TEORÍA DE LIE
COLOQUIO LATINOAMERICANO DE ÁLGEBRA

Titles and abstracts

Carlos Ajila. *Universidad de Talca.*

"Representation theory and the diagonal coinvariant ring of the type B Weyl group ."

In 2003, I. Gordon proved that the ring of diagonal coinvariants R_W of a finite real reflection group W has dimension bounded from below by $(h+1)^n$, where h is the Coxeter number of W and n is its rank, confirming a conjecture of M. Haiman. In a joint work with Stephen Griffeth we obtained an improvement to this lower bound for the case of the Weyl group of type B as a result of the study of certain representations, which we call of coinvariant type, in the category $\mathcal{O}$ for the rational Cherednik algebras associated to $W(B_n)$.

Iván Angiono. *Universidad Nacional de Córdoba*

"Pointed Hopf algebras of finite Gelfand-Kirillov dimension."

Finite dimensional Hopf algebras were intensively studied in the last years, with a big approach towards the classification of pointed ones over the complex numbers: The successful program is based on the so-called Lifting Method introduced by Andruskiewitsch-Schneider around 2000.

Between the infinite dimensional finitely generated Hopf algebras, those of finite GKdim may be thought as the non-commutative analogue of algebras of functions over affine algebraic groups. Indeed, this class includes the algebras of functions already mentioned, the enveloping algebras of finite-dimensional Lie algebras, and the quantized versions of both families.

In the present talk we will summarize the last advances of the classification, following the Lifting Method again, which leads to a complete classification of the coradically graded pointed Hopf algebras with abelian coradical and diagonal braiding. It is based on joint works with Andruskiewitsch-Heckenberger, García Iglesias and Campagnolo-Sanmarco.

Juan Camilo Arias Uribe. *Universidad de los Andes.*

"Soergel bimodules and the Schur-Weyl duality."

For non-negative integers $n \geq m$, I will present a realization of the category of Soergel bimodules, for a Coxeter system of type A_m, in terms of endofunctors of singular Soergel bimodules which preserves the action of the 2-Kac-Moody Lie algebra of $\mathfrak{sl}_n$. As a biproduct, I will show how this result could be interpreted as a categorical analogue of the Shur - Weyl duality. This is a work in progress jointly with Nicolás Libedinsky.

Lien Cartaya. *Universidad de Talca.*
"Zero fiber of quaternionic quotient singularities."

We report on recent joint work with Stephen Griffeth, concerning results and conjectures on the dimension of the quotient ring by the invariants for a quaternionic reflection group. Our results and conjecture are parallel to those of Iain Gordon and Mark Haiman for the case of real reflection groups.

For a reflection group W acting on a quaternionic vector space V , by regarding V as a complex vector space, we consider the scheme-theoretic fiber over zero of the quotient map $\pi : V \to V/W$. For W an irreducible reflection group of (quaternionic) rank at least 6, we show that the ring of functions on this fiber admits a $(g+1)^n$-dimensional quotient arising from an irreducible representation of a symplectic reflection algebra, where $g = 2N/n$ with N the number of reflections in W and $n = \dim_{\mathbb{H}}(V)$, and we conjecture that this holds in general. We observe that in fact the degree of the zero fiber is precisely $g+1$ for the rank one groups (corresponding to the Kleinian singularities).

Jean Felipe van Diejen. *Universidad de Talca.*
"Pieri formula for the characters of simple Lie algebras."

The goal of this talk is to present an explicit Pieri formula for the characters of simple Lie algebras, providing the tensor multiplicities in the products of general irreducibles with fundamental representations pertaining to highest weights of classical type. The Pieri formula in question is derived from a recurrence relation in the character ring found via hypergeometric parameter deformation.

Nicolás Libedinsky. *Universidad de Chile.*
"Alcovic geometry and Euclidean geometry."

We will explain some emerging relationships between these two types of geometries. Specifically, for affine Weyl groups, we will describe how to calculate the number of elements in a lower Bruhat interval using convex geometry, highlighting some very non-intuitive phenomena that appear. Another incarnation of this philosophy appears in the classification of Bruhat intervals, which is closely linked to the combinatorial invariance conjecture.

Elizabeth Manosalva. *Universidad de Chile.*
"Irreducible modules of the degenerate affine Hecke algebra."

The irreducible representations of the complex reflection group $G(\ell, 1, n)$ are indexed by ℓ-partitions, this is an ℓ-tuple of classic partitions but with n total boxes. One of the main objects of study for this talk will be the degenerate affine Hecke algebra of type $G(\ell, 1, n)$ studied by Ram and Shepler, which we denote by $H_{\ell,n}$. Such an algebra has also been studied by Dezelee, where is called generalized graded Hecke algebra.

In this talk we aim to define the irreducible $H_{\ell,n}$-modules $S^{\lambda\backslash\mu}$ which are indexed by two ℓ-partitions λ, μ and prove that for a certain subalgebra $\mathfrak{u}$ of $H_{\ell,n}$ each $\mathfrak{u}$-diagonalizable $H_{\ell,n}$-module can be obtained as one of the mentioned above. This result has an application on the rational Cherednik algebra of type $G(\ell, 1, n)$ since possesses a subalgebra isomorphic to $H_{\ell,n}$.

Katherine Ormeño. *Universidad de Talca.*

"On the spherical partition algebra."

The Partition Algebra $\mathcal{P}_k = \mathcal{P}_k k(x)$ was introduced in the 90s by Paul Martin and V. Jones. As the structure of this algebra began to be understood in the late 90s and early 2000s, it was determined that $\mathcal{P}_k$ is connected to various other areas of mathematics and physics.

$\mathcal{P}_k$ is defined as the $\mathbb{C}[x]$-algebra generated by set partitions in $\{1, 2, \ldots, k\} \cup \{1', 2', \ldots, k'\}$, and these can be represented by diagrams. This structure also has a large number of interesting and widely studied subalgebras, such as the Temperley-Lieb algebra, the Brauer algebra, the group algebra of the symmetric group $\mathcal{S}_k$, etc.

In this talk, I will present a new subalgebra of $\mathcal{P}_k$, the spherical partition algebra denoted $\mathcal{SP}_k$, which comes from the truncation of $\mathcal{P}_k$ by a certain idempotent e_k,that is, $\mathcal{SP}_k = e_k \mathcal{P}_k e_k$. Additionally, we will examine its dimension and study the representation theory of this structure.

Yamil Sagurie. *Universidad de Talca.*

"Kazhdan-Lusztig basis and positivity for pre-canonical bases in type A."

The Hecke algebra is a one-parameter deformation of the group algebra of a Coxeter group W. It is naturally equipped with a basis indexed by the elements of W, which is called the standard basis. In 1979, Kazhdan and Lusztig introduced a new basis for the Hecke algebra. Its coefficients with respect to the standard basis, called Kazhdan–Lusztig polynomials, encode relevant information in representation theory and algebraic geometry.

For W an affine Weyl group there is an spherical Hecke algebra embedded in the affine Hecke algebra, which plays an important role. For instance, the corresponding Kazhdan–Lusztig polynomials coincide with q-weight multiplicities. In 2022, Libedinsky, Patimo, and Plaza introduced the pre-canonical bases $(\mathbf{N}^i)_{i \geq 1}$ of the spherical Hecke algebra. These bases interpolate between the spherical Kazhdan–Lusztig basis and the spherical standard basis, providing a new way to understand the Kazhdan–Lusztig basis. In a joint work with David Plaza we prove that in type A the polynomials occurring in the expansion of an element of the $(i + 1)$-th basis in terms of the i-th basis have positive coefficients. In this talk, we will focus on the previously mentioned structures and, through examples, present the arguments that demonstrate their positivity.