

15th Workshop on Representation theory of Algebraic groups and Quantum groups

Abstracts

Yasuyoshi Yonezawa (Nagoya Univ.):

Bar-Natan's link homology of type A_n , matrix factorization and Soergel bimodule

Dror Bar-Natan defined a link homology using cobordisms of loops, which is a generalization of Khovanov homology. We'll recall this link homology and I'll explain a generalization of Bar-Natan's link homology associated to Khovanov-Rozansky homology. If I have a time, I'll explain a relation to matrix factorizations or Soergel bimodules.

Gustavo Jasso (Nagoya Univ.):

Cluster-tilted Algebras of Canonical Type and Quivers with Potentials

We will describe the effect of mutation on the endomorphism rings of cluster tilting objects in the cluster category associated with a canonical algebra in terms of quivers with potentials.

Hideaki Hosaka (University of Tokyo):

Representation theory of wreath products

In 1996, Okounkov and Vershik show a new approach to representation theory of symmetric groups. I extend their methods to the case of wreath products of finite Abelian groups and symmetric groups. I give seminormal forms of representations of wreath products. I also show the Murnaghan-Nakayama rule for wreath products by using seminormal forms.

Masaki Mori (University of Tokyo):

Super cellular algebras

A cellular algebra is an algebra consisting of "cells" whose structures are similar to those of matrix algebras, and we can construct all of its irreducible representations from its cells. However, in representation theory of super algebras (e.g. spin representation of symmetric groups), this strategy does not work well since there are another kind of simple algebras, that is, matrix algebras over Clifford algebras. In this talk, we introduce a generalized definition of cellular algebra which enables us to treat such cells.

Yoshihisa Saito (University of Tokyo):

Toward Berenstein-Zelevinsky data in affine type A

In this talk, we concentrate on the case of affine type A , and construct (conjectural) affine analogues of Berenstein-Zelevinsky (BZ for short) data. Furthermore, using these affine analogue of BZ data, we give a realization of the crystal basis of the negative half of the quantum universal enveloping algebra of affine type A .

Kohei Yahiro (University of Tokyo):

Weight modules of rational Cherednik algebras

There are similarities between representation theory of semisimple Lie algebras and that of rational Cherednik algebras. In this talk, we consider the modules over rational Cherednik algebras associated to real reflection groups on which the Euler element acts diagonally. This is an analogue of weight modules for semisimple Lie algebras. We show

there are only three types of irreducible modules, i.e., lowest, highest and cuspidal weight modules. We also explain how to construct cuspidal weight modules from irreducible admissible highest weight modules following Mathieu.

Ming Fang (Chinese Academy of Sciences/Osaka Univ.):

Doty coalgebras and dominant dimension of Schur algebras

An explicit multiplication on the dual space $A(n, r)$ of the Schur algebra $S(n, r)$ is constructed, possibly without a unit. We show that the image of this multiplication map coincides with Doty coalgebra $D(n, r)$ and that $D(n, r) = A(n, r)$ if and only if r is smaller than or equal to $n(p - 1)$, where $p > 0$ is the characteristic of the field. In particular, the dominant dimension of $S(n, r)$ is at least 2 whenever $r \leq n(p - 1)$.

Masahide Konishi (Nagoya Univ.):

Khovanov-Lauda-Rouquier quotients correspond to Hecke algebras of A type

This talk is based on my master thesis. A Khovanov-Lauda-Rouquier algebra is defined by a quiver Γ and weight α on its vertices. We fix Γ n -cycle C_n and give another weight Λ on its vertices, then we get a cyclotomic quiver Hecke algebra as a quotient of KLR algebra by an ideal which is determined by Λ . In this talk, we fix both α and Λ in special case, then we can see systematic changes of structures of cyclotomic quiver Hecke algebras for n from diagrammatic approach.

Shunsuke Tsuchioka (Kavli IPMU):

Graded Cartan determinants of the symmetric groups

We give the graded Cartan determinants of the symmetric groups. Based on it, we propose a gradation of Hill's conjecture which is equivalent to Külshammer-Olsson-Robinson's conjecture on the generalized Cartan invariants of the symmetric groups.

Kazuto Iijima (Nagoya Univ.):

On a higher level extension of Leclerc-Thibon product theorem in q -deformed Fock spaces

The q -deformed Fock spaces of higher levels were introduced by Jimbo-Misra-Miwa-Okado. Uglov defined a canonical bases in q -deformed Fock spaces of higher levels. Leclerc-Thibon showed a product theorem in q -deformed Fock spaces of level one. The product theorem is regarded as a formal q -analogue of the tensor product theorem of level one. In this talk, we obtain a higher level extension of Leclerc-Thibon product theorem under a suitable multi charge condition.

Laurent Demonet (Nagoya Univ.):

Categorification of cluster algebra structures of coordinate rings of nilpotent cells of Lie groups

As an introduction, we will explain why so called cluster algebra structures are particularly important in the specific case of coordinate rings of simple Lie groups. We will quickly recall the problem of totally positive elements of such a group and how cluster algebra structures classify optimal criteria for detecting such an element. Thus, will we give the categorification of a specific instance of this problem using module categories of preprojective algebras. Then we will emphasize the necessary enhancement to pass from the simply laced case to the non simply laced case.

Susumu Ariki (Osaka Univ.):

Constructing a q.h. cover of a cellular algebra

In the first half, I explain the motivation for constructing a q.h. cover of a cellular algebra, in which I also remind you the fact that Schur functors come in a parameter family even in the classical type A Schur algebra/Hecke algebra situation. Then, in the second half, I state a theorem which gives an iterated construction of a q.h. cover of a cellular algebra under three assumptions. The theorem is an elementary application of relative homology theory by Auslander and Solberg. If time permits, I give an example of the iterated construction. In the process for the example, three conditions are met in one step, and one condition is violated in other steps. Thus, the example suggests us to develop several more theorems of the similar kind in order to cover those cases.

Katsuyuki Naoi (Kavli IPMU):

Classical limits of minimal affinizations and generalized Demazure modules

We call a module of a quantum affine algebra an affinization if as a module of the classical subalgebra, it is a direct sum of an irreducible module and some smaller modules (in a suitable sense). Some ordering is defined on affinizations, and minimal ones are called minimal affinizations. Minimal affinizations are classified by Chari and Pressley in 90's. However, their structures such as characters are still not known except for some special cases. In this talk, we connect the classical limits of minimal affinizations for classical types with generalized Demazure modules, and as a result we obtain some character formulas for them.

Hiroyuki Yamane (Osaka Univ):

Affine quantum superalgebras and Mathematica

More than fifteen years ago, the speaker decided defining relations of finite-type and affine-type Lie superalgebras \mathfrak{g} and those of finite-type and affine-type quantum superalgebras $U_q\mathfrak{g}$ under the assumption that q is transcendental over \mathbb{Q} . The reason of the assumption is that his proof used a specialization argument under $q \rightarrow 1$. Recently he was convinced that a by-hand program for Mathematica 8 can allow us to show that Lusztig isomorphisms between $U_q\mathfrak{g}$'s can be defined only by using the relations when q is not any root of unity. Therefore near future it will be able to be shown that they are indeed indispensable defining relations when q is not any root of unity except for some exceptional cases. The talk will involve a demonstration of the by-hand program. Part of the results has already been obtained by a joint work with Ivan Angiono and Nicolas Andruskiewitsch, see arXiv.1009.5148. This topic is under construction as a joint work with I. Angiono, K. Ito, K. Oshima.