Representation Theory
Théorie des représentations
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Skein algebras of punctured spheres, Coulomb branches and knot homology

Certain skein algebras of surfaces are expectied to be isomorphic to K-theoretic Coulomb branch algebras. This suggests that these algebras can be categorified using coherent sheaves on BFN spaces. I will explain how we can combine my older work with Cautis into this perspective in order to obtain homological knot invariants for knots in thickened punctured spheres.

NICCOLO MATTAREI, University of Ottawa

THOMAS MORAN, University of Ottawa

MONICA NEVINS, University of Ottawa
Representations of p-adic groups near the identity

The infinite-dimensional irreducible representations of p-adic groups have an elegant geometric structure near the identity. The analytic nature of this structure, expressed in terms of the character of the representation, has been known since the 1970s, and recently progress has been made on understanding it in more concrete terms via the restriction of representations to sufficiently small compact open subgroups. In this talk, we describe the ideas and the techniques involved, focusing on geometric and combinatorial aspects. Parts of this talk are based on ongoing joint work with Ekta Tiwari (IISER Pune), with Zander Karaganis (UBC), and with David Schwein (Utah).

THEO PINET, McGill

ANDREW RIESEN, M.I.T.

HOMA ROUDINI, University of Ottawa

LEONID RYBNIKOV, Université de Montréal

HADI SALMASIAN, University of Ottawa

JAKE S. ZIMMERMANN SIMMONS, University of Toronto
Regular Bisections of Nilpotent Subalgebras of $\mathfrak{sl}(n)$

In this talk, we explore how nilpotent regular Lie subalgebras $\mathfrak{g}$ of the special linear algebra $\mathfrak{sl}(n)$ can be split into bisections, pairs of subalgebras of $\mathfrak{g}$ that equal $\mathfrak{g}$ as a vector space direct sum. These splittings help reveal internal structure of the $\mathfrak{g}$ and provide a concrete way to understand how its parts fit together, through a matrix representation of the bisections. There is a classical bijection between biclosed subsets of root systems and biclosed subsets of root systems. In this talk we will investigate a counting of bisections of the strict upper triangle algebra $\mathfrak{n}(n) \subseteq \mathfrak{sl}(n)$ which provides a new perspective on this bijection, and will discuss how this could lead to investigations using the Weyl group of a matrix representations of bijections, implicitly giving a group structure on all bisections any nilpotent regular subalgebra of $\mathfrak{sl}(n)$. There will be $n!$ bisections of $\mathfrak{n}(n)$ and this will be proven. The proof uses an induction argument that introduces the idea of extending algebras, and those extensions being complementary to each other. Only the bisections of some algebras can be represented as matrices, but all are relevant to the Weyl group as structure of bisections in general can be inherited by those that can be represented as matrices. Lastly, we present an algorithm, which we will call the falling terms algorithm, to count bisections of subalgebras of the strict upper triangle.

JOSHUA SUSSAN, CUNY Medgar Evans College

ALEKSANDR (SASHA) TRUFANOV, University of Montreal

BEN WEBSTER, University of Waterloo

MERI ZAIMI, Perimeter Institute

Knot contact homology as a planar limit of Chern-Simons theory

In the context of holographic duality in physics, it is expected that the quantum knot invariants obtained from $SU(N)$ Chern-Simons theory in the planar limit ($N \to \infty$, $q \to 1$ and q^N fixed) are related to knot contact homology, and hence to augmentation varieties. In particular, it is conjectured that the augmentation polynomial of a knot is the classical limit of a deformed $\hat{A}$-polynomial, which describes recursions for colored HOMFLYPT polynomials. In this talk, I will discuss how to study this connection via the "HOMFLYPT difference module", which encodes the relations among the HOMFLYPT polynomials with different antisymmetric colorings. The construction relies on a spider category for $U_q(gl_N)$ where, in addition to the usual objects carrying integer labels, associated to the antisymmetric powers of the standard representation, we include objects carrying formal labels, which allow the color to be treated as a variable. The main result is that the classical limit of the HOMFLYPT difference module is isomorphic to the degree 0 part of the abelianized knot contact homology. The conjecture relating the augmentation polynomial to the deformed $\hat{A}$-polynomial can be reformulated in terms of certain algebraic properties of the module. This is based on work with Ben Webster.

KIRILL ZAYNULLIN, University of Ottawa

The unimodular degree and the w-index of a Kac-Moody root system

We introduce combinatorial analogues (the unimodular degree and the w-index) of two celebrated geometric invariants of a split simple simply connected linear algebraic group G to the Kac–Moody setting: the canonical dimension of G and the Grothendieck torsion index of G.

We prove finiteness of the unimodular degree for an arbitrary generalized Cartan matrix using coinvariant algebras over finite fields. In rank two, we determine the unimodular degree and obtain a product formula for all w-indices in terms of recursively defined dihedral polynomials. Finally, we use the 1-chains (type A) and 2-chains (type C) to obtain explicit lower bounds for all untwisted and twisted affine types. This is a joint work with Edward Richmond.