Abstracts

Title：Parity duality of super r-matrices via $\mathcal O$-operators and pre-Lie superalgebras

Speaker：Chengming Bai (Nankai University)

Abstract：We interpret the homogeneous solutions of the super classical Yang-Baxter equation, also called super r-matrices, in terms of $\mathcal O$-operators by a unified treatment. Furthermore, by a parity reversion of Lie superalgebra representations, a duality is established between the even and odd $\mathcal O$-operators. This leads to a parity duality of the super r-matrices induced by the $\mathcal O$-operators in semi-direct product Lie superalgebras. Therefore a pre-Lie superalgebra naturally defines an even $\mathcal O$-operator, and hence an odd $\mathcal O$-operator by the duality, thereby giving rise to a parity pair of super r-matrices. This is a joint work with Li Guo and Runxuan Zhang.

Title：Bethe/Gauge Duality for 3d Gauge Theory

Speaker：Xiangmao Ding (Academy of Mathematics and Systems Science Chinese Academy of Sciences)

Abstract：We give a new effective superpotential for 3d N=2 gauge theories with matter, it ensures a clear Bethe/Gauge correspondence between 3d (A)BCDEFG gauge theories and (closed) open XXZ spin chains with diagonal boundary conditions, respectively, and it also works in the case of 3d BC_N-type gauge theories which is not previously discussed in the literature. For an A_2 quiver gauge theory, which is the simplest non-trivial quiver gauge theory, and sl3 open XXZ spin chain with diagonal boundary condition. We demonstrate the correspondence between the vacuum equations of different gauge groups and Bethe Ansatz equations with different boundary parameters. The 2d gauge theory correspondence with XXX spin chain is obviously as a degeneration.

Title：Coset theory and Kac-Wakimoto hypothesis

Speaker：Chongying Dong (University of California)

Abstract：Kac-Wakimoto hypothesis is about the positivity of S-matrices and was proposed by Kac-Wakimoto in 1988 for studying cost constructions associated to affine Kac-Moody algebra. We prove recently that Kac-Wakimoto hypothesis holds in categorical coset construction setting. This is a joint work with Li Ren and Feng Xu.

Title：The Blockwise Alperin Weight Conjecture for Finite Groups of Lie Type D

Speaker：Yucong Du (Southern University of Science and Technology)

Abstract：The Alperin weight conjecture is one of the most important conjectures in modular representation theory for finite groups. It has been reduced to several inductive conditions for finite simple groups, i.e., to prove the Alperin weight conjecture, it suffices to verify the inductive Alperin weight conditions for finite simple groups. In this talk, we will establish a graph-field automorphism equivariant bijection between weights and a basic set for conformal special orthogonal groups of even dimension, which is a regular embedding of the special orthogonal groups of even dimension. In particular, we can prove that the blockwise Alperin weight conjecture holds for conformal special orthogonal groups of even dimension.

Title：Global bases, canonical bases and perfect bases for quantum Borcherds-Bozec algebras

Speaker：Zhaobing Fan (Harbin Engineering University)

Abstract：By using new Kashiwara operators, we construct global bases for quantum Borcherds-Bozec algebra. Moreover, we introduce the primitive canonical bases, and prove it coincides with global bases. This is a joint work with Han, Kang and Kim.

Title： Representations of Affine Lie superalgebras

Speaker： Vyacheslav Futorny (Southern University of Science and Technology)

Abstract： We will discuss representation theory of Affine Lie algebras and superalgebras.

Title： On the centers and cocenters of the cyclotomic Hecke and KLR algebras

Speaker： Jun Hu (Beijing Institute of Technology)

Abstract： In this talk, I shall report our recent work on the centers and cocenters of the cyclotomic Hecke and KLR algebras (including type A). We shall characterize minimal length elements in each conjugacy class of the complex reflection group G(r,1,n). The talk are based on some joint work with Shi Lei, and with Shi Xiaolin and Shi Lei.

Title： Some new isoclasses of one-parameter exotic small quantum groups arising from the two-parameter setting

Speaker： Naihong Hu (East China Normal University)

Abstract： Using the isomorphism theorem of two-parameter small quantum groups of types A, B, C, D, F_4, G_2, when parameters are of odd prime orders, we reduce and obtain a complete classification of one-parameter exotic small quantum groups with the Drinfeld double structures.

For even order $\ell\in \{4, 6, 8\}$, we acquire partial classification lists including some undistinguishable representatives by the aforementioned method. In particular, for some representatives of type A_2, we make a fine distinction via calculating dimension distributions of their simple modules.

Accordingly, to the 42 choosen one-parameter standard small quantum groups, we get the corresponding 201 new isoclasses of one-parameter exotic (i.e.,

non-standard) small quantum groups arising from the two-parameter setting. These form new finite dimensional pointed Hopf algebras with the Drinfeld doubles without the assumption $(ell, 210)=1$ in the classification work of Andruskiewitsch-Schneider's Annals of Math. This is a joint work with Xiao Xu.

Title： Frobenius'arithmetic theory and its application to supercharacter theory.

Speaker： Pengcheng Liao (Southern University of Science and Technology)

Abstract： In order to study prime decomposition of group-determinant on the field of complex numbers , Frobenius used arithmetic method to develop the theory of characters, which is considered the origin of representation theory for finite groups.

In 2008, P. Diaconis and I. Isaacs first gave the definition of supercharacter theory. We applied the arithmetic method of Frobenius to supercharacter theory and obtained some results. In addition, we will introduce the computer algorithm and the classification of supercharacter theory for some finite groups.

Title： 从无挠幂零群导出的几个矩阵结果

Speaker： Heguo Liu (Hubei University)

Abstract： 从无挠幂零群出发，研究代数闭域上矩阵的根。运用中国剩余定理，得到矩阵的根能够表示为该矩阵的多项式的充要条件。

Title： Representations of the orthosymplectic Yangian

Speaker： Alexander Molev (The University of Sydney)

Abstract： The Yangians form a remarkable family of quantum groups with a deep and substantive representation theory and numerous connections in mathematical physics. The Yangians admit at least three different presentations, including the R-matrix presentation going back to the work of Faddeev's school in the 1980s. It is

the R-matrix approach which turned out to be more suitable for the introduction of the super-versions of the Yangians as given by Nazarov (for the general linear Lie superalgebras, 1991) and Arnaudon et al. (for the orthosymplectic Lie superalgebras, 2003). The classification problem for simple finite-dimensional modules over the Yangians associated with the orthosymplectic Lie superalgebras osp(1|2n) and osp(2|2n) has been solved recently (2022). We will discuss the solution which describes the representations in terms of their highest weights. Key arguments rely on an explicit construction of a family of elementary modules of the Yangian for osp(1|2).

Title： Pointed modular tensor category

Speaker： Li Ren (Sichuan University)

Abstract： A modular tensor category is pointed if every simple object is a simple current. We show that any pointed modular tensor category is equivalent to the module category of a lattice vertex operator algebra. Moreover, if the pointed modular tensor category C is the module category of a twisted Drinfeld double associated to a finite abelian group G and a 3-cocycle with coefficients in U(1), then there exists a self dual positive definite even lattice L such that G can be realized an automorphism group of lattice vertex operator algebra V_L, V_L^G is also a lattice vertex operator algebra and C is equivalent to the module category of V_L^G. This is a joint work with C. Dong and S. Ng.

Title： Basic quasi-reductive root data and supergroups

Speaker： Bin Shu (East China Normal University)

Abstract： In this talk, we will talk about the root data for basic classical algebraic Lie supergroups which is an algebraical generalization of root-data theory for connected reductive groups. We show an existence and uniqueness theorem, and explain a

classification of connected quasi-reductive algebraic supergroups of monodromy type under the requirement (i) the root system does not contain 0; (ii) g := Lie(G) admits a non-degenerate even symmetric bilinear form. This is a joint work with Rita Fioresi.

Title： Some multiplication formulas in queer q-schur superalgebras

Speaker： Jinkui Wan (Beijing Institute of Technology)

Abstract： Building on an earlier work by Du and Wan, where some standard basis for the queer q-Schur superalgebra Q_q(n, r;R) is defined by a labelling set of matrices and their associated double coset representatives, we investigate the matrix representation of the regular module of Q_q(n, r;R) with respect to this basis. More precisely, we derive explicitly (resp., partial explicitly) the multiplication formulas of the basis elements by certain even (resp., odd) generators of a queer q-Schur superalgebra.These multiplication formulas are highly technical to derive, especially in the odd case. It requires to discover many multiplication (or commutation) formulas in the Hecke–Clifford algebra Hc r,R associated with the labelling matrices. For example, for a given such a labelling matrix A^⋆, there are several matrices w(A), σ(A), \tilde{A}, and \hat{A} associated with the base matrix A of A^⋆, where w(A) is used to compute a reduced expression of the distinguished double coset representatives d_A, and the other matrices are used to describe the permutation d_A and theSDP (commutation) condition between T_{d_A} nd generators of the Clifford subsuperalgebra. With these multiplication formulas, we will construct a new realisation of the quantum queer supergroup in a forthcoming paper, and to give new applications to the integral Schur–Olshanski duality and its associated representation theory at roots of unity. This is a joint work with Jie Du, Haixia Gu and Zhenhua Li.

Title： Modular version of Frobenius theory

Speaker： Lizhong Wang (Peking University)

Abstract：In this talk, we will introduce the factorization and construction of the modular group determination.

Title：Representations of the orbifold of the parafermion vertex operator algebra K(osp(1|2),k)

Speaker：Qing Wang (Xiamen University)

Abstract：In this talk, we present our recent progress about the orbifold theory of parafermion vertex operator algebras K(osp(1|2),k) associated to the affine vertex operator superalgebra L_{\widehat{osp(1|2)}}(k,0) with any positive integer k. In particular, we classify the irreducible modules for the orbifold of the parafermion vertex operator algebra K(osp(1|2),k). This is a joint work with Cuipo Jiang.

Title：关于自同态平凡模的上同调刻画

Speaker：Fei Xu (Shantou University)

Abstract：设 G 为有限群。自同态平凡模是模表示的重要研究对象之一，它们的同构类构成所谓的自同态平凡模群 T(G)。Balmer 和 Grodal 采用 Cech 上同调和范畴上同调，分别刻画了 T(G)。通过拓扑斯上同调理论，我们说明他们的刻画本质上相同。在此基础上，我们得到一个新的刻画。

Title：Tensor category arising from N=1 super Virasoro algebra

Speaker：Jinwei Yang (Shanghai Jiao Tong University)

Abstract：N=1 super Virasoro algebra plays an important role in the study of superstring theory. We construct tensor structures on the representation categories of N=1 super Virasoro algebra at all central charges, and then prove rigidity of these tensor categories. We will also relate these categories with those of the affine Lie superalgebra osp(1|2). This talk is based on joint work with T. Creutzig, R. McRae

and F. Orosz.

Title：General Capelli-type identities

Speaker：Jian Zhang (Central China Normal University)

Abstract：The Capelli identity is one of the most important results of classical invariant theory. It played the central role in Weyl's famous book, "The Classical Groups". In this talk, we will discuss the Capelli identities from different points of view. A new generalization of Capelli identity for immanant will be introduced. We will also present generalized Turnbull's identities for both symmetric and antisymmetric matrices, as well as the generalized Howe-Umeda-Kostant-Sahi identities for antisymmetric matrices which confirm the conjecture of Caracciolo, Sokal and Sportiello.