Then we extend Awtar's theorem and we extend this result to higher (U, R) -derivations and to generalized higher (U, R) -derivations by giving corresponding definitions. A well-known result of I.N. Herstein concerning Jordan homomorphisms and Jordan triple homomorphisms has been extensively extended by M. Bresar. Also R.C. Shaheen extended these results to generalized Jordan homomorphisms and generalized Jordan triple homomorphisms.

We introduce the concepts of higher homomorphism, Jordan homomorphism and generalized Jordan triple homomorphism, as well as their generalizations. Moreover, we extend the above results and study these concepts onto 2-torsion free prime rings.

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Teoría de Grupos

Coordinador: O P S

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La asociatividad generalizada para la operacion conmutador en grupos

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Horario: Lunes 16:30-17:30

RESUMEN. Presentaremos avances recientes en el tema de la asociatividad generalizada para la operacion conmutador en grupos. Esta propiedad, ya estudiada en 1941 por Levi, fue recientemente conectada con el grupo F de Thompson, en trabajo de Geoghegan y Guzman.

Conjugación en el grupo de Thompson V

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RESUMEN. Se presenta una solución al problema de la conjugación en V , basado en el estudio de la dinámica de los elementos del grupo.

Acción de Grupos en Jacobianos

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RESUMEN. A partir del estudio de Superficies de Riemann compactadas en acción de un grupo dado, surgen diversos problemas para ser considerados; por ejemplo estudiar la acción inducida por el grupo en la variedad Jacobiana de la superficie y su correspondiente descomposición en variedades abelianas de dimensiones menores y relacionar esta descomposición con las representaciones racionales irreducibles del grupo.

En esta charla mostraremos resultados sobre tal descomposición y daremos una interpretación geométrica en términos de variedades Jacobianas y de Prym de cubrimientos intermedios para los factores que aparecen. También, aplicaremos estos resultados para abordar algunas conocidas conjeturas.

Revestimientos Ramificados y Grupos de permutaciones

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RESUMEN. Decimos que un revestimiento se descompone cuando es posible escribirlo como composición de dos revestimientos de grado mayor que 1. En particular se un revestimiento ramificado se descompone, por lo menos uno de sus factores es también ramificado. Por otro lado, todo revestimiento ramificado de grado d determina un grupo de permutaciones del mismo grado, esto es, un subgrupo del grupo simétrico Σ_d y además un conjunto de particiones de d . Mostramos que un revestimiento ramificado se descompone si y solo si el grupo de permutaciones que el determina es imprimitivo. Presentamos también una serie de resultado cuando consideramos dichos revestimientos sobre una superficie orientable de género positivo.

Knot-like groups, Novikov rings and related topics

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RESUMEN. We discuss the applications of Bieri-Strebel-Renz Σ -theory and analytic methods (i.e. von Neumann dimensions of Hilbert modules and analytic Betti numbers) to group theory. As an application we show that the Novikov ring associated to a discrete character of a finitely generated group G is von Neumann finite (i.e. left inverse is right inverse and vice-versa) [2] and that the Rapaport Strasser Conjecture for knot like groups holds i.e. if G is a knot like group with finitely generated commutator then the commutator is free [1], [2]. The main result of [1] was already generalised in [3] and has some \hat{A} applications for Poincare duality groups [4] we hope to discuss if the time permits. It is interesting to note that earlier results on parcial cases of the Rapaport Strasser Conjecture used again analytic methods (i.e. analytic Betti numbers) [5].

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El grupo de en un nudo virtual

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RESUMEN. La teoría de los nudos virtuales fué introducida por Kauffman en 1996 motivada por el estudio de curvas en superficies “engrosadas” $\Sigma_g \times [0, 1]$. A lo largo de estos años muchas de las definiciones, propiedades e invariantes de los nudos clásicos han podido extenderse a la teoría de nudos virtuales, en particular el concepto de grupo de un nudo. Este grupo fué definido por medio de una presentación a partir del diagrama de un nudo virtual.

Nosotros haremos una construcción del grupo de un nudo virtual a partir del concepto de nudo combinatorio. Este método, además de ser mas eficiente, permite la construcción de ejemplos importantes en la categoría de los nudos virtuales. Daremos ejemplos de nudos virtuales cuyos grupos tienen propiedades que no se cumplen o son preguntas abiertas en el caso de los grupos de los nudos clásicos. Mostraremos condiciones necesarias y suficientes para determinar cuando un grupo es el grupo de un nudo virtual y en caso de serlo ilustraremos un algoritmo, utilizando los nudos combinatorios, para construir un nudo virtual cuyo grupo sea isomorfo al grupo en cuestión.

Dualización de grupos abelianos casi totalmente descomponibles Teoría de Grupos

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Horario: Jueves 11:30-12:30

RESUMEN. We consider quotient divisible abelian groups which are dual to almost completely decomposable abelian groups in the sense of duality [1]. The Lemma by L.Fuchs [2] is dualized. It presents a sufficient condition of indecomposability for acd-groups. Finally, we consider a dualization of the well-known example of anomalous direct decompositions for torsion-free finite-rank groups by A.L.S.Corner [3].

References:

- [1] A.A.Fomin and W.J.Wickless. Quotient divisible abelian groups, Proc. of the AMS, vol. 126, no. 1, 1998, 45-52.
- [2] L.Fuchs. The existence of indecomposable abelian groups of arbitrary power, Acta Math. Acad. Sci. Hungar., 10 (1959), 453-457.
- [3] A.L.S.Corner. A note on rank and direct decompositions of torsion free abelian groups, Proc. Cambridge Philos. Soc., 57 (1961),230-233.

Dualización en la teoría de clases de grupos finitos solubles

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Horario: Jueves 12:30-13:00

RESUMEN. En este trabajo presentaremos una generalización de los teoremas de Sylow introduciendo los conceptos de clases de Fitting y Xf -inyector de un grupo finito soluble G . Además mostraremos que dicha extensión es dual a la realizada con las formaciones saturadas y los Xf -proyectores de G .

Representaciones modulares de grupo de Weyl de tipos A_n y B_n

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Horario: Jueves 16:30-17:30

RESUMEN. En [1] Macdonald presenta una familia de representaciones irreducibles para grupos de Weyl. Posteriormente, en [2] Lusztig muestra que estas familias agotan todas las representaciones irreducibles, no isomorfas dos a dos, en el caso de grupos de Weyl de tipos A_n y B_n . Mostramos que las representaciones de Macdonald pueden ser adaptadas para realizar todas las representaciones irreducibles no isomorfas dos a dos, sobre un cuerpo de característica positiva distinta de 2, en el caso de los grupo de Weyl de tipos A_n y B_n .

Referencias:

[1] Macdonald, I.G., Some irreducible representations of Weyl groups, Bull. London Math. Soc., 4 (1972), 148-150.

[2] Lusztig, G., A class of irreducible representations of Weyl group, Indag. Math., 41 (1979), 323-335.

Grupos finitamente presentados

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Horario: Jueves 17:30-18:00

RESUMEN. Esta ponencia trata de los grupos finitamente presentados y en particular de los grupos con un relator, haciendo énfasis en la solución del problema de la palabra en este tipo de grupo y en el papel que desempeña la demostración del Freiheitssatz dada por Magnus en dicha solución. También exhibimos ciertos ejemplos en donde se aplica la solución del problema de la palabra para responder a ciertas preguntas que se habían formulado en este tipo de grupos.

Weighted Vogan diagrams associated to real nilpotent orbits

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Horario: Viernes 11:30-12:30

RESUMEN. Let G_o a real connected semisimple Lie group and \mathfrak{g}_o its Lie algebra. Denote with G and \mathfrak{g} their complexifications. The purpose of this work is to associate to each nilpotent G_o -orbit of a simple real Lie algebra \mathfrak{g}_o a weighted Vogan diagram in analogy with weighted Dynkin diagrams for nilpotent G -orbits of \mathfrak{g} given in [1], [2] or [3].

A weighted Vogan diagram is a 4-tuple (D, θ, J, ω) where D is a Dynkin diagram, θ is an automorphism of the diagram D of order at most 2, J is a subset of the θ -invariant nodes of D and $\omega = (\omega_1, \dots, \omega_n)$ is a set of weights attached to the nodes of D (see [4] for Vogan diagrams).

In the complex case the explicit weighted Dynkin diagrams of distinguished nilpotent G -orbits of complex simple Lie algebras give rise to a classification of all the complex nilpotent orbits of a given complex Lie algebra. Here we characterize the weighted Vogan diagrams of *noticed* nilpotent G_o -orbits of real simple Lie algebras. They play the role of distinguished ones in the real case.

This work was based in the results of Nöel [5], where there is a classification of all the nilpotent K -orbits of \mathfrak{p} for a given Cartan decomposition $\mathfrak{g}_o = \text{Lie}(K)_o \oplus \mathfrak{p}_o$.

References:

- [1] P. Bala and R. W. Carter, *The classification of unipotent and nilpotent elements*, Indag. Math. **36** (1974), 207–252.
- [2] R. W. Carter, *Finite groups of Lie type: Conjugacy classes and complex characters*, Wiley-Interscience Publication, 1985.
- [3] D. H. Collingwood and W. M. McGovern, *Nilpotent orbits in simple Lie algebras*, Van Nostrand Reinhold Mathematics Series, New York, 1985.
- [4] A. W. Knap, *Lie groups beyond an introduction*, Progress in Mathematics, Birkhäuser, 1996.
- [5] A. G. Nöel, *Nilpotent orbits and theta-stable parabolic subalgebras*, Representation Theory (e-jour. of AMS) **2** (1998), 1–32.

Cursillo: Invariants of modules arising from group actions

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Horario: Martes-Miércoles-Jueves-Viernes 10:30-11:30

RESUMEN. In recent joint work, Robert Bieri and I have found new invariants of $\mathbb{Z}G$ -modules in the spirit of the Bieri-Neumann-Strebel-Renz invariants of groups. The input is: a non-negative integer n , a group G of type FP_n , a $\mathbb{Z}G$ -module A , and an action of G by isometries on a proper $CAT(0)$ metric space M . The output is $\Sigma^n(\rho; A)$ which is a subset of the (compact) boundary-at-infinity of M . This subset contains subtle information about the interplay between the module A and the action ρ . Even the case $n = 0$ is non-trivial and the algebraic structure issues there are not fully understood.

The relationship between this and previous work in the literature can be summarized as follows:

(1) In the case where A is the trivial $\mathbb{Z}G$ -module \mathbb{Z} this reduces to a homological version of our previously published “Sigma theory” of actions of groups on proper $CAT(0)$ spaces (Memoirs AMS, Number 765).

(2) In the case where the $CAT(0)$ space is just the real vector space $G/G_{ab} \otimes \mathbb{R}$ this reduces to the Bieri-Renz invariant $\sum^n(G; A)$.

The flavor of these talks will be homological algebra blended with ideas of non-positive curvature which I will explain. While we come to these results from a topological point of view where our module of most interest is the trivial $\mathbb{Z}G$ -module \mathbb{Z} , the questions opened up can be asked, and most likely have interesting answers, for other $\mathbb{Z}G$ -modules.