Titles and Abstracts

Mixed Schur-Weyl-Sergeev duality for queer Lie superalgebras

Jihye Jung, Seoul National University, Korea

In this talk, we introduce a new family of superalgebras $\overrightarrow{B}_{r,s}$ for $r, s \geq 0$ such that $r + s > 0$, which we call the walled Brauer superalgebras, and prove the mixed Schur-Weyl-Sergeev duality for queer Lie superalgebras. More precisely, let $\mathfrak{q}(n)$ be the queer Lie superalgebra, $V = \mathbb{C}^{n|n}$ the natural representation of $\mathfrak{q}(n)$ and W the dual of V. We prove that, if $n \geq r + s$, the superalgebra $\overrightarrow{B}_{r,s}$ is isomorphic to the supercentralizer algebra $End_{\mathfrak{q}(n)}(V^{\otimes r} \otimes W^{\otimes s})^{op}$ of the $\mathfrak{q}(n)$-action on the mixed tensor space $V^{\otimes r} \otimes W^{\otimes s}$. As an ingredient for the proof of our main result, we construct a new diagrammatic realization $\overrightarrow{D}_k$ of the Sergeev superalgebra Ser_k. Finally, we give a presentation of $\overrightarrow{B}_{r,s}$ in terms of generators and relations.

Ring class invariants over imaginary quadratic fields

Ick Sun Eum, Seoul National University, Korea

We show by adopting Schertz's argument with the Siegel-Ramachandra invariants that the singular values of certain Δ-quotients generate ring class fields over imaginary quadratic fields.

The strictly regular quaternary quadratic $\mathbb{Z}$-lattices

Jiyoung Kim , Seoul National University, Korea

A positive definite quadratic $\mathbb{Z}$-lattice is said to be *strictly regular* if it primitively represents all positive integers that are primitively represented by its genus. In this talk, it will be shown that there exist only finitely many isometry classes of primitive integral positive definite quaternary quadratic $\mathbb{Z}$-lattices that are strictly regular. In addition, all strictly regular positive definite primitive integral diagonal quadratic $\mathbb{Z}$-lattices are determined. As

a consequence, all one-class genera of diagonal quaternary quadratic forms are determined by an arithmetic method.

Irreducible elements in commutative rings with zero divisors

Sangmin Chun, Seoul National University, Korea

Let R be a commutative ring with identity and let a be a nonunit. Then a is irreducible if $a = bc$ implies $(a) = (b)$ or $(a) = (c)$. We study the various forms of atomicity. In this talk we introduce the various characterizations of the different types of irreducible elements.

Elliptic curves with all cubic twists of the same root number

Nayoung Kim, Seoul National University, Korea

Let E/K be an elliptic curve with j-invariant 0 defined over a number field K. We will give a simple condition on K which determines whether all cubic twists of E/K have the same root number or not. This is a cubic twist analogue to the work Dokchitser and Dokchitser on quadratic twists of elliptic curves.

Optimal curves differing by a 5-isogeny

Taekyung Kim, Seoul National University, Korea

For $i = 0, 1$, let E_i be the $X_i(N)$-optimal curve of an isogeny class $\mathcal{C}$ of elliptic curves defined over $\mathbb{Q}$ of conductor N. W. Stein and M. Watkins conjectured that E_0 and E_1 differ by a 5-isogeny if and only if $E_0 = X_0(11)$ and $E_1 = X_1(11)$. In this paper, we show that this conjecture is true if N is square-free and is not divisible by 5. On the other hand, T. Hadano conjectured for an elliptic curve E defined over $\mathbb{Q}$ with a rational point P of order 5, the 5-isogenous curve $E' := E/ < P >$ has a rational 5-torsion point again if and only if $E' = X_0(11)$ and $E = X_1(11)$. In the process of the proof of Stein and Watkins' conjecture, we show that Hadano's conjecture is not true.

This is a joint work with my advisor Prof. D. Byeon.

The derivation modules of the extended Shi and Catalan arrangements

Daisuke Suyama, Hokkaido University, Japan

Let Φ be a finite crystallographic irreducible root system. The Weyl arrangement of Φ is the set of all linear hyperplanes orthogonal to positive root in Φ. Extended Shi arrangements and extended Catalan arrangements are obtained by adding to the Weyl arrangement several parallel translations of hyperplanes in the Weyl arrangement. We will talk about basis construction for the derivation modules of cones over extended Shi and Catalan arrangements.

A system of canonical invariants of a finite reflection group

Shuhei Tsujie, Hokkaido University, Japan

The invariant ring of a finite reflection group is generated by finite algebraically independent homogeneous polynomials. A system of the generators is canonical if the generators satisfy the orthogonality condition for a bilinear map defined by differential operators. It is not difficult to give expressions of a canonical system when the rank of reflection group is low, but complicated when the rank is grater than or equal to 6. Iwasaki gave explicit formulas of canonical systems for irreducible finite reflection groups except type E. We give explicit formulas of canonical systems for irreducible finite reflection groups independent of the types of groups. This is a joint-work with Norihiro Nakashima.

Simplified numerical form of universal finite type invariant of Gauss words

Tomonori Fukunaga, Hokkaido University, Japan

In this talk, we study the finite type invariants of Gauss words. In the Polyak algebra techniques, we reduce the determination of the group structure to transformation of a matrix into its Smith normal form and we give

the simplified form of a universal finite type invariant by means of the iso-morphism of this transformation. The advantage of this process is that we can implement it as a computer program. We obtain the universal finite type invariant of degree 4, 5, and 6 explicitly. Moreover, as an application, we give the complete classification of Gauss words of rank 4 and the partial classification of Gauss words of rank 5 where the distinction of only one pair remains. The talk is based on a joint work with T. Yamaguchi and T. Yamanoi (Hokkaido university) [1].

[1] T. Fukunaga, T. Yamaguchi and T. Yamanoi, *Simplified numerical form of universal finite type invariant of Gauss words*, Journal of Knot Theory and Its Ramifications **22** (8) (2013) 1350037(14 pages).

The Moduli Space of Tropical Curves of Genus 1 with Marked Points and its Homology

LIU Ye, Hokkaido University, Japan

In this presentation, we study the moduli space of tropical curves of genus 1 with marked points from the topological point of view. I will explain D. N. Kozlov's work that this moduli space has the homotopy type of a quotient space of the n-torus with respect to a conjugation $\mathbb{Z}_2$-action and the computation of its mod 2 homology. Furthermore, I would like to talk about my joint work with Prof. T. Akita on the integral homology of this space.

On an Orbifold Hamiltonian Structure for the First Painlevé Equation

Shu Okada and Katsunori Iwasaki, Hokkaido University, Japan

For the first Painlevé equation we establish an orbifold polynomial Hamiltonian structure on the fibration of Okamoto's spaces and show that this geometric structure uniquely recovers the original Painlevé equation, thereby solving a problem posed by K. Takano.

Left bialgebroids associated with dynamical Yang-Baxter maps

Youichi Shibukawa, Hokkaido University, Japan

Dynamical Yang-Baxter maps are solutions to the braid relation in some tensor category, which is equivalent to a version of the quantum dynamical Yang-Baxter equation introduced by Gervais-Neveu and Felder. In this poster, we will construct left bialgebroids by means of the dynamical Yang-Baxter map. This is a generalization of Faddeev-Reshetikhin-Takhtajan construction, which produces the quantum group (q-analog of the algebra of functions). This is a joint work with M. Takeuchi.