XXIII Coloquio Latinoamericano de Álgebra

PROGRAM

Mexico City, 5-9 of August 2019

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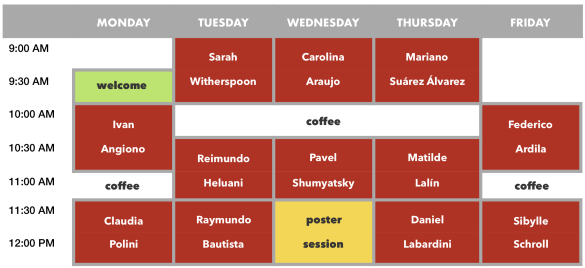


Monday, August 5

10.00-11.00

Iván Angiono (*Universidad Nacional de Cordoba*)

Poisson orders on large quantum groups

In the nineties De Concini, Kac and Procesi introduced and studied a quantized enveloping algebra $U_q(\mathfrak{g})$ (where $\mathfrak{g}$ is a finite-dimensional simple Lie algebra) at a root of unity q. The representation theory of $U_q(\mathfrak{g})$ was described from a geometric approach based on the fact that $U_q(\mathfrak{g})$ is module-finite over a central Hopf subalgebra $Z_q(\mathfrak{g})$. A key ingredient of this approach is the existence of a Poisson structure on $Z_q(\mathfrak{g})$ so that the algebraic group M corresponding to this algebra is a Poisson algebraic group, whose Lie bialgebra is dual to the standard Lie bialgebra structure on $\mathfrak{g}$. The approach consists in packing the irreducible finite-dimensional representations of $U_q(\mathfrak{g})$ along the symplectic leaves of M.

Based on a joint work with Nicolás Andruskiewitsch and Milen Yakimov, we will describe the representation theory of a larger class of Hopf algebras by means of Poisson orders. The keystone of the definition of these Hopf algebras, called large quantum groups, is the notion of distinguished pre-Nichols algebra, a covering of a finite-dimensional Nichols algebra. The Hopf algebras dealt with are module-finite over a central Hopf subalgebra. We will see that the maximal spectrum of this central Hopf subalgebra is a solvable algebraic Poisson group M, every irreducible representation of a large quantum group is finite-dimensional and we will describe the role played by the symplectic leaves of M.

11.30-12.30

Claudia Polini (University of Notre Dame)

Degrees of vector fields

Abstract: In this talk we relate the degrees of vector fields in projective n-space to properties of curves or even varieties that they leave invariant. We will survey some of the numerous previous results and report on recent joint work with Marc Chardin, Hamid Hassanzadeh, Aron Simis, and Bernd Ulrich, where the question is approached from a more algebraic point of view. We provide lower bounds for the degrees of vector fields in terms of local and global data of the curves they leave invariant. Higher dimensional varieties are considered as well, and the sharpness of the bounds will be discussed.

Tuesday, August 6

9.00-10.00

Sarah Witherspoon (Texas A&M University)

Varieties for representations and tensor categories

Algebraic geometry is used in representation theory to uncover information through the assignment of support varieties to modules. This theory began with finite group representations, and has been generalized in many directions. In this talk we will introduce the general theory in the contexts of finite dimensional Hopf algebras and finite tensor categories. These include representations of finite group algebras, restricted Lie algebras, and small quantum groups. We will discuss applications and recent developments.

10.30-11.30

Reimundo Heluani (*IMPA*)

The first chiral homology group

For a vertex algebra V, Beilinson and Drinfeld introduced a complex of vector bundles with connections on the moduli space of smooth curves. In the case of elliptic curves, the flat sections of the homology in degree 0 agree with the space of conformal blocks. Zhu proved that under certain conditions, the characters of irreducible representations form a basis of this space. We generalize his techniques for higher homology groups. In particular we associate flat sections in degree one to certain extensions of modules. This is joint work with Jethro van Ekeren.

11.30-12.30

Raymundo Bautista (*UNAM, México*)

Bocses

Bocs is an acronym for (b)-imodule (o)ver a (c)ategory with (c)oalgebra (s)tructure. In this talk a bocs is a quadruple $\mathcal{B} = (S, W, \mu, \epsilon)$, where S is an algebra over some field k, W is a S-S-bimodule $\mu : W \otimes_S W \to W$ is a co-associative co-multiplication and $\epsilon : W \to S$ is a co-unit. Bocses were introduced in 1980 by A.V. Roiter.

During the talk we recall the definition and properties of the category of representations of the bocs $\mathcal{B}$, and how this category was used by Yu.A. Drozd for proving the Wild-Tame theorem for finite-dimensional k-algebras. Then we consider the case in which W is obtained by the bar construction of some A-infinite algebra A. In this case we will see the relation between the category of representations of $\mathcal{B}$ and the A-infinite modules over A. Finally we explain how this construction is used for proving the wild tame dichotomy for the category of the stratified modules over a quasi-hereditary algebra.

Wednesday, August 7

9.00-10.00

Carolina Araujo (*IMPA*)

Tsen's Theorem and higher Fano manifolds

In 1936, Tsen proved that a 1-dimensional family of hypersurfaces of degree d in complex projective n-space always admits a section provided that $d \leq n$. This simple statement has been generalized in many ways, and still inspires developments in algebraic geometry. In this talk, I will survey the history of Tsen's Theorem, mostly from the geometric point of view, and describe current research toward new interpretations and generalizations. In particular, motivated by a conjectural generalization of Tsen's Theorem, I will introduce higher Fano manifolds and discuss their intrinsic geometry.

10.30-11.30

Pavel Shumyatsky (*Universidade de Brasília*)

Centralizers in profinite groups

I will survey some recent results on centralizers in profinite groups. In particular, I will describe the theorem that if G is a profinite group in which

all centralizers are abelian, then G is either virtually abelian or virtually pro-p. This is a joint result with Pavel Zalesski and Theo Zapata.

Thursday, August 8

9.00-10.00

Mariano Suárez Álvarez (*Universidad de Buenos Aires*)

TBA

10.30-11.30

Matilde Lalín (*Université de Montréal*)

L-functions and Mahler measure: number theory and beyond

In this talk we will begin by discussing zeta and L-functions and explaining why they are important. We will then introduce the Mahler measure, which is a function on the roots of polynomials but can also be extended to multivariable polynomials by doing a complex integral. These two seemingly unrelated topics are surprisingly connected, since the Mahler measure of multivariable polynomials often yields special values of L-functions. We will discuss some aspects of these intriguing relations as well as other unexpected relations arising from Mahler measure.

11.30-12.30

Daniel Labardini (*UNAM*)

Cluster algebras, hyperbolic geometry, and generic bases

Cluster algebras were invented by Sergey Fomin and Andrei Zelevinsky almost 20 years ago. Ever since, a lot of the related research has meandered between the discovery of connections with several different areas of Mathematics (e.g. Hyperbolic Geometry and Teichmüller Theory), and the search and understanding of various types of bases for cluster algebras.

I will start this talk by giving a brief overview of what a cluster algebra is (a ring whose generators are produced recursively by applying a very simple combinatorial operation, called mutation, on oriented graphs). Then I will present an identity discovered to hold in the hyperbolic plane by Robert Penner, and describe how this identity allows cluster algebras to appear as coordinate rings of Teichmüller spaces of punctured surfaces, as discovered by Sergey Fomin, Michael Shapiro and Dylan Thurston, and Vladimir Fock and Alexander Goncharov. Then I will sketch an elementary proof, obtained by Christof Geiss, Jan Schröer and myself, that certain proposed sets are

bases, called generic bases, for the cluster algebras that appear in the context of punctured surfaces with non-empty boundary.

Friday, August 9

10.00-11.00

Federico Ardila (San Francisco State University)

El álgebra y la geometría de las matroides

La teoría de matroides es una teoría combinatoria de la independencia que viene del álgebra lineal y la teoría de grafos, y tiene conexiones importantes con muchos otros campos de la matemática. Con el tiempo, las raíces geométricas de esta área se han profundizado y fortalecido enormemente, dando muchos frutos.

El enfoque algebraico y geométrico a las matroides ha llevado al desarrollo de matemática fascinante, y ha brindado las herramientas necesarias para la solución a varios problemas abiertos clásicos. Esta charla dará un resumen de algunos logros recientes.

La charla no asumirá conocimiento (¡o interés!) previo sobre la teoría de matroides. Presentará el trabajo de muchas personas, incluyendo mis trabajos con Carly Klivans, Graham Denham, y June Huh.

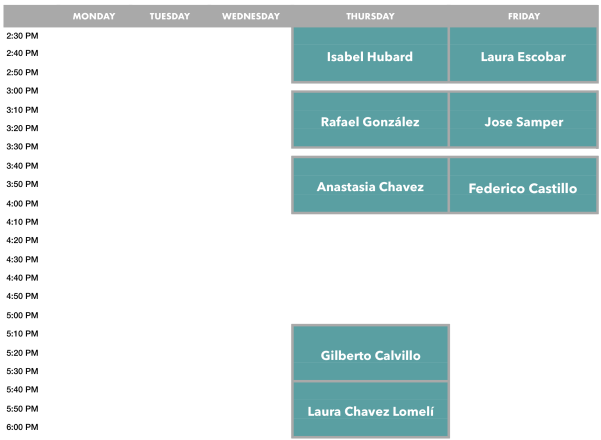
11.30-12.30

Sibylle Schroll (University of Leicester)

Geometric surface models in representation theory

Over the past ten years, geometric surface models have played an increasingly important role in the representation theory of finite dimensional algebras. In this talk we will give a brief overview of the different models and then focus on geometric models for a well-known class of algebras, the so-called gentle algebras. While gentle algebras originate in the representation theory of algebras they appear in many different areas of mathematics, such as in $N = 2$ gauge model theories, in the theory of cluster algebras and most recently in the context of homological mirror symmetry of 2-dimensional manifolds. We will introduce the geometric models for gentle algebras from a representation theoretic point of view and show how they relate to the surface models in the homological mirror symmetry program.

	MON	TUE	WED	THU	FRI
Finite Fields	■	■			
Hopf Algebras and Tensor Categories	■	■			
Logic and Universal Algebra	■	■			
Homological Methods	■	■			
Rings and Algebras	■	■			
Commutative Algebra and Algebraic Geometry		■		■	
Algebraic Combinatorics				■	■
Group Theory				■	■
Lie Groups and Representations				■	■
Number Theory				■	■
Representations of Algebras				■	■
Computational Algebra and Applications of Algebra					■
Poster Session			■		



Thursday, August 8

14.30-15.00

Isabel Hubard *(UNAM, México)*

Abstract polytopes and their groups

In this talk the concept of an abstract polytopes will be introduced and we will talk about the two groups that encapsule all the information of the combinatorial structure.

15.05-15.35

Rafael González *(Universidad Sergio Arboleda, Colombia)*

A weighted generalization of the bond lattice of a graph

For any pair of positive integers n and k, we introduce a family of posets that generalize both the bond lattice of a graph and the poset of weighted partitions introduced by Dotsenko and Khoroshkin in the case $k = 2$ of the complete graph, which was extended and studied by González D'León and Wachs. We show that for chordal graphs, these posets are EL-shellable and

hence Cohen-Macaulay. The Möbius values of the máximal intervals induce an interesting family of symmetric functions that conjecturally distinguish trees. In the case of path graphs, the family of symmetric functions coincides with Garcia-Haiman's parking function symmetric functions. In the case k=2 of a tree, the symmetric function conjecturally contains the information of the h-vectors of graph associahedra studied by Postnikov, Reiner and Williams, and others. This is joint work with Michelle Wachs.

15.40-16.10

Anastasia Chavez (UC Davis, USA)

Characterizing quotients of positroids

We characterize quotients of specific families of positroids. Positroids are a special class of representable matroids introduced by Postnikov in the study of the nonnegative part of the Grassmannian. Postnikov defined several combinatorial objects that index positroids. In this talk, we make use of two of these objects to combinatorially characterize when certain positroids are quotients. Furthermore, we conjecture a general rule for quotients among arbitrary positroids on the same ground set.

17.10-17.40

Gilberto Calvillo *(UNAM, México)*

A geometrical characterization of matroids

It is well known that there are plenty of ways to characterize matroids. Some time ago I found one in pure geometric terms. The characterization is valid for integer polimatroids too. The idea arose from the realm of combinatorial optimization, so I will describe a geometrical property that is related to polytopes of polynomially solvable problems and then a stronger version for matroids that happens to characterize them.

17.45-18.15

Laura Chavez Lomelí *((UAM Azcapotzalco, México)*

Balance en matroides

En 1976, A. Hoffman publicó un artículo en el que presenta un resultado sobre matrices totalmente unimodulares y una lista de aplicaciones de este a varios campos, incluyendo teoríaa de gríaficas. En el caso de gráficas, dicho resultado relaciona una noción de balance en cortes de aristas con el problema de flujo en redes. Dualmente el resultado se puede aplicar a circuitos obteniendo una versión de número cromático. El ``Lema de

Hoffman", como se le conoce ahora, es (claramente) válido para matroides regulares y es natural tratar de extender estos conceptos y resultados a otras clases de matroides. En esta plática presentaremos algunos de los resultados nacidos de este estudio.

In 1976, A. Hoffman published a paper where he introduces a result on totally unimodular matrices along with a list of applications to various areas of science, among them, graph theory. For graphs, this result connects a notion of balance of edge cuts to network flows. Dually, it can be applied to circuits resulting on a version of chromatic number. ``Hoffman's Lemma" as it is now known, is (clearly) valid form regular matroids and it is natural to try to extend these concepts and results to other classes of matroids.In this talk we present some of the results derived from this study.

Friday, August 9

14.30-15.00

Laura Escobar (Washington University in St. Louis, USA)

Wall-crossing phenomena for Newton-Okounkov bodies

A Newton-Okounkov body is a convex set associated to a projective variety, equipped with a valuation. These bodies generalize the theory of Newton polytopes. Work of Kaveh-Manon gives an explicit link between tropical geometry and Newton-Okounkov bodies. We use this link to describe a wall-crossing phenomenon for Newton-Okounkov bodies. As an application we show how the wall-crossing formula for the tropicalization of $Gr(2, n)$ is an instance of our phenomenon for Newton-Okounkov bodies. This is joint work with Megumi Harada.

15.05-15.35

Jose Samper (MPIM-Bonn, Germany)

Monoides de Hopf y clases quasi-matroidales

Continuando con el trabajo de M. Aguiar y F. Ardila sobre monoides de Hopf y matroides, construimos un monoide que considera matroides al tiempo que un orden lineal sobre el conjunto base. Una de las ventajas técnicas es que la construcción nos permite extender la estructura algebraica para varias familias de complejos simpliciales que se parecen mucho a las matroides. Esto nos deja trabajar en matroides con herramientas de combinatoria topológica y geométrica que está fuera del alcance de la teoría de matroides clásica. Presentaremos varias conjeturas para las clases nuevas

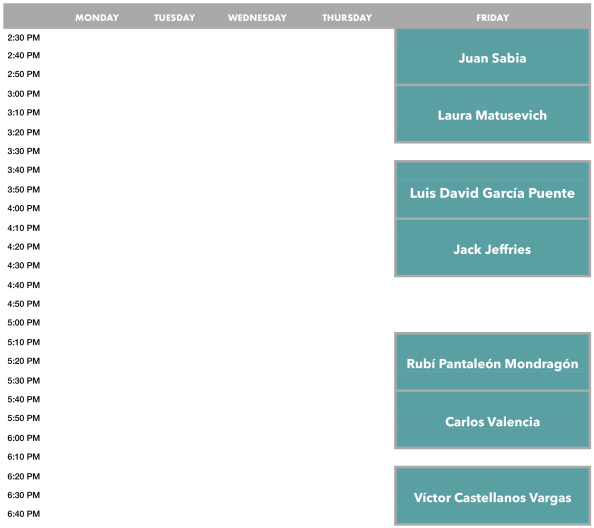
se objetos. Esta charla es basada en trabajo conjunto con Federico Castillo y Jeremy Martin y servirá como motivación para la charla de Federico.

15.40-16.10

Federico Castillo (University of Kansas, USA)

Monoides de Hopf de matroides ordenadas

Continuando con el trabajo de M. Aguiar y F. Ardila sobre monoides de Hopf y matroides, construimos un monoide que considera matroides al tiempo que un orden lineal sobre el conjunto base. En el proceso de calcular la antipoda de este monoide por sorpresa nos encontramos complejos simpliciales combinatoricamente interesantes. La idea es mostrar como la teoria de combinatoria topologica nos puede ayudar a entender un objeto algebraico mucho mejor. Esta charla es basada en trabajo conjunto con Jeremy Martin y Jose Samper.



Friday, August 9

14.30-15.00

Juan Sabia (*Universidad de Buenos Aires, Argentina*)

Hilbert's Nullstellensatz, sparse polynomials and degree bounds

Hilbert's Nullstellensatz states that a family F of polynomials has no common zeroes in an algebraically closed field if and only if 1 is in the ideal F generates. In this talk, we present new upper bounds for the degrees of the polynomials appearing in the writing of 1 as a linear combination of the polynomials in F in terms of mixed volumes of convex sets associated with the supports of F. Moreover, for an ideal I, we give an upper bound for the Noether exponent of I (a notion extremely related to Hilbert's Nullstellensatz) also in terms of mixed volumes of convex sets associated with the supports of a family of generators of I. Our bounds are the first one

to distinguish the different supports of the arbitrary polynomials involved and can be considerably smaller than previously known ones. This is a joint work with María Isabel Herrero and Gabriela Jeronimo (Universidad de Buenos Aires and CONICET, Argentina).

15.00- 15.30

Laura Matusevich (Texas A&M University, USA)

Computations for monomial ideals in semigroup rings

We extend the notion of standard pairs, originally introduced for monomial ideals in polynomial rings by Sturmfels, Trung and Vogel, to the context of monomial ideals in semigroup rings. In this more general setting, subtle behaviors have to be taken into account, especially in the non-normal case. We discuss how to compute standard pairs, and how to use standard pairs to compute irreducible decompositions.

This is joint work with Byeongsu Yu.

15.40-16.10

Luis David García Puente (Sam Houston State University, USA)

Absolute concentration robustness: Algebra and Geometry foundations

Molecules inside the cell undergo various transformations known as chemical reactions. Chemical Reaction Network Theory correlates qualitative properties of ordinary differential equations corresponding to a reaction network to the network structure. During the last several decades, there has been a lot of impetus in analyzing the long-term dynamics, the existence, uniqueness, multiplicity and stability of fixed points and several other concepts associated to these networks. Particular attention has been paid to the connection between mass-action kinetics of biochemical reaction networks and toric varieties. This algebro-geometric perspective has provided strong insights into the subject.

In this talk, we will focus on the notion of absolute concentration robustness (ACR). In 2010, Shinar and Feinberg introduced this notion in order to study the question of how do cells maintain homeostasis in fluctuating environments? A biochemical system exhibits ACR in some species A if for every positive steady state, regardless of initial conditions, the value of A is the same.

The main goal of this talk will be to establish the relation of ACR to various algebraic objects (ideals and varieties) associated to a reaction network. We will also focus on the problem of deciding whether a network has ACR. We

will discuss previous approaches to the problem together with their pitfalls and also introduce our own procedures based on comprehensive Groebner bases and numerical algebraic geometry.

This talk will not assume prior knowledge into the subject. In a broad sense, it will showcase a particular application of advanced computational algebra techniques in the biochemical sciences. This is joint work currently in progress with Elizabeth Gross, Heather Harrington, Matthew Johnson, Nicolette Meshkat, and Anne Shiu.

16.10-16.40

Jack Jeffries (*CIMAT, México*)

Neural rings

Neural rings and ideals, as introduced by Curto, Itskov, Veliz-Cuba, and Youngs, are a useful algebraic tool for organizing the combinatorial information of neural codes in the brain. In this talk, we will discuss this construction, and survey some of the results on this topic. In the end, we will focus on the notion of polarization of neural rings developed in joint work with Sema Güntürkün and Jeffrey Sun.

17.10-17.40

Rubí Pantaleón Mondragón (*CIMAT, México*)

An algorithm to detect foliations inside a Hilbert scheme

In 2001, Campillo and Olivares proved that a foliation of degree $d > 1$ on the complex projective plane, is uniquely determined by its singular subscheme. This subscheme corresponds to a point in the Hilbert scheme of $d^2 + d + 1$ points on the projective plane. However, there are elements in the Hilbert scheme that do not come from foliations.

In this presentation, I will talk about a method to detect points in the Hilbert scheme arising from foliations. This method not only detect the foliations, in the affirmative case, it builds them too, which we will see it with some examples.

17.40-18.10

Carlos Valencia (*CINVESTAV, México*)

k-stable and k-recurrent ideals of a matrix

In this talk we introduce k-stable and k-recurrent ideals of a matrix.

Their monomial standard correspond to k-stable and k-recurrent configurations, which generalizes superstable and recurrent configurations in the chip-firing game.

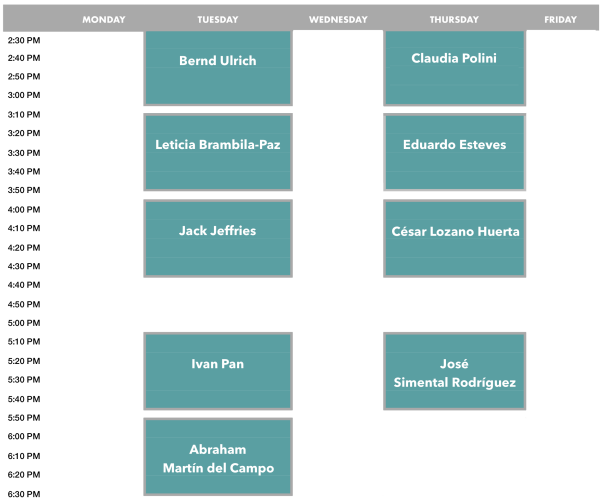
The concept of k-stability of a configuration was inspired on the concept of the k-skeleta of the G-parking function ideal and the concept of k-recurrent configuration is dual to k-stability.

18.20-18.50

Víctor Castellanos Vargas (*UJAT, México*)

The Koszul complex of vector fields and the calculus of the Poincaré-Hopf index

In this conference we will to compute the Poincaré-Hopf index of real analytic vector fields at isolated singularities using the Eisenbud-Levine algebraic formula and we generalize this formula using the Koszul complex, K, and the annihilator of the $H_k(K)$ as a $H_0(K)$ module.



Tuesday, August 6

14.30-15.10

Bernd Ulrich (Purdue University, USA)

Homological invariants of linkage

This is a report on joint work with Ragnar Buchweitz. We investigate homological properties that are invariant under linkage. These properties are finer than Cohen-Macaulayness or perfection, and include the depth and local cohomology of normal modules and twisted conormal modules, cohomology modules of the cotangent complex, and properties of the Yoneda Ext-algebra. These results can be used to distinguish linkage classes, and they have applications in deformation theory and the study of secant and join varieties, for instance.

15:15-15:55

Leticia Brambila-Paz (*CIMAT, México*)

On Butler's conjecture

The moduli spaces of augmented bundles, in general, depends of a parameter and we get a family of moduli spaces. In this talk I will explain Butler's conjecture and apply it to study the geometry of these moduli spaces

16:00-16:40

Jack Jeffries (University of Michigan, USA))

Bernstein-Sato polynomials and singularities

For a polynomial f in a polynomial ring R, its Bernstein-Sato polynomial is a rational polynomial in one variable that describes the action of differential operators on powers of f. Many results relate the roots of Bernstein-Sato polynomials to properties of the singularities of the hypersurface defined by f. Recent work of Ã€lvarez Montaner, Huneke, and NÃºÃ±ez-Betancourt shows that Bernstein-Sato polynomials sometimes exist for elements in rings A that are not smooth over a field (not polynomial rings). In this talk, we will extend some of these results on existence of Bernstein-Sato polynomials, and give some results relating roots of Bernstein-Sato polynomials on non-smooth rings A to singularities of the pair (A, f). This is based on joint work with Ã€lvarez Montaner, HernÃ¡ndez, NÃºÃ±ez-Betancourt, Teixeira, and Witt.

17:10-17:50

Ivan Pan (*Universidad de la República, Uruguay*)

On the Automorphism Group of a polynomial differential ring in two variables

We consider the group of plane k-automorpisms which commute with a derivation, in the case where k is algebraically closed of characteristic 0. We caracterize when such a group is algebraic and in this case we classify the corresponding groups. This is a join work with Rene Baltazar.

17:55-18:35

Abraham Martin del Campo (*CIMAT, México*)

The Optimal Littlewood-Richardson Homotopy

Schubert calculus is an important class of geometric problems involving linear spaces meeting other fixed but general linear spaces. Problems in Schubert calculus can be modeled by systems of polynomial equations.

Thus, we can use numerical methods to find the solutions to these geometrical problems.

We present the Littlewood-Richardson homotopy algorithm, which uses numerical continuation to compute solutions of Schubert problems on Grassmannians and is based on Vakil's geometric Littlewood-Richardson rule. This work is joint with Anton Leykin, Frank Sottile, Ravi Vakil, and Jan Verschelde.

Thursday, August 8

14.30-15.10

Claudia Polini (University of Notre Dame, USA)

Defining equations of blowup algebras

Finding the defining equations of graphs and images of rational maps is a fundamental problem in elimination theory that is wide open, even in the simplest of cases. Even if the defining equations cannot be determined explicitly, bounds on the generation degree of the defining ideal can provide structural information and are an important step in solving the implicitization problem. Furthermore, degree bounds make a difference computationally. In this talk we discuss how to bound the degrees of the defining equations of graphs and images of rational maps.

15:15-15:55

Eduardo Esteves (IMPA, Brazil)

Compactified Jacobians of stable curves

The compactified Jacobian is a natural compactification of the (generalized) Jacobian of a singular curve, the quasi-projective variety parameterizing line bundles (or invertible sheaves) over the curve with (multi)degree 0. It was first described for irreducible curves by Dâ€™Souza, Rego, Altman and Kleiman in the 1970â€™s, following suggestions by Mumford to use torsion-free, rank-1 sheaves. The interest arose from work on fixing Severiâ€™s proof of the Brill-Noether Theorem, eventually carried out by Griffiths and Harris. In the early 1980â€™s Eisenbud and Harris gave another proof of the theorem, introducing the notion of limit linear series for curves of compact type. Their theory was used in several applications to explain the geometry of the moduli space of stable curves. Unfortunately though, stable curves of compact type give only divisorial information about the moduli, thus the desire to find natural compactified Jacobians for all stable curves. In the 90â€™s Caporaso described such a compactification,

using ingeniously a variation of the GIT construction of the moduli of stable curves. Unfortunately though, the compactification parameterizes only stable sheaves, which seldom carry enough information about degenerating divisors. I will describe work in progress, joint with Omid Amini (École Polytechnique, Paris) and Margarida Melo and Filippo Viviani (Roma Tre), to produce another natural compactification of the Jacobian, one that does not rely on the notion of stability and accounts for all degenerating divisors.

16:00-16:40

César Lozano Huerta (*UNAM, México*)

Birational geometry via syzygies and interpolation of vector bundles

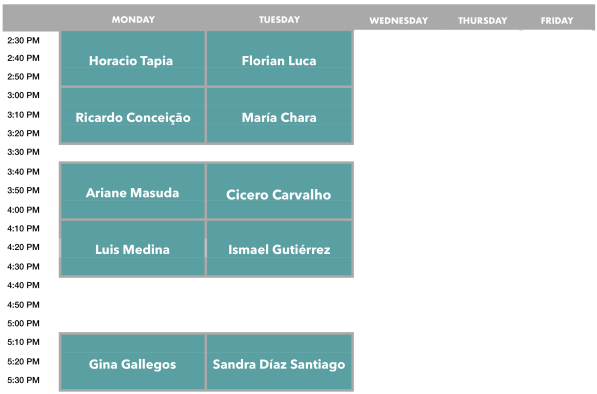
Often, the study of the birational geometry of a moduli space is understood as a program. This program first aims to determine invariants such as the cones of effective, ample and movable divisors; or the Mori chamber decomposition. In this talk, we will discuss the cone of effective and movable divisors of the Hilbert scheme of points on the plane. We propose an inductive method which determines such cones via syzygies in some cases. It is work in progress whether we can effectively compute the Mori chamber decomposition using this method. This is joint work with Manuel Leal and Tim Ryan.

17:10-17:50

José Simental Rodríguez (UC Davis, USA)

The k-equals arrangement via Cherednik algebras

We consider the subspace arrangement consisting of points in $\mathbb{C}^n$ *that have a cluster of* k *−equal coordinates (for example, when* k = 2$, this is the usual braid arrangement). We will give explicit formulas for the graded Betti numbers of this arrangement via abacus combinatorics, and we will see that these formulas come from explicitly constructing a minimal graded-free resolution of the defining ideal of the arrangement, which in turn comes from the representation theory of rational Cherednik algebras and Hecke algebras (analogously to Lascoux resolution of determinantal varieties). This is joint work with Emily Norton and Chris Bowman.



Monday, August 5

14.30-15.00

Horacio Tapia (*UAM-Iztapalapa, México*)

Elementos idempotentes en una clase de anillos conmutativos

Es bien sabido que los códigos cíclicos de longitud n (y algunas generalizaciones de estos como los constacíclicos), definidos sobre diversos anillos que incluyen campos y anillos de cadena finitos, R, se pueden identificar con ideales del anillo $R[x]/\langle x^n - 1\rangle$. Estos ideales se pueden describir por medio de un conjunto de generadores y en algunos casos por un solo generador (principales), siendo otra forma por medio de elementos idempotentes del anillo. Ambas formas tiene sus ventajas dependiendo del estudio que se realice de estos códigos. Por ejemplo, el conocer elementos idempotentes generadores de un código cíclico permite saber si este es un códigos LCD (Linear Complementary Dual). En general, determinar elementos idempotentes en un anillo A (finito conmutativo) no es una tarea fácil. En esta plática se presenta un método para determinar tales elementos a partir de elementos idempotentes de un anillo cociente A/N donde N es un ideal nilpotente del anillo A y A tiene una sucesión de ideales con ciertas propiedades. Ejemplos de esta clase de anillos incluye anillos de grupo, AG,

donde A es un anillo finito de cadena y G un grupo finito conmutativo. (Con la colaboración de F. Dinitz de Melo-Hernández y J.C. Hernández).

15.00-15.30

Ricardo Conceição (Gettysburg College, USA)

On MVSPs taking on three values

Let q be a power of a prime, and for any non-constant polynomial $F \in \mathbb{F}_q[x]$, let $V_F = \{F(\alpha) : \alpha \in \mathbb{F}_q\}$ be its value set. One can easily show that V_F satisfies

$$\left\lfloor \frac{q-1}{\deg F} \right\rfloor + 1 \leq |V_F| \leq q, \tag{1}$$

where $\lfloor n \rfloor$ is the greatest integer $\leq n$, and $|S|$ denotes the cardinality of the set S. Polynomials attaining the lower bound in (1) are called minimal value set polynomials (shortened to MVSP).

In this talk we discuss how a classification of Lacunary polynomials by L. Rédei can be used to classify MVSPs which split completely over the base field and whose value set has three elements.

15.40-16.10

Ariane Masuda (City University of New York, USA)

Isomorphism of graphs associated with Rédei functions

Let $\mathbb{F}_q$ be a nonbinary field. We fix $a \in \mathbb{F}_q^*$ and a positive integer n. For $x \in \mathbb{F}_q \cup \{\infty\}$, the Rédei function can be defined by $R_n(x,a) = \sqrt{a}\dfrac{(x+\sqrt{a})^n + (x-\sqrt{a})^n}{(x+\sqrt{a})^n - (x-\sqrt{a})^n}$. In 2015, Qureshi and Panario provided a description of the functional graphs associated with Rédei functions based on the dynamics of the multiplication map on cyclic groups. By using the conditions on the isomorphism of graphs of multiplication maps obtained by Deng in 2013, we investigate when graphs of Rédei functions are isomorphic. As a result, we obtain infinite families of isomorphic graphs associated with Rédei permutations. In particular, we describe all involutions that are isomorphic. This is joint work with Juliane Capaverde and Virgínia Rodrigues.

16.10-16.40

Luis Medina (University of Puerto Rico, Puerto Rico)

Value distribution of elementary symmetric polynomials and their perturbations over finite fields

In this talk we establish the asymptotic behavior of generating functions related to the exponential sum over finite fields of elementary symmetric functions and their perturbations. This asymptotic behavior allows us to calculate the probability generating function of the probability that the the elementary symmetric polynomial of degree k (and its perturbations) returns $\beta \in \mathbb{F}_q$, where $\mathbb{F}_q$ represents the field of q elements.

17.10-17.40

Gina Gallegos (*IPN, México*)

Efficient computations in the ring of integer polynomials $\mathcal{R}_q$ module $X^n + 1$

The evolution of computing power has led from the imminent arrival of quantum computers to the start of the NIST Post-quantum standardization process in 2017. Considering that security of the modern cryptography may be broken in polynomial time, in such a standardization process, new standards for encryption, signature and key encapsulation mechanism are being discussed. All of them can be classified depending the security problem they are based on, as in example: Codes, hashes, polynomials with multiple variables, isogenies of supersingular elliptic curves and lattices. Some of the schemes that base their security on this last one, perform computations in the ring of integer polynomials $\mathcal{R}_q$ with $\mathcal{R}_q = \mathbb{Z}_q[X]/(X^n + 1), n = 512$ or 1024 and $q = 12289$ where each coefficient is reduced modulo q. In this talk I will discuss about how such computations are enabled efficiently by using the Number Theoretic Transform (NTT) in order to transform polynomials into Fourier space. (In collaboration with Jesus-Javier Chi-Dominguez, Olimpia Saucedo-Estrada, Alfonso F. De Abiega-L'Eglisse, Kevin A. Delgado-Vargas and Luis Alberto Rivera-Zamarripa).

Tuesday, August 6

14.30-15.00

Florian Luca (University of the Witwatersrand, South Africa)

Fibonomials modulo p

We say that a set X of numbers is an additive bases of finite order k for a prime p if every residue class modulo p can be represented as $x_1 + x_2 + \cdots + x_k \pmod{p}$ where $x_i \in X$ for $i = 1, \ldots, k$. In my talk, I will survey results about sets of combinatorial objects which are known to

be additive bases modulo p either for every prime number p, or for a set of prime numbers p of asymptotic density 1 as a subset of all then primes. These include middle binomial coefficients, Catalan numbers, products of two factorials, Apery numbers and values of the Ramanujan τ-function. We will also present a new result to the effect that the set of Fibonomials $\binom{n}{k}_F$ forms an additive basis of order 8 for most primes p. Here, the Fibonomial coefficient $\binom{n}{k}_F$ is defined as $\frac{n!_F}{k!_F(n-k)!_F}$, where $n!_F = F_1 F_2 \cdots F_n$ and F_m is the mth Fibonacci number. The proofs use results from additive combinatorics. This is joint work with Victor García.

15.00-15.30

María Chara (*Universidad Nacional del Litoral, Argentina*)

An optimal recursive tower over the field with 4 elements with mixed variables

In this talk we introduce an optimal quadratic recursive tower $\mathcal{E} = (E_0, E_1, \dots)$ over $\mathbb{F}_4$ whose field extensions E_{i+1}/E_i are Artin-Schreier extensions but the tower itself is not recursively defined by an Artin-Schreier equation. To prove the optimality of this tower we use a simple but powerful systematic method, that we will also present in this talk, to construct proper recursive subsequences and supersequences of functions fields from other recursive sequences. This is a joint work with R. Toledano (Universidad Nacional del Litoral, Argentina) and H. Navarro (Universidad del Valle, Colombia).

15.40-16.10

Cicero Carvalho (*Universidade Federal de Uberlândia, Brasil*)

On some evaluation codes defined on higher dimensional scrolls

We will present a class of projective Reed-Muller type codes defined by evaluating a space of homogeneous polynomials in the points of a higher dimensional scroll. We determine a formula for the dimension of these codes and the exact value of the minimum distance in some special cases. This is a joint work with Victor G.L. Neumann, Xavier Ramírez-Mondragón and Horacio Tapia-Recillas.

16.10-16.40

Ismael Gutiérrez (*Universidad del Norte, Colombia*)

Cliques in projective space and construction of cyclic Grassmannian Codes

Cyclic Grassmannian codes were first presented by A. Kohnert and S. Kurz from the perspective of design theory over finite fields. Later T. Etzion and A. Vardy defined them as a q-analog of cyclic code from the classical coding theory. J. Rosenthal et al. and H. Gluesing et al. studied cyclic codes from the point of view of groups actions. Specifically, they have used an action of the general linear group over a Grassmannian to define them: these codes were called cyclic orbits codes. Cyclic Grassmannian codes are a special case of orbits codes.

Recently T. Etzion et al., K. Otal et al., B. Chen, and H. Liu presented new methods for constructing such codes, what includes linearized polynomials, namely subspace polynomials and Frobenius mappings.

A computational method for construction of cyclic Grassmannian codes was given by Gutierrez and Molina. Construction of Grassmannian codes in some projective space is highly mathematical and requires strong computational power for the resulting searches. In this talk, we present a new technique to construct subspace codes. We use some cliques in projective space $\mathbb{P}_q(n)$ to produce cyclic Grassmannian codes.

We denote with $\mathbb{P}_q(n)$ the projective space of order n, that is, the set of all subspaces of $\mathbb{F}_q^n$, including the null space and $\mathbb{F}_q^n$ itself. For a fixed natural number k, with $0 \leq k \leq n$ we denote with $G_q(n,k)$ the set of all subspaces of $\mathbb{F}_q^n$ of dimension k and we call it the k-Grassmannian over $\mathbb{F}_q$ or Grassmannian in short. We say that $\mathscr{C} \subseteq G_q(n,k)$ is an $(n, M, d, k)_q$ Grassmannian code if $|\mathscr{C}| = M$ and $d(X,Y) \geq d$ for all distinct $X, Y \in \mathscr{C}$. Such a code is also called a constant dimension code.

Let $\mathcal{A}_q(n,d,k)$ and $\mathcal{C}_q(n,d,k)$ be the maximum number of codewords in an $(n, M, d, k)_q$ grassmannian code over the filed $\mathbb{F}_q$ and the maximum number of codewords in an $(n, M, d, k)_q$ cyclic code over $\mathbb{F}_q$, respectively. It is clear that $\mathcal{C}_q(n,d,k) \leq \mathcal{A}_q(n,d,k)$.

Let $\alpha \in \mathbb{F}_{q^n}^*$ and $V \in G_q(n,k)$. The *cyclic shift* of V is defined as follows:

$$\alpha V := \{\alpha v \mid v \in V\}.$$

Clearly αV is a subspace belonging to $G_q(n,k)$. That is, it has the same dimension as V. A Grassmannian code $\mathscr{C} \subseteq G_q(n,k)$ is called \texttt{cyclic}, if for all $\alpha \in \mathbb{F}_{q^n}^*$ and all subspace $V \in \mathscr{C}$ we have that $\alpha V \in \mathscr{C}$. The set $\mathcal{O}rb(V) := \{\alpha V \mid \alpha \in \mathbb{F}_{q^n}^*\}$ is called the \texttt{orbit} of V. Observe that in this definition the zero vector was omitted from the set of an orbit. Starting now, this will be explicitly deleted when we specify the elements of a codeword of a cyclic Grassmannian code.

If $V \in G_q(n,k)$, then $|\mathcal{O}rb(V)| = \frac{q^n-1}{q^t-1}$, for some natural number t, which divides n.

Theorem

$$\mathcal{C}_q(n,d,k) = \sum_{t|n} \alpha_t \frac{q^n-1}{q^t-1}$$

for some integer $0 \leq \alpha_t$.

A clique of an undirected graph G is a complete subgraph of G; that is, A clique is a subset of vertices of G such that every two distinct vertices in the clique are adjacent. The clique of the largest possible size is referred to as a maximum clique; that is, it cannot be extended by including one more adjacent vertex. The clique number $\omega(G)$ of G is the number of vertices in a maximum clique in G. A clique of size k is called a k-clique.

To calculate the coefficients α_t in the previous theorem we proceed as follows:

1. Find all the orbits of $G_q(n,k)$ and denote this set by $\mathfrak{O}$. That is,

$$\mathfrak{O} := \{\mathcal{O}rb(V) \mid V \in G_q(n,k)\}.$$

2. Calculate the minimum subspace distance $d_{\mathcal{O}rb(\cdot)}$ of each orbit independently; then we form the pair $(\mathcal{O}rb(\cdot), d_{\mathcal{O}rb(\cdot)})$.

3. A minimum distance d is fixed, for which we want to obtain a cyclic code.

4. The graph $\mathcal{G} = (\mathcal{O}, \mathcal{E})$ is constructed so that the set $\mathcal{E}$ of edges is obtained in the following way: two orbits are adjacent if their union has a minimum distance greater or equal than d.

5. A clique in the graph $\mathcal{G}$ constructed in (4) is a Grassmannian cyclic code with minimum distance d and dimension k.

6. To determine the maximum values of each α_t, the graph $\mathcal{G}$ is separated into independent subgraphs by the number of spaces in their orbits (every vertex in each subgraph with the same number of associated spaces), and the number of cliques in each one is calculated.

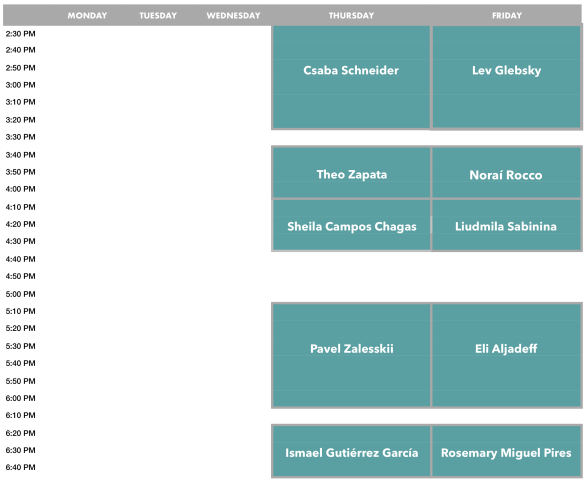
(In collaboration with Ivan Molina Naizir).

17.10-17.40

Sandra Díaz Santiago (*IPN, México*)

Una aplicación de secreto compartido

Un esquema de secreto compartido es un mecanismo, para compartir un secreto entre un grupo de participantes. El primer esquema de este tipo fue propuesto por Shamir en 1979 y consiste en dividir un secreto K en w partes que se les entregan a w participantes. El secreto K podrá recuperarse si se tienen al menos $u \leq w$ partes, pero no será posible reconstruirlo con menos de u partes. En esta charla, se presentará un protocolo criptográfico para el intercambio seguro de llaves. Aunque ya existen soluciones bien conocidas con este propósito, como el protocolo Diffie-Hellman o el uso de una infraestructura de clave pública, éstas pueden resultar costosas en ciertos escenarios. El protocolo criptográfico propuesto, utiliza el esquema original de Shamir sobre un campo primo, para intercambiar una clave de manera segura, bajo el supuesto de que el enemigo es un programa de cómputo y no un ser humano.



Thursday, August 8

14.30-15.30

Csaba Schneider (Federal University of Minas Gerais, Brazil)

A new look at permutation groups of simple diagonal type

Permutation groups of simple diagonal type form one of the classes of (quasi)primitive permutation groups identified by the O'Nan-Scott Theorem. They also occur among the maximal subgroups of alternating and symmetric groups. Until now, they were not considered as a geometric class in the sense that they were not viewed as stabilizers of geometric or combinatorial objects. In this talk I will report on some new research, carried out in collaboration with Cheryl Praeger, Peter Cameron and Rosemary Bailey, whose results show that these groups can also be viewed as full stabilizers of certain combinatorial structures. I will also show that a permutation group of simple diagonal type is the automorphism group of a graph which is constructed as the edge union of Hamming graphs. The results hold also for infinite permutation groups.

15.40- 16.10

Theo Zapata (*Universidade de Brasília, Brasil*)

Profinite groups in which the centralizer of any non-identity element is abelian

Groups in the title (\textit{i.e.}, profinite CA-groups) are also known as profinite commutativity-transitive groups. In this talk I shall present a dichotomy theorem obtained with P.~Shumyatsky and P.~Zalesskii (2019, Israel J. Math, v.~230): *Any profinite CA-group has a finite index closed subgroup that is either abelian or pro-p.*

16.10-16-40

Sheila Campos Chagas (University of Brasilia, Brazil)

Subgroup Conjugacy Separability

We will discuss the Subgroup Conjugacy Separability property introduced by O. Bogopolski and F. Grunewald. A group G is said to be subgroup conjugacy separable if for every pair of non-conjugate finitely generated subgroups H and K of G, there exists a finite quotient of G where the images of these subgroups are not conjugate. This is a joint work with Pavel Zalesskii.

17.10-18.10

Pavel Zalesskii (University of Brasilia, Brazil)

Virtually free pro-p groups and p-adic represantations

We shall discuss the connection between of a pro-p group $G = F \rtimes K$, where F is free of rank n and K is finite, and p-adic representations of K in $GL_n(\mathbb{Z}_p)$.

18.20-18.50

Ismael Gutiérrez García (*Universidad del Norte, Colombia*)

The Strong Containment for Saturated Formations of Finite Soluble Groups

All objects called groups will be supposed to belong to the class $\mathfrak{S}$ of the finite soluble groups. Let $\mathfrak{F}$ and $\mathfrak{H}$ be saturated formations with $\mathfrak{F} \subseteq \mathfrak{H}$. The fact that $\mathfrak{F}$ is in $\mathfrak{H}$ contained, does not imply a corresponding inclusion between their projectors. For example, in $sym(4)$, an $\ddot{\mathfrak{U}}$-projector cannot be contained in an $\mathfrak{NA}$-projector, although, $\ddot{\mathfrak{U}} \subseteq \mathfrak{NA}$.

Let $\mathfrak{F}$ and $\mathfrak{H}$ be saturated formations. We say that $\mathfrak{F}$ is strongly contained in $\mathfrak{H}$ if, in each finite soluble group G a $\mathfrak{F}$-projector of G is contained, as subgroup, in a $\mathfrak{H}$-projector of G. To denote it we write $\mathfrak{F} \ll \mathfrak{H}$. It is clear that $(\mathscr{F}, \ll)$ is a partial order.

The strong containment for Schunck classes is quite well understood. But in the context of the family, $\mathscr{F}$ of saturated formations in $\mathfrak{S}$ the theory is less satisfactory. The proofs are very complicated, and results of general applicability are difficult to find.

In this talk, we present a small historical tour through the strong containment relationship, its challenges and new consideration of this relation in another universe. (In collaboration with Anselmo Torresblanca Badillo)

Friday, August 9

14.30-15.30

Lev Glebsky (*Universidad Autonoma de San Luis Potosi, México*)

Approximations of groups and stability

In the talk I plan to present several definitions of approximations of groups, starting with one of A. Turing, discuss motivations, results and open problems. Then I will speak about stability (with respect to some asymptotic homomorphisms). The stability may serve as an obstruction for approximability. Unfortunately, the known results on stability is not sufficient to prove non-approximabilty results in most interesting cases.

15.40- 16.10

Noraí Rocco (University of Brasilia, Brazil)

Some Bounds for the Orders of Non-abelian Tensor Products of Groups

Let G and H be groups that act compatibly on each other. In this talk we consider the group $\eta(G, H)$, a certain extension of the non-abelian tensor product $G \otimes H$ by $G \times H$. Our purpose is to discuss the influence of the finiteness of the set of all tensors $T_{\otimes}(G, H) := \{g \otimes h : g \in G,\ h \in H\}$ on the finiteness of the non-abelian tensor product $G \otimes H$. We prove that if $|T_{\otimes}(G, H)| = m$, then $G \otimes H$ is finite with m-bounded order. We also address some results concerning finiteness conditions for the non-abelian tensor square of a group.

(This is a joint work with Raimundo Bastos and Irene Nakaoka).

16.10-16-40

Liudmila Sabinina (*UAEM, Cuernavaca, Mexico*)

On automorphic Moufang loops

The variety of Moufang loops and the variety of commutative Moufang loops are the most known varieties of loops. In our previous work it was shown that the variety of automorphic Moufang loops, i.e Moufang loops with some additional family of automorphisms, is a join of the variety of groups and the variety of commutative Moufang loops. In my talk I will present the variety of automorphic Moufang loops invariant under isotopy and discuss some related questions. It will be shown that any loop isotopic to 3-generator automorphic Moufang loop is again automorphic.

(This is a joint work with Alexandre Grishkov, Ricardo Diaz and Marina Rasskazova).

17.10-18.10

Eli Aljadeff (Technion-Israel)

Group gradings on finite dimensional division algebras

Finite group grading play a key role in the study of finite dimensional division algebras and more generally in the study of finite dimensional central simple algebras. For instance, crossed product algebras, which provide the bridge between Brauer groups and Galois cohomology, and symbol algebras, which provide the bridge between Brauer groups and K-theory, are both naturally graded algebras.

We consider the following question: What are all possible (finite) group gradings on finite dimensional k-central division algebras?

This seems to be a difficult problem in its full generality. For example we do not know for which finite groups G, there exists a field k_0 and a 2-cocycle $\alpha \in H^2(G, k_0^*)$ such that the twisted group algebra $k_0^\alpha G$ is a division algebra. In this talk we give, by means of generic constructions, a complete answer in the case where the center k contains an algebraically closed field of characteristic zero.

18.20-18.50

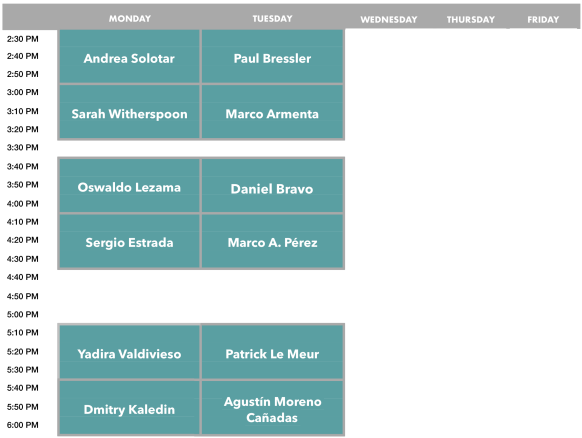
Rosemary Miguel Pires (Fluminense Federal University, Brazil)

Groups with triality associated to code loops

The study of code loops began with the paper *Code loops* of Griess. The complete classification of all code loops up to isomorphism is very difficult, since the number of those loops grows very quickly with growth of rank. Now we have classification of all code loops of rank up to 8. By the other hand, using the concept of the characteristic vectors associated with code loops, the classification of all code loops of rank $n < 5$ also has been done: there are exactly 5 nonassociative code loops of rank 3 (up to isomorphism) and 16 nonassociative code loops of rank 4 (up to isomorphism).

A group G that admits an action of $S_3 = \left\{\sigma, \rho \mid \sigma^2 = \rho^3 = (\sigma\rho)^2 = 1\right\}$ satisfying $(x^{-1}x^{\sigma})(x^{-1}x^{\sigma})^{\rho}(x^{-1}x^{\sigma})^{\rho^2} = 1$ is called a group with triality. Groups with triality are naturally connected with Moufang loops. In the paper *Groups with triality*, Grishkov and Zavarnitsine describe all possible groups with triality associated with a given Moufang loop. In this talk, with a computational approach, we present some results obtained applying the tecniques developed by Grishkov and Zavarnitsine to the code loops of rank 3.

(This is a joint work with Alexandre Grishkov (University of São Paulo, Brazil).



Monday, August 5

14.30-15.00

Andrea Solotar (*Universidad de Buenos Aires, Argentina*)

Split bounded extension algebras and Han's conjecture

For an extension of algebras $B \subseteq A$ with A flat over B, A. Kaygun obtained a Jacobi--Zariski long exact sequence which relates usual Hochschild homology of A and B with the relative Hochschild homology. We obtain a Jacobi-Zariski long exact sequence in a somehow different situation, as follows. A B-bimodule M is called bounded if M is B-tensor nilpotent, of finite projective dimension as a B-bimodule and projective as a left or right B-module. A split bounded extension algebra is a split extension $A = B \oplus M$ with M bounded.

We prove that the class $\mathcal{H}$ of finite-dimensional algebras which verify Han's conjecture is closed under split bounded extensions. More precisely if $A = B \oplus M$ is such an extension, then A belongs to $\mathcal{H}$ if and only if B belongs to $\mathcal{H}$. The proofs make use of the Jacobi-Zariski long exact sequence, and of the reduced relative bar resolution.

This is a joint work with Claude Cibils, Marcelo Lanzilotta and Eduardo Marcos.

15:00-15:30

Sarah Witherspoon (Texas A & M University, USA)

The Gerstenhaber bracket on Hochschild cohomology

The Hochschild cohomology of an algebra is both an associative algebra and a graded Lie algebra. We will discuss some recent results leading to better understanding of the Lie structure. We will focus on Volkov's homotopy lifting method for defining brackets by way of an arbitrary resolution for algebras over a field, and methods developed with Negron for computing brackets on resolutions that are differential graded coalgebras. We will discuss some examples.

15:40-16:10

Oswaldo Lezama (*Universidad Nacional, Colombia*)

Point modules for finitely semi-graded rings

In this short talk we study the set of point modules for finitely semi-graded rings. A standard Zariski topology will be defined for them as well as the point functor. In particular, the parametrization of the point modules for the quantum affine n-space is computed, and from this, the set of point modules for some important examples of non $\mathbb{N}$-graded quantum algebras is presented.

16:10-16:40

Sergio Estrada (*Universidad de Murcia, Spain*)

The stable category of Gorenstein flat sheaves on a noetherian scheme

A classical result due to Buchweitz says that the singularity category of a Gorenstein local ring A is equivalent to the homotopy category of totally acyclic complexes of finitely generated projective modules. The latter is also equivalent to the stable category of finitely generated Gorenstein projective modules. This second equivalence extends for general noetherian rings and without the finiteness assumption on the modules. In 2011 Murfet and Salarian introduced an optimal non-affine replacement for the homotopy category of totally acyclic complexes of projectives. But the question of the non-affine analogue for the stable category of Gorenstein projective modules remained open. In the talk we will propose and show evidences to justify that the stable category of cotorsion and Gorenstein flat quasi-coherent

sheaves is one natural candidate for this. As an application, we give a characterization of Gorenstein schemes by using these sheaves.

This talk is based on a joint work with Lars Winther Christensen and Peder Thompson.

17:10-17:40

Yadira Valdivieso (University of Leicester, UK)

From the potential to the first Hochschild cohomology group of a cluster-tilted algebra of surface type.

The objective of this talk is to give a concrete computation of the dimension of the first Hochschild cohomology space of a cluster tilted algebra in terms of a numerical invariant arising from the potential. We show that this invariant has a geometric interpretation using the geometric model of the cluster tilted algebra of type A, D and $\widetilde{D}$.

This is a joint work with Ibrahim Assem, Juan Carlos Bustamante and Sonia Trepode.

17:40-18:10

Dmitri Kaledin (Steklov Institute / NRU HSE, Russia)

Deformations of abelian categories

Deformation theory of abelian categories has been constructed some time ago by Wendy Lowen, and the results are roughly similar to the theory for associative algebras; in particular, square-zero extensions are classified by Hochschild cohomology classes. However, in the abelian category setting, there is a much more direct way to build the theory, and it can even handle some situations the usual theory cannot, such as $\mathbb{Z}/p^2\,\mathbb{Z}$ considered as a square-zero extension of $\mathbb{Z}/p\mathbb{Z}$. This has been around for some time as a sort of folklore result but to the best of my knowledge, nothing was ever written down. I am going to present this story. This is joint work in progress with Wendy.

Tuesday, August 6

14.30-15.00

Paul Bressler *(Universidad de Los Andes, Colombia)*

Deligne groupoid revisited

To a differential graded Lie algebra whose components vanish in degrees -2 and below one associates two simplicial sets:

(1) the simplicial set of solutions of the Maurer-Cartan equation in differential forms on simplexes with values in the Lie algebra, and

(2) the nerve of the Deligne 2-groupoid.

I will describe a map (equivalence) between (1) to (2) given in terms of non-abelian multiplicative integrals.

15:00-15:30

Marco Armenta (*CIMAT Guanajuato, México*)

Derived invariance of the Tamarkin-Tsygan calculus of an algebra

The Gerstenhaber algebra structure of Hochschild cohomology has been proved to be a derived invariant. By proving derived invariance of the cap product in Hochschild theory, we get derived invariance of the Lie module structure of Hochschild homology over Hochschild cohomology. Then we prove derived invariance of Connes' differential. Therefore derived equivalent algebras have isomorphic differential calculi in the sense of Tamarkin-Tsygan. This is a joint work with B. Keller and it is part of my Ph.D. thesis under the supervision of José Antonio de la Peña and Claude Cibils.

15:40-16:10

Daniel Bravo (*Universidad Austral de Chile, Chile*)

FP_n-injective objects, cotorsion and torsion classes

In R-modules the class FP_n-Inj, of FP_n-injective modules, is introduced as a generalization of the class of injective modules, with respect to the class FP_n, of finitely n-presented R-modules (which in turn, can be thought as a refinement of finitely generated and finitely presented modules). Several properties about this relative injective class have been investigated. For example, conditions on the ring R so that FP_n-Inj is the right half of a hereditary cotorsion pair. The class of FP_n-injective modules and its properties have also been studied in other contexts such as chain complexes; more recently progress have been made in the more general context of Grothendieck categories.

In this talk, we will see how the class of finitely n-presented modules allows for a generalization of hereditary and semi-hereditary rings, which we will call n-hereditary rings, study its homological characterizations and how over

these rings the class FP_n-Inj forms part of a torsion pair. We will then tackle the question of how the much of this torsion pair situation can be generalized to other setting such as chain complexes and if time allows to certain Grothendieck categories.

This is part of an in-progress joint work with Sinem Odabasi, Carlos Parra and Marco Pérez. Partially supported by CONICYT + FONDECYT/Regular 1180888 grant

16:10-16:40

Marco A. Pérez (*Universidad de la República, Uruguay*)

Locally type FP_n and n-coherent categories

In this talk we will study finiteness conditions in Grothendieck categories by introducing the concepts of objects of type FP_n and checking their closure properties with respect to short exact sequences. This allows us to propose a notion of locally type FP_n category as a generalization of locally finitely generated and locally finitely presented categories. We will also present the injective objects that are Ext-orthogonal to the class of objects of type FP_n, called FP_n-injective objects, which will be the right half of a complete cotorsion pair.

As a generalization for the category of modules over an n-coherent ring, we will present the concept of n-coherent categories. Such categories will provide a setting in which the FP_n-injective cotorsion pair is hereditary, and where it is possible to construct (pre)covers by FP_n-injective objects. If time allows, we will see how n-coherent categories provide a suitable framework for a nice theory of Gorenstein injective homological algebra.

This is a joint work with Daniel Bravo and James Gillespie.

17:10- 17.40

Patrick Le Meur (*Université Paris Diderot, France*)

Skew Calabi-Yau algebras

Skew Calabi-Yau algebras are generalisations of Calabi-Yau algebras. They were discovered by Reyes, Rogalski, and Zhang in 2014. Their relevance comes from the fact that a connected graded algebra is skew Calabi-Yau if and only if it is (Artin-Schelter) regular. As a special feature, skew Calabi-Yau algebras are equipped with a so-called Nakayama automorphism.

The talk will survey this class of algebras from various points of view such as methods to construct them, properties of their Nakayama automorphisms,

and connections to representation theory.

17:40- 18.10

Agustín Moreno Cañadas (*Universidad Nacional de Colombia, Colombia*)

Matrix Problems Associated to Some Brauer Configuration

Brauer configuration algebras were introduced recently by E.L. Green and S. Schroll as a generalization of Brauer graph algebras in order to deal with the research of algebras of wild representation type. Such algebras are induced by suitable Brauer configurations which have a rich combinatorial structure. In this talk we describe the use of Brauer configurations in order to establish bijections between solutions of the four subspace problem, the Kronecker problem and the semilinear Kronecker problem and indecomposable projective modules over some Brauer configuration algebras. Specialization of these kind of algebras have been interpreted recently as shares in visual cryptography schemes.

References:

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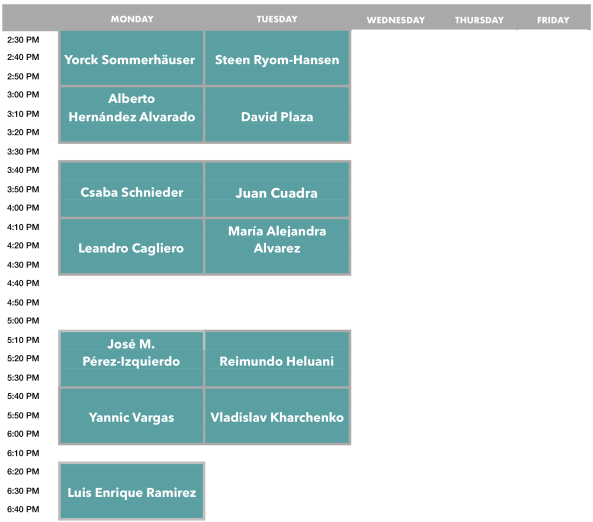

Monday, August 5

14.30-15.00

Yorck Sommerhäuser (Memorial University of Newfoundland, Canada)

Examples of Cores in Yetter-Drinfel'd Hopf Algebras

For a finite-dimensional cosemisimple cocommutative Yetter-Drinfel'd Hopf algebra over a finite abelian group, one can define the core of a group-like element, at least when the base field is algebraically closed of characteristic zero. The core controls the action of the finite abelian group on the group-like element from inside the Yetter-Drinfel'd Hopf algebra.

In the case where the finite abelian group has prime order, the core is always completely trivial in the sense that both the action and the coaction of the group on the core are trivial. In this talk, we describe examples of Yetter-

Drinfel'd Hopf algebras whose cores are not completely trivial. They have dimension 8, and their biproducts are semisimple Hopf algebras of dimension 32. The talk is based on joint work with Yevgenia Kashina.

15.00-15.30

Alberto Hernández Alvarado (*CIMPA, Universidad de Costa Rica*)

Minimum odd depth and the Drinfeld Double

In this paper we explore the concept of the minimum odd depth of a ring extension when the overall algebra factorises as a product of two subalgebras, in particular the case of finite dimensional Hopf algebras in their Drinfel'd double, $H \hookrightarrow D(H)$. We analyse the relationship between module depth and subring depth for this case and use it to get a result via Double Crossed Products of finite dimensional Hopf algebras. Finally we get a formula for the minimum odd depth of an extension $R \hookrightarrow H$ via the generalised smash product $Q^{*op}\#_{\psi}H$ where Q is the H-module coalgebra associated with the extension.

15.40-16.10

Csaba Schnieder (*Universidade Federal de Minas Gerais, Brasil*)

The isomorphism problem for universal enveloping algebras of Lie algebras

Let $U(L)$ denote the universal enveloping algebra of a Lie algebra L. George Bergman in his influential article of 1978 remarked that it was an open question whether an isomorphism between two universal enveloping algebras $U(L)$ and $U(K)$ implied the isomorphism between the Lie algebras L and K. Since the publication of Bergmanâ€™s paper we have learned that the answer to this problem is no. On the other hand, as far as we know, it is a rather rare phenomenon among small-dimensional Lie algebras that non-isomorphic algebras have isomorphic enveloping algebras. This is what makes this problem so interesting.

In this talk, I will focus on small-dimensional solvable Lie algebras. The main result I will present states that if L and K are solvable Lie algebras of dimension at most four over a field of characteristic zero such that $U(L)$ is isomorphic to $U(K)$, then L is isomorphic to K. The talk is based on joint work with José Rodriguez and Hamid Usefi.

16.10-16.40

Leandro Cagliero (*Universidad Nacional de Córdoba, Argentina*)

Nilpotency degree of Lie subalgebras generated by two upper triangular matrices and uniserial representations

In this talk we will recall the basic facts about finite dimensional uniserial representations of Lie algebras and we will give some results about classification. In particular we will present a complete classification of all f.d. uniserial representations of the solvable Lie algebra $g = \langle x \rangle \ltimes N_k(V)$, where $N_k(V)$ denotes the free k-step nilpotent Lie algebra associated to a f.d. vector space V and x acts on V via an invertible Jordan block. A crucial step towards this classification result is obtaining the nilpotency degree of the Lie subalgebra generated by two nilpontent matrices in Jordan form N_0 and N_1, with N_0 of maximal degree.

17.10-17.40

José M. Pérez-Izquierdo (*Universidad de La Rioja, España*)

Nonassociative Solomon's descent algebra

In this talk we extend the connection between Solomon's descent algebra for the symmetric groups, the Hopf algebra of noncommutative symmetric functions and its descent algebra in the sense of F. Patras to a nonassociative setting by means of universal enveloping algebras of relatively free Sabinin algebras. We also present a nonassociative lifting of the Malvenuto-Reutenauer Hopf algebra of permutations and of the dual of the Hopf algebra of noncommutative quasi-symmetric functions. This lifting is a free nonassociative algebra as well as a cofree graded coassociative coalgebra which also admits an associative inner product that satisfies a Mackey type formula when restricted to its nonassociative Solomon's descent algebra.

17.40-18.10

Yannic Vargas *(Instituto Venezolano de Investigaciones Científicas)*

Hadamard product of free monoids and universals Hopf monoid

The Hadamard product $*$ is a basic operation on species which mirrors the familiar Hadamard product of power series. Aguiar and Mahajan introduced a new operation on species $\star$, based on set compositions, which intertwines with the Hadamard product via the free monoid functor. In particular, this provides an explicit basis for the Hadamard product of two free monoids in terms of bases of the factors. Using the product $\star$, we define the notion of $\star$-character of a Hopf monoid. In this work we show that the category of such elements has a terminal object, which maps via the Fock functor to a Hopf algebra based on permutations, related to the notion of permutation patterns.

18.20-18.50

Luis Enrique Ramirez (*Universidade Federal do ABC, Brasil*)

On the construction of admissible $\mathfrak{gl}(n)$-modules

The idea of the talk is to describe an effective method of constructing explicitly Gelfand -Tsetlin modules for $\mathfrak{gl}_n$ (relation modules). Such modules arise in [FRZ19] by allowing more general relations between basis elements in the classical construction of basis for simple finite dimensional $\mathfrak{gl}_n$-modules. We obtain a large family of simple modules that have a basis consisting of Gelfand-Tsetlin tableaux and the action of the Lie algebra is given by the Gelfand-Tsetlin formulas. This talk is based in [FRZ19].

[FRZ19] V. Futorny, L.E. Ramirez, J. Zhang, Combinatorial construction of Gelfand-Tsetlin modules for $\mathfrak{gl}_n$, Advances in Mathematics, Vol 343, 681-711 (2019).

Tuesday, August 6

14.30-15.00

Steen Ryom-Hansen (*Universidad de Talca, Chile*)

Graded representation theory of the higher level Temperley-Lieb algebra

In the talk we present joint work with Diego Lobos. We start out by recalling the origin and philosophy of $\mathbb{Z}$-graded representation theory, where we put special emphasis on the Brundan-Kleshchev and Rouquier isomorphism Theorem between the cyclotomic KLR-algebra and the cyclotomic Hecke algebra. We explain how one can use this Theorem to obtain a non-trivial $\mathbb{Z}$-grading on a certain higher level Temperley-Lieb algebra, ``the generalized blob algebra b_n" that was introduced by Martin and Woodcock.

15.00-15.30

David Plaza (*Universidad de Talca, Chile*)

Type $\tilde{C}$ Temperley-Lieb algebra quotients and Catalan combinatorics

In this talk we explain some algebraic and combinatorial features of two algebras that arise as quotients of Temperley-Lieb algebras of type $\tilde{C}$, namely, the two-boundary Temperley-Lieb algebra and the symplectic blob algebra. We provide a monomial basis for both algebras. The elements of

these bases are parameterized by certain subsets of fully commutative elements. We enumerate these elements according to their affine length.

15.40-16.10

Juan Cuadra (University of Almería, Spain)

Orders of Nikshych's Hopf algebra

Let p be an odd prime number and K a number field containing a primitive p-th root of unity. Consider Nikshych's non group-theoretical Hopf algebra H_p as defined over K [2]. In this talk, we will present the following result and outline its proof:

The Hopf algebra H_p admits a Hopf order over the ring of integers $\mathcal{O}_K$ if and only if there is an ideal I of $\mathcal{O}_K$ such that $I^{2(p-1)} = (p)$. As a consequence, if a Hopf order exists, K can not be a cyclotomic field.

This provides an example of semisimple Hopf algebra over a number field not admitting a Hopf order over any cyclotomic ring of integers.

The above result appears in [1]. It is part of a more extensive investigation about Hopf orders in non-commutative/non-cocommutative semisimple Hopf algebras carried out in collaboration with Ehud Meir (University of Aberdeen, UK).

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16.10-16.40

María Alejandra Alvarez (*Universidad de Antofagasta, Chile*)

Sobre las degeneraciones de superálgebras de Lie

En este trabajo, damos condiciones necesarias para la existencia de degeneraciones entre dos superálgebras de Lie complejas de dimensiÃ³n $(m|n)$. Como aplicación estudiamos la variedad de superálgebras de Lie complejas de dimensión $(2|2)$, obtuvimos su clasificación algebraica y que esta variedad es la unión de siete componentes irreducibles, una de los cuales es la clausura Zariski de la órbita de una superálgebra de Lie nilpotente.

Alvarez M.A., Hernández I.: On degenerations of Lie superalgebras. Linear Multilinear Algebra. (2018).
https://doi.org/10.1080/03081087.2018.1498060

17.10-17.40

Reimundo Heluani (*IMPA, Brasil*)

Vertex algebras and arc spaces

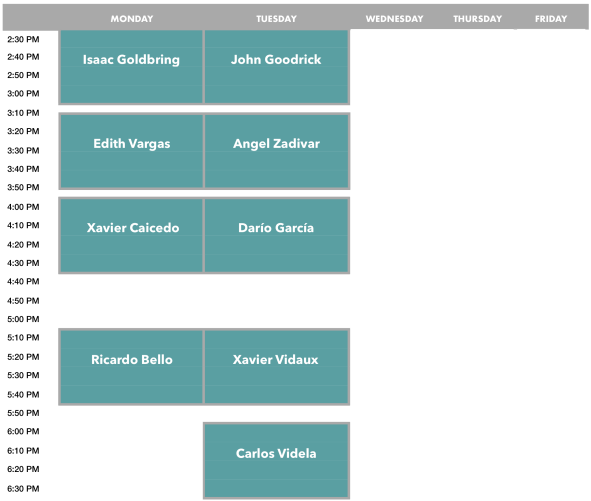
To each vertex algebra V one can attach a graded commutative algebra with a derivation A. Its degree zero piece A_0 is a Poisson algebra. We investigate the relation between the spectrum of A and the arc space of A_0. For several years it was not known whether these two spaces were always equal, we give examples and counterexamples to this claim. For admissible level affine Kac-Moody algebras and their quantum Hamiltonian reduction we conjecture that these spaces are equal if and only if the level is boundary admissible. We give some weak evidence for this conjecture.

17.40-18.10

Vladislav Kharchenko (*UNAM, México*)

Quantizations as quadratic algebras

We prove that the multiparameter quantizations of type A_n and B_n are quadratic-linear Koszul algebras in q-Weyl generators.



Monday, August 5

14.30-15.10

Isaac Goldbring (UC Irvine, USA)

On supra-SIM sets of natural numbers

A property $\mathcal{P}$ of the natural numbers is said to be **partition regular** if: whenever $A \subseteq \mathbb{N}$ has property $\mathcal{P}$ and $A = A_1 \cup \cdots \cup A_n$, then some A_i also has property $\mathcal{P}$. Examples of partition regular properties include being infinite (Pigeonhole principle), being an FS-set (Hindman's theorem), being piecewise syndetic, and having positive Banach density.

In this talk, we introduce a new partition regular property of sets of natural numbers called being **supra-SIM**. This notion originates in nonstandard analysis and generalizes the notion of SIM sets introduced by Leth. The basic idea behind SIM sets is that these are the sets for which is there a link

between the internal notion of having small gaps and the external notion of having large measure.

While the class of SIM sets is poorly behaved from the combinatorial point of view, the fact that supra-SIM is partition regular indicates that it is a much more natural combinatorial property. Another indication of this is that it is also preserved under finite embeddability. We discuss these results as well as mention a few other new results about SIM sets and sumsets.

No knowledge of nonstandard analysis will be assumed and we discuss briefly the amount that we need for the purposes of our results.

The new results mentioned in this talk are joint with Steve Leth.

15.15-15.55

Edith Vargas (*ITAM, México*)

Reconstructing the topology on monoids and polymorphism clones

Transformation Monoids and *Clones* on a set A carry a natural topology, induced by the topology of point-wise convergence. The endomorphism monoids $\mathrm{End}(\mathcal{A})$ and polymorphism clones $\mathrm{Pol}(\mathcal{A})$ of a relational structure $\mathcal{A}$ are viewed abstractly as topological monoids and topological clones, respectively. Their topology is the natural one. In this talk we show how to reconstruct the topology on the monoid of endomorphisms and the polymorphism clone of some relational structures, among others are: Reducts of the rationals $\mathbb{Q}$.

This is joint work with Mike Behrisch and John K. Truss.

16.00-16.40

Xavier Caicedo (*Universidad de los Andes, Colombia*)

The model companion of a variety of abelian lattice ordered groups

The class of abelian lattice ordered groups (ℓ-groups) does not to posses a model companion (Glass and Pierce, 1980). In particular, the divisible members of the class are not always existentially closed, in contrast with the case of abelian o-groups. Call an abelian ℓ-group *pseudo-complemented* if for any $u > 0$ and $x \in [0, u]$ there is maximum $x_u^* \leq u$ such that $x \wedge x_u^* = 0$ (equivalently, the lattice $([0, u], \leq)$ is a Heyting algebra). This is the case, for example, of any product of abelian o-groups.

We show that the class of pseudo-complemented abelian ℓ-groups form a variety of algebras having a model companion, in fact a model completion,

consisting on the divisible members of the class for which the image of $(\ )^*$ is atomless. The proof is based in representation of these groups by boolean products of o-groups, a general form of Macintyre theorem on the model completeness of structures of global sections, and some facts of algebraic logic pertaining MV algebras. It follows that any operation defined implicitly by universal Horn formulas in divisible pseudo-complemented abelian ℓ-groups is a term on $0, +, \wedge, \vee, (\ )^*$, and division by $n \in \omega$.

17.10-17.50

Ricardo Bello (*UJED, México*)

Generalised stability and algebraic properties of pseudofinite rings

By a pseudofinite ring (field, group) we mean an infinite model of the common theory of all finite rings (fields, groups). The systematic study of the algebraic properties of pseudofinite structures started with Ax ('68) with the algebraic classification of pseudofinite fields and related results. These results allowed to locate pseudofinite fields nicely into the generalised stability picture as simple (supersimple) structures. In this talk we will present some definitions from generalised stability and give some context on results about pseudofinite fields and groups, before presenting results on algebraic properties of pseudofinite rings that arise from model theoretic properties of these structures.

Tuesday, August 6

14.30-15.10

John Goodrick (*Universidad de los Andes, Colombia*)

Dp-minimal and dp-finite ordered Abelian groups

A classic result is that if the theory of an ordered Abelian group is o-minimal (definable sets in one variable are finite unions of points and intervals), then any definable unary function is piecewise continuous and piecewise monotonic, and a nice decomposition of higher-dimensional definable sets into "cells" can be obtained. There are many expansions of ordered Abelian groups in which similar theorems can be proved, even though they are not o-minimal, such as tame pairs or dense pairs of o-minimal structures.

In this talk we will focus on the case of dp-minimal and dp-finite ordered Abelian groups. Dp-minimality generalizes weak o-minimality and also includes many other structures such as $(\mathbb{Z}, <, +)$, and dp-finite structures are an even broader class which can be thought of as "NIP structures with finite

weight." We will present some new results around how "tame topology" theorems from o-minimality can or cannot be generalized to the dp-minimal and dp-finite ordered context.

Some of the work presented here is joint with Alfred Dolich and Viktor Verbovskiy.

15.15-15.55

Angel Zadivar (*Universidad de Guadalajara, México*)

The frame of nuclei of an Alexandroff space

Frames (locales, complete Heyting algebras) are complete lattices $(L, \leq \bigvee, \wedge, \top, \bot)$ such that the following distributivity holds:

$$a \wedge (\bigvee X) = \bigvee \{a \wedge x \mid x \in X\}$$

for each $a \in L$ and $X \subseteq L$.

Frames can be understood as an algebraic manifestation of a topological space. Indeed, for every topological space S, the open sets $\mathcal{O}S$ constitute a frame but not every frame is a topology. A decent analysis of the category of topological spaces can be done in the language of frames.

As any algebraic object, to study a frame we need to look at to its quotients. There is an elegant treatment to this, a *nucleus* on a frame L, is a monotone function $j\colon L \to L$ which satisfies the following:

(1) $a \leq j(a)$ for all $a \in L$.

(2) $j^2 = j$.

(3) $j(a \wedge b) = j(a) \wedge j(b)$.

The former of all nuclei, denoted by $N(L)$, is called the *assembly* of L.

This constitute a frame and many properties of L can be capture via its assembly. An important class of frames are complete boolean algebras (frames in which every element has a complement); not every frame is a complete boolean algebra and not every frame is a topology (a spatial frame).

The study of these two properties via the frame of nuclei have been explored by many authors [1-3]. This characterization lead to a description of the complicated structure of $N(L)$.

In this talk we will see a new technique based on [4]. As we will see this technique is useful not only to obtain various theorems about the structure of the frame $N(L)$ but also to recover the topological intuition in the setting of Esakia spaces. In particular we will see a complete characterization of the frame $N(\mathcal{O}S)$ for any Alexandroff space S.

This is joint work with F.Avila, G. Bezhanishvili and P. Morandi.

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16.00-16.40

Darío García (*Universidad de los Andes, Colombia*)

Pseudofinite structures, forking and unimodularity

The fundamental theorem of ultraproducts (Łoś's Theorem) provides a transference principle between the finite structures and their limits. It states that a formula is true in the ultraproduct M of an infinite class of structures if and only if it is true for "almost every" structure in the class, which presents an interesting duality between finite structures and their infinite ultraproducts.

This kind of finite/infinite connection can sometimes be used to prove qualitative properties of large finite structures using the powerful known methods and results coming from infinite model theory, and in the other direction, quantitative properties in the finite structures often induce desirable model-theoretic properties in their ultraproducts. These ideas were used by Hrushovski (cf. [Hru1] to apply ideas from geometric model theory to additive combinatorics, locally compact groups and linear approximate subgroups.

Macpherson and Steinhorn define in [MS] the concept of *one-dimensional asymptotic classes*, which are classes of finite structures with strong

conditions on the sizes of definable sets that imply nice model-theoretic behaviour of their ultraproducts. These classes include, among many others, the class of finite fields, the class of Paley graphs and the class of cyclic groups.

In this talk I will review the main concepts of pseudofinite structures, and present joint work with D. Macpherson and C. Steinhorn (cf. [GMS]) where we explored conditions on the (fine) pseudofinite dimension that guarantee good model-theoretic properties (simplicity or supersimplicity) of the underlying theory of an ultraproduct of finite structures, as well as a characterization of forking in terms of decrease of the pseudofinite dimension. I will also present the concept of unimodularity (for definable sets) - which is satisfied by both pseudofinite structures and omega-categorical structures - and joint with F. Wagner (cf. [GW]) about the equivalence between difference notions of unimodularity.

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17.10-17.50

Xavier Vidaux (*Universidad de Concepción, Chile*)

Indecidibilidad en anillos de enteros de extensiones infinitas totalmente reales del campo de números racionales

A una extensión algebraica K de $\mathbb{Q}$ que es totalmente real, Julia Robinson asoció un número real (o $+\infty$) y mostró que una cierta propiedad topológica de este número implica la indecidibilidad del anillo de enteros de K en el lenguaje de anillos. Haremos un mini-survey de resultados obtenidos gracias

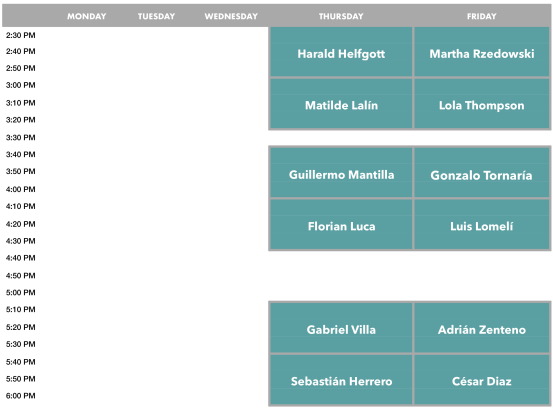
a una generalización de este método. Es un trabajo en conjunto con Marianela Castillo y Carlos R. Videla.

18.00-18.40

Carlos Videla (Mount Royal University, Canada)

La indecidibilidad de $\mathbb{Q}(2)$

$\mathbb{Q}(2)$ es por definición el compósito de todas las extensiones de grado 2 sobre el campo de números racionales Q. Demostraré la indecidibilidad de su teoría de primer orden en el lenguaje usual de anillos y hablaré de algunos problemas abiertos. Esto es trabajo en colaboración con Carlos Martinez-Ranero y Javier Utreras profesores de la Universidad de Concepción, Chile



Thursday, August 8

14.30-14.55

Harald Helfgott (*Universität Göttingen, Deutschland*)

Cómo sumar $\mu(n)$: un mejor algoritmo elemental

Consideremos cualquiera de dos problemas relacionados: determinar el numero preciso $\pi(x)$ de números primos $p \leq x$, y calcular el valor $M(x)$ de la función de Mertens $M(x) = \sum_{n \leq x} \mu(n)$, donde μ es la función de M\"obius.

Los dos mejores algoritmos conocidos son los siguientes:

1. Un algoritmo analítico (Lagarias-Odlyzko, 1987), con calculos basados sobre integrales o ceros de $\zeta(s)$; toma tiempo $O(x^{1/2+\epsilon})$.

2. Un algoritmo más elemental (Meissel-Lehmer, 1959 and Lagarias-Miller-Odlyzko, 1985; refinado por Deléglise-Rivat, 1996), que corre en tiempo $O(x^{2/3})$.

El algoritmo anal\'tico fue implementado de manera rigurosa e incondicional por primera vez casi 30 a\~nos después de ser descrito (Platt, 2015), y sólo para $\pi(x)$; su implementación para $M(x)$ podría ser más difícil. Lo que es más, en el rango explorado hasta ahora ($x \leq 10^{24}$), el algoritmo elemental es más rápido en la práctica.

Presentaremos un algoritmo elemental e incondicional para calcular $M(x)$ que corre en tiempo aproximadamente $O(x^{3/5})$. El algoritmo debería poder adaptarse para calcular $\pi(x)$ y otras funciones relacionadas.

15.00-15.25

Matilde Lalín (*Université de Montréal, Canada*)

Conjectures for moments associated with cubic twists of elliptic curves

We extend the heuristic introduced by Conrey, Farmer, Keating, Rubinstein and Snaith in order to formulate conjectures for the (k,ℓ)-moments of L-functions of elliptic curves twisted by cubic characters. We also apply the work of Keating and Snaith on the (k,ℓ)-moments of characteristic polynomials of unitary matrices to extend our conjecture to $k,\ell \in \mathbb{R}_{>-1}$ such that $k+\ell \geq 0$. Our conjectures are then numerically tested for two families. This is joint work with C. David and J. B. Nam.

15.40-16.05

Guillermo Mantilla (*Universidad Konrad Lorenz, Colombia*)

On a question about Dedekind zeta functions and related results

Let K be a number field. The K-arithmetic type of a rational prime ℓ is the tuple $A_K(\ell) = (f_1^K, \ldots, f_{g_\ell}^K)$ of the residue degrees of ℓ in K, written in ascending order. A well known result of Perlis from the 70's states that two number fields have the same Dedekind zeta function if and only if for almost all primes ℓ the arithmetic types of ℓ in both fields coincide. By the end of the 90's Perlis and Stuart asked if having the same zeta function implies that for ramified primes the sum of the ramification degrees coincide. During the talk we will answer their question for a nontrivial and interesting class of cases. Moreover, using basic facts from the theory of Galois representations we will provide an alternative proof to the fact that the zeta function of K is determined by the lengths of K-arithmetic types over the primes.

16.10-16.35

Florian Luca (University of the Witwatersrand, South Africa)

X and Y-coordinates of Pell equations in various sequences

Let $d > 1$ be a squarefree integer and (X_n, Y_n) be the nth solution of the Pell equation $X^2 - dY^2 = \pm 1$. Given your favourite set of positive integers U, one can ask what can we say about those d such that $X_n \in U$ for some n? Formulated in this way, the question has many solutions d since one can always pick $u \in U$ and write $u^2 \pm 1 = dv^2$ with integers d and v such that d is squarefree obtaining in this way that (u, v) is a solution of the Pell equation corresponding to d. What about if we ask that $X_n \in U$ for at least two different n's? Then the answer is very

different. For example, if U is the set of squares, then it is a classical result of Ljunggren that the only such d is 1785 for which both X_1 and X_2 are squares. In my talk, I will survey recent results about this problem when U is the set of Fibonacci numbers, Tribonacci numbers, k-Generalized Fibonacci numbers, sums of two Fibonacci numbers, rep-digits (in base 10 or any integer base $b \geq 2$), and factorials. We also present some results concerning the same problem for Y-coordinates. The proofs use linear forms in logarithms and computations and in the case of factorials results about primes in arithmetic progressions. These results have been obtained in joint work with various colleagues such as J. J. Bravo, C. A. Gómez, S. Laishram, A. Montejano, L. Szalay and A. Togbé and recent Ph.D. students M. Ddamulira, B. Faye and M. Sias.

17.10-17.35

Gabriel Villa (*CINVESTAV, México*)

Caracteres de Dirichlet y Campos de Géneros en Campos

El campo de géneros de un campo global de funciones K con respecto a un subcampo K_0 es la parte sencilla del campo de clase de Hilbert K_H de K. Más precisamente, el campo de géneros $K_{\mathfrak{ge}}$ de K es $K_{\mathfrak{ge}} = KK_0^*$ donde K_0^* es la máxima extensión abeliana de K_0 contenida en el campo de clase de Hilbert K_H de K.

En esta plática pretenderemos describir como obtener $K_{\mathfrak{ge}}$ cuando K/k es una extensión finita separable donde $k = \mathbb{F}_q(T)$ es el campo de funciones racionales. Énfasis particular se hará en el caso en que K/k es una extensión abeliana.

Nuestra herramienta principal es el uso del grupo de caracteres de Dirichlet asociado a un campo de funciones ciclotómico K. Usamos el análogo al estudo de la aritmética de los campos de funciones ciclotómicos hecha por Leopoldt en 1953 en campos numéricos. También se hace uso de la teoría de campos de clase, especialmente la global y particularmente la correspondientes a los campos de funciones.

17.40-18.05

Sebastián Herrero (Chalmers University, Sweden)

Solutions of equations involving the modular j function

Inspired on Zilber's work on pseudo-exponentiation, in particular on his analysis of the complex exponential field, several authors have studied the existence of generic solutions of systems of exponential-polynomial equations. Results on the existence of solutions in certain cases follow from the work of Katzberg (1983) and Brownawell and Masser (2016), among others. On the other hand, assuming Schanuel's conjecture, Marker (2006), Mantova (2016) and D'Aquino, Fornasiero and Terzo (2018) have proved that generic solutions also exist (again, in certain cases). Since there are plenty of analogies between the exponential and the

modular j function, it is natural to ask if the results mentioned above can be replicated for the j function. In this talk I will report on work in progress in collaboration with Sebastián Eterović (University of Oxford) where we prove that solutions of certain systems of polynomial equations involving the j function exist. Moreover, assuming a modular analogue of Schanuel's conjecture, we obtain results on the existence of generic solutions.

Friday, August 9

14.30-14.55

Martha Rzedowski (*CINVESTAV, México*)

Campo de Géneros Extendido

La teoría de géneros se remonta a Gauss en el contexto de formas cuadráticas binarias. En la charla se presentan un bosquejo histórico del desarrollo de los conceptos campo de géneros y campo de géneros extendido y también algunos resultados tanto para campos numéricos como para campos de funciones con campo de constantes finito.

15.00-15.25

Lola Thompson (Oberlin College, USA)

Sumas de divisores

Sea $s(\cdot)$ la suma de divisores propios, en otras palabras, $s(n) = \sum_{d|n,\, d<n} d$. Esta función tiene una gran historia debido a su conexión con el estudio de los numeros perfectos. Erdos-Granville-Pomerance-Spiro conjeturaron que, para cualquier conjunto $\mathcal{A}$ de densidad asintótica zero, el conjunto $s^{-1}(\mathcal{A})$ también tiene densidad zero. Nosotros probamos una forma débil de esta conjectura. Esta charla está basada en trabajo conjunto con Paul Pollack y Carl Pomerance.

15.30-15.55

Gonzalo Tornaría (*Universidad de La República, Uruguay*)

TBA

16.10-16.35

Luis Lomelí (*Pontificia Universidad Católica de Valparaíso, Chile*)

SL_* *groups and the adeles*

We prove that the ring of adeles over a global field is a $*$-Euclidean ring and study the SL_* groups of Pantoja and Soto-Andrade [PaSA2003]. The Bruhat decomposition allows us to connect to the Langlands-Shahidi local coefficient of $\mathfrak{p}$-adic representations and to automorphic representations [Sh1981], enabling

Number Theoretic applications. We provide a proof of compatibility of Asai L-functions with the local Langlands correspondence for GL(2) based on a method of Henniart and Henniart-Lomelí [He2010, HeLo2013].

Referencias:

[He2010] G. Henniart, Correspondance de Langlands et fonctions L des carrés extérieur et symétrique, Int. Math. Res. Not. (2010), no.4, 633-673.

[HeLo2013] G. Henniart and L. Lomelí, Characterization of γ-factors: the Asai case, Int. Math. Res. Not. (2013), no. 17, 4085-4099.

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[Sh1981] F. Shahidi, On certain L-functions, Amer. J. Math. 103 (1981), 297-355.

17.10-17.35

Adrián Zenteno (*Pontificia Universidad Católica de Valparaíso, Chile*)

On the image of the Galois representations attached to Siegel modular forms

Let G be a connected reductive group over $\mathbb{Q}$ and ${}^LG$ be the L-group of G. The (conjectural) global Langlands correspondence for G predicts a correspondence between certain automorphic representations π of $G(\mathbb{A}_\mathbb{Q})$ and certain ℓ-adic Galois representations $\rho_{\pi,\ell} : \mathrm{Gal}(\overline{\mathbb{Q}}/\mathbb{Q}) \longrightarrow {}^LG(\overline{\mathbb{Q}}_\ell)$. Some results of Serre (for elliptic curves), Ribet-Momose (for classical modular forms), Dieulefait (for Siegel modular forms of genus 2 and level 1) and Dieulefait-Vila (for cuspidal automorphic representations of GL(3) and GL(4)) suggest that the image of $\rho_{\pi,\ell}$ will be large for almost every prime if and only if π is genuine to the group G, i.e., if π does not come from an automorphic representation of a reductive group smaller than G.

In this talk I will explain how, by using Serre's modularity conjecture, Langlands functoriality and some recent results about residual irreducibility of compatible systems, we can prove that the i mage of the Galois representations attached to ``genuine" cuspidal automorphic representations of $G = \mathrm{GSp}(4)$ are as large as possible for almost every prime. Moreover, I will try to explain what is expected in general for GSp(2n). This is a joint work with Luis Dieulefait.

17.40-18.05

César Diaz (*UNAM-UMSNH, México*)

Productos de subconjuntos de pequeños intervalos y aplicaciones

Sean p un número primo grande, $h > 0$ y s enteros, y $\mathcal{X} \subset [1, h] \cap \mathbb{Z}$. Siguiendo el trabajo de Bourgain, Garaev, Konyagin, y Shparlinski [BGKS-2], estudiaremos

el problema de obtener cotas superiores no triviales para el número de soluciones a la congruencia

$$\prod_{i=1}^{4}(x_i + s) \equiv \prod_{j=1}^{4}(y_j + s) \not\equiv 0 \pmod{p}, \qquad x_i, y_j \in \mathcal{X}.$$

Veremos como una cota de este tipo se puede aplicar para obtener resultados acerca del número de puntos enteros sobre curvas exponenciales módulo un primo. Es un trabajo conjunto con Moubariz Garaev y José Hernández.

Referencia:

[BGKS-2] J. Bourgain, M. Z. Garaev, S. V. Konyagin, and I. E. Shparlinski, On congruences with products of variables from short intervals and applications, Proc. Steklov Inst. Math., 280} (2013) 61-90.

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
2:30 PM					
2:40 PM				Christof Geiss	María Julia Redondo
2:50 PM					
3:00 PM					
3:10 PM				José Vélez Marulanda	Santiago Valente
3:20 PM					
3:30 PM					
3:40 PM				Alfredo González Chaio	Victoria Guazzelli
3:50 PM					
4:00 PM					
4:10 PM				Hernán Giraldo	Yohny Calderón Henao
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5:00 PM					
5:10 PM				Ricardo Rueda Robayo	Jesús Jiménez González
5:20 PM					
5:30 PM					
5:40 PM				Alejandro Argudín Monroy	Sinem Odabaşı
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6:00 PM					
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6:20 PM				Patrick Le Meur	Ibrahim Assem
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6:50 PM					

Thursday, August 8

14.30-15.00

Christof Geiss (*UNAM, México*)

Quantum cluster algebras and their specializations

This is a report on joint work with B. Leclerc and J. Schröer.

We show that if a cluster algebra coincides with its upper cluster algebra and admits a grading with finite dimensional homogeneous components, the corresponding Berenstein-Zelevinsky quantum cluster algebra can be viewed as a flat deformation of the classical cluster algebra.

15:00-15:30

José Vélez Marulanda (Valdosa State University, USA)

Deformations of modules for finite dimensional Jacobian algebras

It follows from results due to Ch. Geiss et al. and S. Ladkani that every Jacobian algebra over an algebraically closed field associated to a triangulation of a closed surface S with a collection of marked points M is tame and (weakly) symmetric (and in particular finite dimensional). In this talk, we investigate the behavior of the versal deformation rings (in the sense of F. M. Bleher and J. A. Velez-Marulanda) of finitely generated modules over such Jacobian algebras. We also investigate versal deformation rings of Gorenstein-projective modules over monomial Jacobian algebras.

15:40-16:10

Alfredo González Chaio (*Universidad Nacional de Mar del Plata, Argentina*)

Description of complexes in the derived category

Joint work with Claudia Chaio and Isabel Pratti.

Let A be a finite dimensional algebra over an algebraically closed field. We denote by mod A the finitely generated module category and by proj A the full subcategory of mod A whose objects are the finitely generated projective A-modules.

Let n be a positive integer, with $n \geq 2$. The categories $\mathbf{C_n}$(proj A) of complexes of fixed size were defined and studied in [BSZ]. Moreover, in [CPS], the authors showed that the knitting technique used to build the Auslander-Reiten quiver of a module category can also be used to build the Auslander-Reiten quiver of the category of complexes of fixed size.

In this work, we explain how to use the mentioned knitting technique to obtain specific Auslander-Reiten triangles in the bounded derived category. To show this process, we consider two different families of finite dimensional algebras over an algebraically closed field. We describe the complexes that belong to the mouth of non-homogeneous tubes in the Auslander-Reiten quiver of their bounded derived category, whenever this algebras are either derived equivalent to hereditary algebras of type $\widetilde{A}_n$ or $\widetilde{D}_n$. In case the algebras are discrete, we describe the complexes in the mouth of components of type $\mathbb{Z}A_\infty$ of the Auslander-Reiten quiver of their bounded derived category.

References:

[BSZ] R. Bautista, M.J. Souto Salorio, R. Zuazua. Almost split sequences for complexes of fixed size. J. Algebra 287, 140-168, (2005).

[CPS]. C. Chaio, I. Pratti, M. J. Souto Salorio. On sectional paths in a category of complexes of fixed size. Algebras and Representation Theory 20, (2017), 289-311.

16:10-16:40

Hernán Giraldo (*Universidad de Antioquia, Colombia*)

String and band complexes over string almost gentle algebras

We give a combinatorial description of a family of indecomposable objects in the bounded derived categories of string almost gentle algebras. These indecomposable objects are, up to isomorphism, the string and band complexes introduced by V. Bekkert and H. Merklen in [BM]. With this description, we give a characterization for a given string complex to have infinite minimal projective resolution, and we extend this characterization for the case of string algebras.

Reference:

[BM] Bekkert, V., Merklen, H.A.: Indecomposables in derived categories of gentle algebras. Algebr. Represent Theory 6 (3), 285-302 (2003).

17:10-17:40

Ricardo Rueda Robayo (*Universidad de Antioquia, Colombia*)

Position of String and Band Complexes in the Auslander-Reiten Quiver of $K^b(P_\Lambda)$

We introduce the Bondarenko-type algebras, which satisfy that the string and band complexes, as introduced by Bekkert and Merklen are indecomposable in the category of perfect complexes $K^b(P_\Lambda)$.

We discuss the shape of the components of the Auslander Reiten quiver of $K^b(P_\Lambda)$ containing these objects.

17:40-18:10

Alejandro Argudín Monroy (*Universidad Nacional Autónoma de México*)

The study of extensions is a theory that has developed since 1926 from multiplicative groups. In this talk we will focus on extensions in an abelian category C. In this context, an extension of an object A by an object C is a short exact sequence

$$0 \to A \to M \to C \to 0$$

up to equivalence, where two exact sequences are equivalent if there is a morphism from one to another with identity morphisms at the ends. This kind of approach was first made by R. Baer in 1934. The class of extensions of an object A by an object C is usually denoted by $\mathrm{YExt}^1(C,A)$.

Later on, H. Cartan and S. Eilenberg, showed that the first derived functor of the Hom functor is isomorphic to YExt^1. This result marked the beginning of a series of research works looking for ways of constructing the derived functors of the Hom functor without using proyective or inyective objects, with the spirit that resolutions should be only a calculation tool for derived functors.

One of this attempts, was based in the ideas of N. Yoneda, defining what is known today as the theory of n-extensions and the functor called as the Yoneda Ext. An n-extension of an object A by an object C is an exact sequence of length n

$$0 \to A \to M_1 \to \cdots \to M_n \to C \to 0$$

up to equivalence, where the equivalence of exact sequences of length $n > 1$ is defined in a similar way as was defined for length 1. In this theory, it can be proved that the class $\mathrm{YExt}^1_C(A)$ of n-extensions of A by C is a functor equivalent to the n-th derived functor of the Hom functor.

Recently, the generalization of homological techniques such as Gorenstein or tilting objects to abstract contexts, such as abelian categories that do not necessarily have proyectives or inyectives, claim for the introduction of an Ext functor that can be used without restraints. A natural candidate is the Yoneda Ext. The only problem is that some of the properties of the homological Ext are not known to be valid for the Yoneda Ext. Namely, for an Ab4 abelian category with enough proyectives $\mathcal{A}$, given an object X and a set of objects $\{A_i\}_{i\in I}$, the following isomorphism can be built

$$\mathrm{Ext}^n_{\mathcal{A}}\left(\bigoplus_{i\in I} A_i, X\right) \cong \prod_{i\in I} \mathrm{Ext}^n_{\mathcal{A}}(A_i, X)$$

where Ext^n is the n-th derived functor of the Hom functor. The goal of this talk is to show a similar isomorphism for the n-th Yoneda Ext. The desired isomorphism will be constructed explicitly by using colimits, in Ab4 abelian categories with not necessarily enough projectives nor injectives. A dual result will be also stated.

18:20-18:50

Patrick Le Meur (*Université Paris Diderot, France*)

Group actions and Calabi-Yau duality

In the past few years, there have been several investigations of the generalised cluster categories associated to the triangulations of certain orbifold surfaces with marked points. These investigations involve an action of a group on a quiver with potential (QP). This talk will present general results on the behaviour of cluster tilting theory - from the viewpoint of generalised cluster categories - under the actions of finite groups. This includes a complete description of the skew group algebra $A(Q, W) * G$ of any Ginzburg dg algebra $A(Q, W)$ acted on by a finite group G as well as the comparison of the associated generalised cluster categories. Some applications to the interaction between actions of finite groups and higher Auslander-Reiten theory will be outlined.

Friday, August 9

14.30-15.00

María Julia Redondo *(Universidad Nacional del Sur, Argentina)*

Deformations of monomial algebras

It is well known that deformation problems can be described in terms of differential graded Lie algebras, and that if F is a quasi-isomorphism of differential graded Lie algebras then F induces an equivalence between the corresponding deformation problems. The problem of deforming the multiplication of a monomial algebra A can be described by the graded Lie algebra $C(A, A)[1]$ which is the shifted Hochschild complex endowed with the Gerstenhaber bracket. However, Bardzell's complex $B(A)$ has shown to be more efficient to compute Hochschild cohomology of monomial algebras. We use explict comparison morphisms between $C(A, A)$ and $B(A)$ in order to describe deformations of A by computing the corresponding Maurer-Cartan equation. In the particular case of infinitesimal deformations, we describe the quiver and relations of the deformed algebra in terms of the quiver and relations of A.

15:00-15:30

Santiago Valente (*UNAM, México*)

Triangular matrix categories and recollements

Joint Work with M. Ortíz Morales and Alicia Leon.

We define the analogous of the triangular matrix algebra to the context of rings with several objects. Given two additive categories $\mathcal{U}$ and $\mathcal{T}$ and

$M \in \mathrm{Mod}(\mathcal{U} \otimes \mathcal{T}^{op})$ we will construct the triangular matrix category $\mathbf{\Lambda} := \left[\begin{smallmatrix} \mathcal{T} & 0 \\ M & \mathcal{U} \end{smallmatrix}\right]$ and we prove that there is an equivalence

$$\Big(\mathrm{Mod}(\mathcal{T}), \mathbb{G}\mathrm{Mod}(\mathcal{U})\Big) \simeq \mathrm{Mod}(\mathbf{\Lambda}).$$

We will show that if $\mathcal{U}$ and $\mathcal{T}$ are dualizing K-varieties and $M \in \mathrm{Mod}(\mathcal{U} \otimes \mathcal{T}^{op})$ satisfies certain conditions then $\mathbf{\Lambda} := \left[\begin{smallmatrix} \mathcal{T} & 0 \\ M & \mathcal{U} \end{smallmatrix}\right]$ is a dualizing variety.

Finally, we will show that given a recollement between functor categories we can induce a new recollement between triangular matrix categories, this is a generalization of a result given by Chen and Zheng in Theorem 4.4 of [CZ].

References:

[CZ] Q. Chen, M. Zheng. Recollements of abelian categories and special types of comma categories. J. Algebra. 321 (9), 2474-2485 (2009).

[LOMS] A. León-Galeana, M. Ort&iacut;ez-Morales, V. Santiago, Triangular Matrix Categories I: Dualizing Varieties and generalized one-point extension. Preprint arXiv: 1903.03914v1

[LOMS] A. León-Galeana, M. Ortíz-Morales, V. Santiago, Triangular Matrix Categories II: Recollements and functorially finite subcategories.

[S] S. O. Smalø. Functorial Finite Subcategories Over Triangular Matrix Rings. Proceedings of the American Mathematical Society Vol.111. No. 3 (1991).

15:40-16:10

Victoria Guazzelli (*Universidad Nacional de Mar del Plata, Argentina*)

Trivial extensions, Admissible Cuts and HW Reflections

This talk is based on a work in progress initiated in the Workshop "Mathematics in the Southern Cone" at Universidad de la República, Montevideo Uruguay, December 2018.

Let A be a finite dimensional algebra over an algebraically closed field. We consider the trivial extension of A by its minimal injective cogenerator $D(A)$. The trivial extension of A is the orbit algebra obtained under the action of the Nakayama automorphism ν.

In [HW], D. Hughes and J. Waschbüsch, characterized when two algebras have the same repetitive category in terms of a sequence of ν-reflection which transforms one algebra into the other. In particular if two algebras have the same trivial extension and the same repetitive category, then it can be obtained one from the other by a sequence of ν-reflections.

Later, in [FP1], E. Fernández and M. I. Platzeck gave a description of the bound quiver of the trivial extension of A under the hypothesis that any oriented cycle in the ordinary quiver of A is zero in A. Moreover, in [FP2], under the same hypothesis, the authors characterized all the algebras B which have the same trivial extension as A. They showed that B can be obtained as a quotient of the trivial extension by the ideal generated by some arrows which have been cut in an admissible way. The algebra B is said to be an admissible cut of the trivial extension of A.

The aim of this talk is to relate these two points of view. More precisely, given an algebra B, admissible cut of the trivial extension of the algebra A, such that A and B have the same repetitive category, we described the sequence of $\nu-$reflections which transforms the algebra A into the algebra B.

Reciprocally, given a sequence of $\nu-$reflections which transforms A into B, we determined the ideal generated by arrows such that B is an admissible cut of the trivial extension of the algebra A.

References:

[FP1] Fernández, E., Platzeck, M.I. Presentations of trivial extensions of finite dimensional algebras and a theorem of Sheila Brenner. J. Algebra 249 (2002), no. 2, 326-344.

[FP2] Fernández, E., Platzeck, M.I. Isomorphic trivial extensions of finite dimensional algebras. Journal of Pure and Applied Algebra 204 (2006), no. 1, 9-20.

[HW] Hughes, D., Washbüsch, J. Trivial extensions of tilted algebras. Proc. London Math. Soc. 46, (1983), 347-364.

16:10-16:40

Yohny Calderón Henao (*Universidad de Antioquia, Colombia*)

Shapes of the irreducible morphisms and Auslander-Reiten triangles in the stable category of modules over repetitive algebras

This is a joint-work with Hernán Giraldo and José Vélez-Marulanda.

For the stable category of modules on a repetitive algebra, we have that the irreducible morphisms are divided into three canonical forms: first, all the component morphisms are split monomorphisms (smonic case), second, they are all split epimorphims (sepic case), and third, there is exactly an irreducible component (sirreducible case). Finally, we describe the shape of the Auslander-Reiten triangles using the properties of the irreducible morphisms as hown above.

17:10-17.40

Jesús Jiménez González (*CIMAT, México*)

Discrete geometry in the indecomposable modules of a hereditary algebra

In the talk we review a classical result by Dlab and Ringel on representations of quivers, and apply it to the analysis of triples of indecomposable modules belonging to exact sequences. It is shown that these triples constitute a Fisher space in the finite representation case, and we relate this to recent constructions of commutative nonassociative algebras.

17:40-18.10

Sinem Odabaşı (*Universidad Austral de Chile, Chile*)

On monoids with enough idempotents and geometrical purity

Let $\mathcal{V}$ be a closed symmetric monoidal Grothendieck category. In this talk, we present a study on several aspects of the theory of $\mathcal{V}$-enriched categories: We firstly introduce and develope the theory of *monoids with enough idempotents*, and accordingly, *unitary modules over a monoid with enough idempotent*. Besides, we prove a $\mathcal{V}$-enriched analogous of the Mitchell's result: there exists a bijection

$$\{\text{monoids with enough idempotents in } \mathcal{V}\} \longleftrightarrow \{\text{small } \mathcal{V}\text{-categories}\},$$

and for a given small $\mathcal{V}$-category $\mathcal{A}$, there exists a monoid A with enough idempotents in $\mathcal{V}$ such that

$$\mathcal{V}\text{-Fun}(\mathcal{A}, \mathcal{V}) \cong A\text{-Mod},$$

where $\mathcal{V}$-Fun$(\mathcal{A}, \mathcal{V})$ is the category of $\mathcal{V}$-functors from $\mathcal{A}$ to $\mathcal{V}$, and A-Mod is the category of unitary left A-modules.

In the second part, we develop further the theory of geometrical purity, which was also studied in [EGO]. We let $\mathcal{E}_{\otimes}$ denote the \textit{geometrical pure exact structure} on $\mathcal{V}$, which consists of short exact sequences in $\mathcal{V}$

that remain exact under `tensor product' by any object. We show that, under mild conditions, there exists a small category $\mathcal{A}$, which also has a $\mathcal{V}$-category structure, and an embedding

$$(\mathcal{V}, \mathcal{E}_{\otimes}) \longrightarrow \mathcal{V}\text{-Fun}(\mathcal{A}, \mathcal{V})$$

such that $\mathcal{E}_{\otimes}$-Inj $\cong$ Inj($\mathcal{V}$-Fun($\mathcal{A}$, $\mathcal{V}$)).

The talk is formed by certain results of two joint works-in-progress with Henrik Holm and Simone Virili, which has been supported by the grant CONICYT/FONDECYT/Iniciación/11170394.

References

[EGO] Estrada, S.; Gillespie, J & Odabaşı, S. (2014). Pure exact structures and the pure derived category of a scheme. Mathematical Proceedings of the Cambridge Philosophical Society, 1-14. doi:10.1017/S0305004116000980

18:20-18.50

Ibrahim Assem (*Université de Sherbrooke, Canadá*)

From the potential to the first Hochschild Cohomology group of a cluster tilted algebra

This is a report on joint work with Juan Carlos Bustamante, Sonia Trepode y Yadira Valdivieso-Diaz.

We give a concrete interpretation of the dimension of the first Hochschild cohomology space of a cyclically oriented or tame cluster tilted algebra in terms of a numerical invariant arising from the potential.

Monday, August 5

14.30-15.00

Olivier Mathieu (*Institut Camille Jordan, Lyon, France*)

On self similar groups

A self similar group is a group with a self similar action on a tree. Here we provide an exact condition for a finitely nilpotent group to be self similar.

15.10-15.30

Rodrigo Lucas Rodrigues (Universidade Federal do Ceara, Brasil)

The algebraic classification of commutative power-associative algebras of low dimension

This talk is concerned with small dimension commutative power-associative algebras over an algebraically closed field k with characteristic relative prime with 30. We prove that an algebra of this variety is Jordan if its dimension as vector space over k is not greater than 3. Albeit in dimension

4, non-Jordan commutative power-associative algebras exist, we can show that such algebras yet admits Wedderburn decomposition. Finally, we classify algebraically all commutative power-associative algebras of dimension less or equal than 4.

This is a joint work with Angelo Papa Neto and Elkin Quintero Vanegas.

15.40-16.10

Sergio Roberto López-Permouth (Ohio University, USA)

On the extent of amenability of bases of infinite dimensional algebras

Let F be a field and A an F-algebra . For $r \in A$, let l_r denote the left multiplication map $l_r : A \to A$. A basis B for A is amenable if the matrix representation with respect to B of every l_r is row finite. An algebra that has an amenable basis is said to be an amenable algebra; countable dimension algebras are amenable. For every countable basis $B = \{b_i\}_{i=1}^{\infty}$ of A, there exists a topology τ_B on $F^{(B)}$ such that B is amenable if and only if, for all $r \in A$, the sequence $\{[rb_i]_B\}_{i=1}^{\infty}$ of representations of $\{rb_i\}_{i=1}^{\infty}$ with respect to B converges to 0 in τ_B.

Given an algebra A, and a basis B for A, the amenability domain of B is the subalgebra of A consisting of all elements $r \in A$ with row finite matrix representation with respect to B. A basis having amenability domain F is said to be contrarian; we show that, under some mild additional hypotheses, amenable algebras always have contrarian bases. The collection of amenability domains of bases of an algebra A is called the amenability profile of A. The profile is a measurement of the diversity of the bases of A and serves to sort them according to the extent of their amenability.

We consider when profiles are minimal (consisting of only F and A) and when they are maximal (consisting of all subalgebras of A); the former algebras are said to *lack discernment* and the latter to be *full rank*. We provide an example of a graph magma algebra without discernment. We show that $F[x]$ does not lack discernment and that graph magma algebras are never full rank.

This talk relates to ongoing collaborations with many coauthors including Al-Essa, Aydogdu, Díaz Boils, Muhammad, Muthana, and Stanley.

16.20-16.40

Martha Lizbeth Shaid Sandoval Miranda (*UAM-Iztapalapa, México*)

On the weak-injectivity profile of a ring

In order to study rings in which every essential cyclic module is embedded in a projective module, a concept of weak injectivity was introduced by S.K. Jain and S. López-Permouth. Given modules $N, M \in Mod(R)$, M is said to be *weakly N-injective* if whenever $\varphi \in Hom_R(N, E(M))$, there exists $X \leq E(M)$ satisfying that $X \cong M$ and $\varphi(N) \subseteq X$. A module M is said to be *weakly injective* if it is weakly $N-$injective for every $N \in fgmod(R)$, where $fgmod(R)$ denotes the full subcategory of finitely generated $R-$modules (see S.K Jain and S.R López-Permouth, A survey of theory of weakly injective modules, Computational Algebra. Lecture Notes in Pure and Applied Mathematics 151 (1994) 205 - 232). Weakly injective modules have served to offer characterizations of qfd rings and to shed light about subtleties of open conjectures regarding QI rings.

Now, given a module M,

$$\mathcal{W}\mathfrak{Im}^{-1}(M) := \{N \in Mod(R) \mid M \text{ is weakly } N - \text{injective}\},$$

denotes the domain of weak injectivity of M. Domains of weak-injectivity may be used to gauge at least two different properties, namely, injectivity and weak injectivity. The first one gauged via the complete domains of weak injectivity, and the second one by looking only at only the finitely generated modules in them.

In this work, we will explore properties of weak injectivity domains. In particular, we study $\bigcap\{\mathcal{W}\mathfrak{Im}^{-1}(M) \mid M \in Mod(R)\}$ looking for some analogous to the situation of poverty but now for weak injectivity case.

This is a joint work with Pınar Aydoğdu (Hacettepe University), and Sergio López-Permouth (Ohio University).

17.10-17.40

Misha Dokuchaev (*Universidade de São Paulo, Brasil*)

Group cohomology related to the partial group algebra

With respect to theory of partial actions and partial representations, two group cohomologies were introduced. The first one was given in [DKh], in which actions of a group G on abelian groups (G-modules) were replaced by unital partial actions of G on commutative semigroups (partial G-modules). Another cohomology was defined in [AAR], where KG-modules (or G-modules) were substituted by modules over the partial group algebra $K_{par}G$. The latter algebra governs the partial representations of G in a similar fashion as KG does for the representations of G. Despite the relations between partial actions and partial representations, the two cohomologies have little in common.

Given a unital partial action α of G on an algebra $\mathcal{A}$ we consider $\mathcal{A}$ as a $K_{par}G$-module in a natural way and study the globalization problem for the cohomology in the sense of [AAR] with values in $\mathcal{A}$. Assuming that $\mathcal{A}$ is a product of blocks, we prove that any cocycle is globalizable, and globalizations of cohomologous cocycles are also cohomologous. As a consequence we obtain that the Alvares-Alves-Redondo cohomology group $H^n_{par}(G, \mathcal{A})$ is isomorphic to the usual cohomology group $H^n(G, \mathcal{M}(\mathcal{B}))$, where $\mathcal{M}(\mathcal{B})$ is the multiplier algebra of $\mathcal{B}$ and $\mathcal{B}$ is the algebra under the enveloping action of α. The results are obtained using the ideais of our earlier preprint on the globalization problem for partial cohomologies in the sense of [DKh].

This is a joint work with Mykola Khrypchenko and Juan Jacobo Simón.

Bibliography

[AAR] E.R.Alvares, M.M.S.Alves, M.J.Redondo, Cohomology of partial smash products, J. Algebra, 482 (2017), 204-223.

[DKh] M.Dokuchaev, M.Khrypchenko, Partial cohomology of groups, J. Algebra, 427 (2015), 142-182.

17.50-18.10

Elkin Oveimar Quintero Vanegas (*Universidade Federal do Amazonas, Brasil*)

Train algebras of rank and dimension 4 that are power-associative

Train algebras of rank 4 which are power-associative was classified in three families in which two of them are Jordan algebras. Commutative power-associative algebras which are non Jordan belong to the third one. Recently, we classified all commutative power-associative algebras of dimension 4 over an algebraically closed field. The aim of this work is to show that all commutative power-associative and non Jordan algebras of dimension 4 are train algebras of rank 4. Furthermore, we show that class, the power-associative and train algebras of rank and dimension 4, has a unique non trivial irreducible representation.

This is a joint work with R. Lucas Rodrigues.

Tuesday, August 6

14.30-15.00

Ángel del Río (*Universidad de Murcia, España*)

Torsion units of integral group rings: Positive and negative results

Let G be a finite group and let $\mathbb{Z}G$ denote the integral group ring of G. Hans Zassenhaus conjectured in the 1970's that every torsion unit of $\mathbb{Z}G$ is conjugate in the rational group algebra to an element of $\pm G$. This conjecture was proved for many families of groups but recently Eisele and Margolis have shown a counterexample, or rather a family of counterexamples. They comes from a strategy to produce candidates to minimal counterexamples proposed by Margolis and del Río. This leads to the question of classifying the finite groups for which the Zassenhaus Conjecture holds. We will present the strategy leading to the counterexample and some families of cyclic-by-nilpotent groups for which the Zassenhaus Conjecture holds.

This is a joint work with Mauricio Caicedo.

15.10-15.30

Héctor Suárez (*UPTC, Tunja, Colombia*)

σ-Filtered skew PBW extensions and their homogenization

In this work we provide a special filtration on the skew PBW extensions. We define σ-filtered skew PBW extensions and present some properties of these algebras. We show that the homogenization of a σ-filtered skew PBW extension A of R is a graded skew PBW extension of the homogenization of R. Using this fact we prove that if the homogenization of R is Auslander-regular, then the homogenization of A is a domain noetherian, Artin-Schelter regular and A is noetherian, Zariski and (ungraded) skew Calabi-Yau.

This is a joint work with Armando Reyes.

15.40-16.10

Plamen Koshlukov (State University of Campinas, Brazil)

Trace ideals of almost polynomial growth

In this talk we consider algebras with trace and their trace polynomial identities over a field of characteristic 0. We study the algebras of 2×2 diagonal matrices and describe all possible traces on these algebras. We prove that in the non-degenerate cases the corresponding trace codimensions have exponential growth. Moreover we prove that a variety generated by a finite dimensional algebra with trace has a polynomially bounded (trace) codimension sequence if and only if it does not contain any of the algebras of two concrete series of trace algebras defined on the 2×2 diagonal matrices. In fact we were able to exhibit finite generating sets for the trace identities of each algebra in these two series, and to compute the

codimension sequences in an explicit form. As a consequence of our methods of proof we prove that given a variety of trace algebras its codimension growth is either polynomial or exponential.

This is a joint work with D. La Mattina (Palermo, Italy) and A. Ioppolo (Palermo, Italy, and UNICAMP, Brazil).

16.20-16.40

Mauricio Medina-Barcenas (Northern Illinois University, USA)

A generalization of right hereditary rings

In this talk we will study the concept of hereditary ring in the module-theoretic context. We will define Σ-Rickart modules which generalize right hereditary rings. We will define these modules in terms of Rickart modules and we will see some of their properties which extend classical results of hereditary rings. Also, we will see when the endomorphism ring of a Σ-Rickart module is a right hereditary ring.

This is a joint work with Gangyong Lee

17.10-17.40

Victor Petrogradsky (University of Brasilia, Brazil)

Nil restricted Lie algebras and superalgebras analogous to Grigorchuk and Gupta-Sidki groups

The Grigorchuk and Gupta-Sidki groups play fundamental role in modern group theory. They are natural examples of self-similar finitely generated periodic groups. The author constructed their analogue in case of restricted Lie algebras of characteristic 2, Shestakov and Zelmanov extended this construction to an arbitrary positive characteristic.

There are also analogues of the Grigorchuk and Gupta-Sidki groups in the world of Lie superalgebras of an arbitrary characteristic constructed by the author. In these examples, $\mathrm{ad}(a)$ is nilpotent, a being even or odd with respect to $\mathbb{Z}_2$-grading as Lie superalgebras. This property is an analogue of the periodicity of the Grigorchuk and Gupta-Sidki groups. So, we get an example of a nil finely-graded Lie superalgebra of slow polynomial growth, which shows that an extension of a theorem due to Martinez and Zelmanov for the Lie superalgebras of characteristic zero is not valid.

We have a family of 2-generated restricted Lie algebras of slow polynomial growth with a nil p-mapping, a field of positive characteristic being

arbitrary. In particular, we obtain a continuum subfamily of nil restricted Lie algebras having Gelfand-Kirillov dimension one but the growth is not linear.

17.50-18.10

Helbert Venegas (Universidad Nacional de Colombia)

Cancellation problem for AS-Regular algebras of dimension three

A noncommutative version of the Zariski cancellation problem (ZCP) asks whether $A[x] \cong B[x]$ implies $A \cong B$ when A and B are noncommutative algebras. In this talk we study the ZCP for noncommutative noetherian connected graded Artin-Schelter (abbreviated as AS) regular algebras of global dimension three. In particular, we prove that if A is generated in degree 1 and A is not polynomial identity, then it is *cancellative*.

This is a joint work with Xin Tang, Fayetteville state university and James Zhang, University of Washington, USA.

The poster session:

Adriana Juzga León (*Universidade Estadual de Campinas*)

Finitely presentated restricted metabelian Lie algebras over perfect fields

Luis Alexandher Vergara Gómez (*ESFM-IPN*)

Dice Primes

Eduardo Camps Moreno (*ESFM-IPN*)

Códigos álgebro-geométricos y códigos polares

Eudes Antonio Costa (*Colegiado de Matemática-UFT*)

On maximal trivial Jordan subalgebra of the simple Jordan algebra

René Gonzalez (*UNAM*)

Ideales binomiales de arista Gorenstein

Cesar A. Ipanaque Zapata (*Universidade de São Paulo*)

Configuration spaces for groups

Delio Jaramillo Velez (*CIMAT*)

The F-pure threshold of a Thom-Sebastiani-type sum

Doris Y. Madroñero Toro (*Universidad de Nariño*)

Conjuntos producto pequeños en grupos no abelianos finitos

Jonathan Toledo (*Cinvestav-IPN*)

Edge ideals of weighted oriented graphs

José Simental Rodriguez (University of California, Davis)

Hecke algebras and lattice-path counting

Sara Raissa (*University of Brasilia*)

Exponent of a finite group of odd order with an involutory automorphism

Nathália Nogueira (*Universidade de Brasília*)

The q-tensor square of a powerful p-group, $q \geq 0$

Martha Lizbeth Shaid Sandoval Miranda (*UAM*)

On the weak-injectivity profile of a ring

Lourdes Cruz (*Cinvestav-IPN*)

Ideales tóricos intersección completa asociados a gráficas y gráficas orientadas