Lecture Series and Conference on Representation Theory, Geometry and Categorification

Beijing Institute of Technology

School of Mathematics and Statistics

June.17.2024–June.28.2024

Time:

June 17–22 (Lecture Series); June 24–28 (Conference)

Venue:

Wencui Building Room M134, Liangxiang Campus at BIT

Organizer:

Jinkui Wan (Beijing Institute of Technology)

Weiqiang Wang (University of Virginia)

Lecture Series Speakers:

Alistair Savage (University of Ottawa)

Eric Vasserot (Université Paris Cité)

Alex Weekes (University of Saskatchewan)

Conference Speakers:

Huanchen Bao (National University of Singapore, Singapore)

Gaston Burrull (Peking University, China)

Ben Elias (University of Oregon, USA)

Jiepeng Fang (Peking University, China)

Mengmeng Gao (Tongji University, China)

Euiyong Park (University of Seoul, Korea)

Hankyung Ko (Uppsala University, Sweden)

Pengcheng Li (Tsinghua University, China)

Ming Lu (Sichuan University, China)

Sian Nie (Chinese Academy of Sciences, China)

Hebing Rui (Tongji University, China)

Alistair Savage (University of Ottawa, Canada)

Lei Shi (Beijing Institute of Technology, China)

Linliang Song (Tongji University, China)

Changjian Su (Tsinghua University, China)

Daniel Tubbenhauer (University of Sydney, Australia)

Michela Varagnolo (Université de Cergy-Pontoise, France)

Eric Vasserot (Université Paris Cité)

Bart Vlaar (Beijing Institute of Mathematical Sciences and Applications, China)

Weiqiang Wang (University of Virginia)

Alex Weekes (University of Saskatchewan, Canada)

Harold Williams (University of South California, USA)

Weinan Zhang (Hongkong University, China)

Xiaoting Zhang (Capital Normal University, China)

Conference Guide

1. Registration:

Beijing Northern Spring Conference Center (北方温泉会议中心)

June 16 2024 (14:00–20:00)

June 23 2024 (14:00–20:00)

2. Meals:

Breakfast: 1st floor in Hotel (会议中心一层中餐厅)

Lunch: 3rd floor in East Canteen (东区食堂三层)

Dinner: 1st floor in Hotel (会议中心一层中餐厅)

3. Schedule of Shuttle Bus: (Adjustment may be made)

- **From Hotel to Campus:**

  June 17–22: Morning 8:25, 8:45; Afternoon 13:25, 13:45

  June 24: Morning 7:40, 8:00; Afternoon 13:25, 13:45

  June 25–28: Morning 7:55, 8:15; Afternoon 13:25, 13:45

- **From Campus to Hotel:**

  June 17–22: Noon 12:10, 12:30; Afternoon 16:10–17:30 (every 20 minutes)

  June 24–26, 28: Noon 12:40, 13:00; Afternoon 16:30–17:30 (every 20 minutes)

  June 27: Noon 12:40, 13:00; Afternoon 17:30–18:30 (every 20 minutes)

4. Contact:

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School of Mathematics and Statistics, BIT

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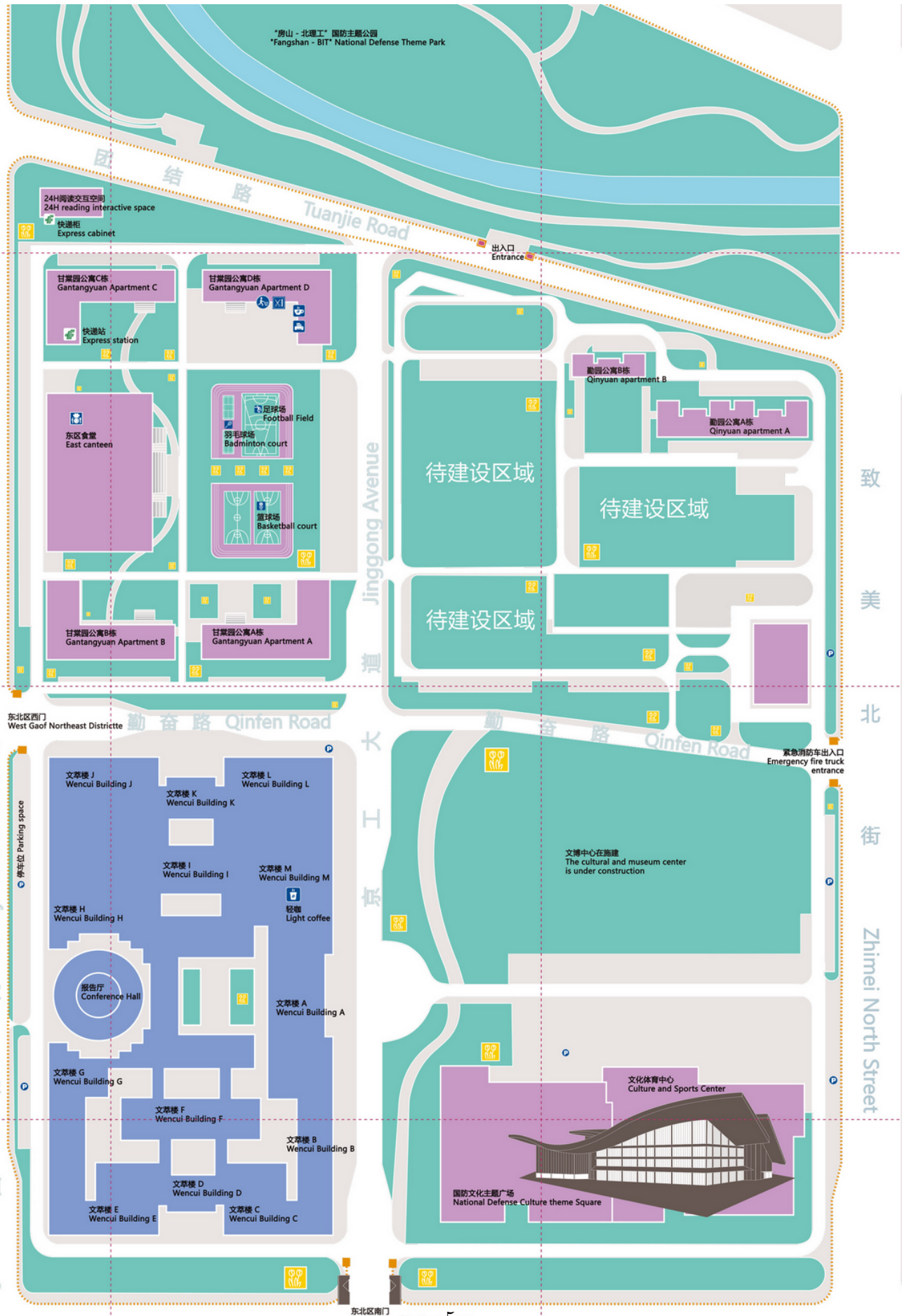
From hotel to lecture room

Route 1

Route 2

Map around the lecture room

"房山 - 北理工" 国防主题公园
"Fangshan - BIT" National Defense Theme Park

团结路
Tuanjie Road

24H阅读交互空间
24H reading interactive space

快递柜
Express cabinet

出入口
Entrance

甘棠园公寓C栋
Gantangyuan Apartment C

甘棠园公寓D栋
Gantangyuan Apartment D

勤园公寓B栋
Qinyuan apartment B

快递站
Express station

勤园公寓A栋
Qinyuan apartment A

东区食堂
East canteen

足球场
Football Field

羽毛球场
Badminton court

待建设区域

待建设区域

篮球场
Basketball court

待建设区域

甘棠园公寓B栋
Gantangyuan Apartment B

甘棠园公寓A栋
Gantangyuan Apartment A

Jinggong Avenue

致

美

东北区西门
West Gaof Northeast Districtte

勤奋路 Qinfen Road

勤奋路
Qinfen Road

紧急消防车出入口
Emergency fire truck
entrance

北

街

文萃楼 J
Wencui Building J

文萃楼 L
Wencui Building L

停车位 Parking space

文萃楼 K
Wencui Building K

文博中心在施建
The cultural and museum center
is under construction

文萃楼 I
Wencui Building I

文萃楼 M
Wencui Building M

Zhimei North Street

文萃楼 H
Wencui Building H

轻咖
Light coffee

报告厅
Conference Hall

文萃楼 A
Wencui Building A

文萃楼 G
Wencui Building G

文化体育中心
Culture and Sports Center

文萃楼 F
Wencui Building F

文萃楼 B
Wencui Building B

文萃楼 D
Wencui Building D

文萃楼 E
Wencui Building E

文萃楼 C
Wencui Building C

国防文化主题广场
National Defense Culture theme Square

东北区南门

Schedules of Lecture Series and Conference

<table>
<tr><td colspan="7" align="center">Lecture Series</td></tr>
<tr>
<th>Time \ Date</th>
<th>June 17</th>
<th>June 18</th>
<th>June 19</th>
<th>June 20</th>
<th>June 21</th>
<th>June 22</th>
</tr>
<tr>
<td>9:00-11:00
(1.5 hours lecture
+0.5 hour questions)</td>
<td>Savage</td>
<td>Savage</td>
<td>Weekes</td>
<td>Vasserot</td>
<td>Vasserot</td>
<td>Weekes</td>
</tr>
<tr>
<td>14:00-16:00
(1.5 hours lecture
+0.5 hour questions)</td>
<td>Weekes</td>
<td>Vasserot</td>
<td>Savage</td>
<td>Weekes</td>
<td>Savage</td>
<td>Vasserot</td>
</tr>
<tr><td colspan="7">Lecture Room:
Wencui Building Room M134,
Liangxiang Campus at Beijing Institute of Technology
(北京理工大学良乡校区文萃楼 M134)</td></tr>
<tr><td colspan="7">Schedule of Shuttle bus: (Adjustment may be made)
(1) From Hotel to Campus: 8:25, 8:45; 13:25, 13:45
(2) From Campus to Hotel: 12:10, 12:30; 16:10–17:30 (every 20 minutes)</td></tr>
</table>

Conference Schedule

Location: Wencui Building M134 (文翠楼 M134)

	June 24	June 25	June 26	June 27	June 28
8:20-8:30	Open Ceremony				
8:30-9:20	Hebing Rui	Linliang Song	Huanchen Bao	Alexander Weekes	Daniel Tubbenhauer
9:30-10:20	Pengcheng Li	Alistair Savage	Weinan Zhang	Changjian Su	Euiyong Park
10:20-11:00	Tea Break				
11:00-11:50	Jiepeng Fang	Ben Elias	Ming Lu	Weiqiang Wang	Xiaoting Zhang
12:00-14:00	Lunch				
14:00-14:50	Eric Vasserot	Hankyung Ko		Harold Williams	Bart Vlaar
14:50-15:30	Tea Break	Group Photo & Tea Break		Tea Break	
15:30-16:20	Sian Nie	Michela Varagnolo		Mengmeng Gao	Lei Shi
16:30-17:20				Gaston Burrull	
17:30-19:00	Dinner				

Location: Wencui Building M134 (文萃楼 M134)			
June 24 (Monday)			
Time	**Speaker**	**Title**	**Chair**
8:20-8:30	Open Ceremony		
8:30-9:20	Hebing Rui	Weakly triangular categories	Xueqing Chen
9:30-10:20	Pengcheng Li	Categorical action for finite classical groups and its applications	
10:20-11:00	Tea Break		
11:00-11:50	Jiepeng Fang	Lie algebras arising from two-periodic projective complex and derived categories	Xueqing Chen
12:00-14:00	Lunch		
14:00-14:50	Eric Vasserot	Cohomological Hall algebras of quivers and Yangians	Alistair Savage
14:50-15:30	Tea Break		
15:30-16:20	Sian Nie	On higher Deligne-Lusztig characters	Alistair Savage
17:30-19:00	Dinner		

Location: Wencui Building M134 (文萃楼 M134)			
June 25 (Tuesday)			
Time	**Speaker**	**Title**	**Chair**
8:30-9:20	Linliang Song	Affine web and Schur categories	Weiqiang Wang
9:30-10:20	Alistair Savage	The spin Brauer category	
10:20-11:00	Tea Break		
11:00-11:50	Ben Elias	The philosophy of light leaves	Weiqiang Wang
12:00-14:00	Lunch		
14:00-14:50	Hankyung Ko	Singular light leaves	Hebing Rui
14:50-15:30	Group Photo & Tea Break		
15:30-16:20	Michela Varagnolo	Non symmetric quantum loop groups and critical convolution algebras	Hebing Rui
17:30-19:00	Dinner		

Location: Wencui Building M134 (文萃楼 M134)			
June 26 (Wednesday)			
Time	**Speaker**	**Title**	**Chair**
8:30-9:20	Huanchen Bao	Acyclic matchings on Bruhat intervals and totally nonnegative Springer fibres	Michela Varagnolo
9:30-10:20	Weinan Zhang	Relative braid group symmetries on i-quantum groups	
10:20-11:00	Tea Break		
11:00-11:50	Ming Lu	Braid group symmetries and PBW bases of i-quantum groups	Michela Varagnolo
12:00-14:00	Lunch		
14:00-	Free Time		
17:30-19:00	Dinner		

Location: Wencui Building M134 (文萃楼 M134)			
June 27 (Thursday)			
Time	**Speaker**	**Title**	**Chair**
8:30-9:20	Alexander Weekes	Embeddings of affine Grassmannian slices via Coulomb branches	Eric Vasserot
9:30-10:20	Changjian Su	Calogero-Moser systems and quantum cohomology of the Springer resolution	
10:20-11:00	Tea Break		
11:00-11:50	Weiqiang Wang	A Drinfeld presentation of twisted Yangians via degeneration	Eric Vasserot
12:00-14:00	Lunch		
14:00-14:50	Harold Williams	Differential operators on the base affine space and quantized Coulomb branches	Xun Xie
14:50-15:30	Tea Break		
15:30-16:20	Mengmeng Gao	Representations of cyclotomic oriented Brauer categories	Xun Xie
16:30-17:20	Gaston Burrull	On the length-counting sequences of Bruhat intervals	
17:30-19:00	Dinner		

Location: Wencui Building M134 (文萃楼 M134)			
June 28 (Friday)			
Time	**Speaker**	**Title**	**Chair**
8:30-9:20	Daniel Tubbenhauer	Fractal behavior in monoidal categories	Huanchen Bao
9:30-10:20	Euiyong Park	PBW theory for Bosonic extensions of quantum groups	
10:20-11:00	Tea Break		
11:00-11:50	Xiaoting Zhang	Simple transitive 2-representations of Soergel bimodules for finite Coxeter types	Huanchen Bao
12:00-14:00	Lunch		
14:00-14:50	Bart Vlaar	Reflections on quantum integrability - the cylindrical structures at the origin of trigonometric K-matrices	Ming Lu
14:50-15:30	Tea Break		
15:30-16:20	Lei Shi	On the cocenter of the cyclotomic quiver Hecke algebras	Ming Lu
17:30-19:00	Dinner		

• Abstracts of Lecture Series

HEISENBERG AND KAC-MOODY CATEGORIFICATION

Alistair Savage (University of Ottawa)

Abstract: Heisenberg categories and Kac-Moody 2-categories have proven to be powerful tools in representation theory. We will introduce these diagrammatic categories, including a useful generating function approach to their study. We will then relate these categories to each other, showing how an action of one leads to an action of the other.

QUIVER VARIETIES, AFFINE QUANTUM GROUPS AND COHOMOLOGICAL HALL ALGEBRAS

Eric Vasserot (Université Paris Cité)

Abstract: First, we will review Nakajima's geometric construction of symmetric quantum loop group representations via K-theory and cohomology of quiver varieties. Then, we will explain the relation with cohomological algebras, providing several constructions of the latter. Finally, we will explain a construction of non-symmetric quantum loop group representations via critical K-theory, which generalizes Nakajima's construction.

AFFINE GRASSMANNIANS SLICES AND COULOMB BRANCHES

Alex Weekes (University of Saskatchewan)

Abstract: Affine Grassmannians play an important role in geometric representation theory, in particular through the celebrated Geometric Satake Correspondence. A more recently introduced topic of study are Coulomb branches, which arise in theoretical physics, and were defined mathematically in groundbreaking work of Braverman, Finkelberg and Nakajima. Their work also established an important link between these two topics: affine Grassmannian slices arise as Coulomb branches for quiver gauge theories. Crucially, this provides a candidate for defining affine Grassmannian slices in Kac-Moody types: as Coulomb branches. In these lectures we will overview the objects mentioned above, and discuss their ties to represention theory.

• Abstracts of Conference

ACYCLIC MATCHINGS ON BRUHAT INTERVALS AND TOTALLY NONNEGATIVE SPRINGER FIBRES

Huanchen Bao (National University of Singapore, Singapore)

Abstract: Discrete Morse theory, developed by Forman, is an efficient tool to determine the homotopy type of a regular CW complex. The theory has been reformulated by Chari in purely combinatorial terms of acyclic matchings on the face poset. In this talk, I will discuss explicit constructions of such acyclic matchings on Bruhat intervals using reflection orders. As an application, we show the totally nonnegative Springer fibres are contractible, verifying a conjecture of Lusztig. This is based on joint work with Xuhua He.

ON THE LENGTH-COUNTING SEQUENCES OF BRUHAT INTERVALS

Gaston Burrull (Peking University, China)

Abstract: The Bruhat order of a Coxeter group is a very important partial order that is extremely complex and little understood. It is graded by a natural length function. Although the poset type of an interval [x,y] is far from being comprehended, we can say a few things about its length counting sequence—which is a finite sequence of positive numbers like (1, 5, 11, 15, 14, 9, 4, 1). In this talk, I summarize available results and conjectures on these sequences and explain some of my current research on their asymptotic behavior in the "dominant lower" case—joint work with Tao Gui and Hongsheng Hu.

THE PHILOSOPHY OF LIGHT LEAVES

Ben Elias (University of Oregon, USA)

Abstract: Singular Soergel bimodules form a 2-category which is fairly ubiquitous in geometric and categorical representation theory. Recently, in joint with with Hankyung Ko, Leonardo Patimo, and Nicolas Libedinsky, we have constructed a "combinatorial" basis for morphisms between singular Bott-Samelson bimodules, a class of singular Soergel bimodules which contains all other singular Soergel bimodules as direct summands. Our basis is called the double leaves basis, built by gluing together two light leaves morphisms. Hankyung Ko will give more details on this construction in part II of this two-talk series. This basis was modeled

on other bases now in the literature, such as the crossingless matching basis for the Temperley-Lieb category, the double ladders basis for webs in type A, or the double leaves basis for ordinary Soergel bimodules (originally due to Libedinsky, who coined the name "light leaves"). This construction is actually a fairly general and broadly applicable one, applying to monoidal categories which are generically semisimple and satisfy some unitriangularity property. Here in part I of the talk we discuss the general philosophy of light leaves and double leaves bases. Of particular note is the concept of branching patterns, which enables one to construct an infinite number of projection and inclusion maps with a finite amount of work.

LIE ALGEBRAS ARISING FROM TWO-PERIODIC PROJECTIVE COMPLEX AND DERIVED CATEGORIES

Jiepeng Fang (Peking University,China)

Abstract: Let A be a finite-dimensional $\mathbb{C}$-algebra of finite global dimension and $\mathcal{A}$ be the category of finitely generated right A-modules. By using of the category of two-periodic projective complexes $\mathcal{C}_2(\mathcal{P})$, we construct the motivic Bridgeland's Hall algebra for $\mathcal{A}$ whose structure constants are given by the virtual Poincaré polynomials in t, then construct a $\mathbb{C}$-Lie subalgebra $\mathfrak{g}$ at $t = -1$. For the stable category $\mathcal{K}_2(\mathcal{P})$ of $\mathcal{C}_2(\mathcal{P})$, we construct its moduli spaces and a $\mathbb{C}$-Lie algebra $\tilde{\mathfrak{g}}$, which generalizes Peng-Xiao's construction over finite fields. We prove that $\mathfrak{g} \cong \tilde{\mathfrak{g}}$ intrinsically. This is a joint work with Yixin Lan and Jie Xiao.

REPRESENTATIONS OF CYCLOTOMIC ORIENTED BRAUER CATEGORIES

Mengmeng Gao (Tongji University, China)

Abstract: Cyclotomic oriented Brauer categories are categories version of Cyclotomic walled Brauer algebras. Let A be the locally unital algebra associated to cyclotomic oriented Brauer categories. The category A-lfdmod of locally finite dimensional left A-modules is an upper finite fully stratified category in the sense of Brundan-Stroppel. Furthermore, certain endofunctors are defined and give categorical actions of Lie algebra g on the subcategory of A-lfdmod consisting of all objects which have a finite standard filtration. This leads to the tensor product categorifications (in the general sense of Losev and Webster) for an integrable lowest weight with an integrable highest weight representation of the same level for the Lie algebra g. This talk is based on joint works with Hebing Rui, Linliang Song.

SINGULAR LIGHT LEAVES

Hankyung Ko (Uppsala University, Sweden)

Abstract: This is part II of the two-talk series on light leaves; see Ben Elias' part I abstract. Here we apply the light leaf philosophy to the singular Soergel bimodules. In particular, we discuss diagrammatics for the singular Bott-Samelson bimodules and present relevant combinatorics of parabolic double cosets, such as braid relations between double coset reduced expressions. Using these we can describe the branching patterns, called the (singular) elementary light leaves, as well as explaining the branching procedure via explicit examples.

CATEGORICAL ACTION FOR FINITE CLASSICAL GROUPS AND ITS APPLICATIONS

Pengcheng Li (Tsinghua University, China)

Abstract: In this talk, we construct a double quantum Heisenberg action on the representation category of finite classical groups. We get a categorical action of a Kac-Moody algebra $\mathfrak{sl}_{I_+} \oplus \mathfrak{sl}_{I_-}$ on the representation category of finite classical groups over a field of characteristic zero or characteristic ℓ with $\ell \nmid q(q-1)$. Using the theta correspondence, the Kac-Moody action on the Grothendieck group of the whole category can be determined explicitly. We show that the colored weight functions $\mathbb{O}^+(u)(\bullet)$, $\mathbb{O}^-(v)(\bullet)$ and uniform projection can distinguish all the irreducible characters of finite classical groups. We also consider its applications to the positive characteristic. This is a joint work with Peng Shan and Jiping Zhang.

BRAID GROUP SYMMETRIES AND PBW BASES OF I-QUANTUM GROUPS

Ming Lu (Sichuan University, China)

Abstract: A quantum symmetric pair consists of a quantum group and its coideal subalgebra (called an i-quantum group). Quantum groups can be viewed as an example of i-quantum groups associated to symmetric pairs of diagonal type. Similar to real Lie algebras/groups, i-quantum groups are classified by Satake diagrams (bicolored diagrams with involutions), and have more cases than quantum groups, even for finite type. In this talk, we shall introduce braid group symmetries and then construct PBW type bases for i-quantum groups of finite type. We show that our PBW type basis gives rise to an integral basis for the modified i-quantum group by using i-divided powers. The leading terms of our bases can be identified with the usual

PBW bases in the theory of quantum groups. This is joint work with Ruiqi Yang and Weinan Zhang.

ON HIGHER DELIGNE-LUSZTIG CHARACTERS

Sian Nie (Chinese Academy of Sciences, China)

Abstract: It is well-known that Deligne-Lusztig characters play an essential role in the classification of irreducible representations of finite groups of Lie type. As a comparison, the higher Deligne-Lusztig characters, which are cohomological inductions for higher/parahoric Deligne-Lusztig varieties, are closely related to supercuspidal representations of p-adic groups. In this talk, I will discuss recent progresses, including a decomposition theorem, on higher Deligne-Lusztig characters.

PBW THEORY FOR BOSONIC EXTENSIONS OF QUANTUM GROUPS

Euiyong Park (University of Seoul, Korea)

Abstract: In this talk, we will talk about the PBW theory for the bosonic extension $\widehat{A}_{\mathfrak{g}}$ of a quantum group $U_q(\mathfrak{g})$. When $U_q(\mathfrak{g})$ is of finite simply-laced type, the algebra $\widehat{A}_{\mathfrak{g}}$ is isomorphic to the quantum Grothendieck ring of the Hernandez-Leclerc category over a quantum affine algebra. We introduce PBW vectors and PBW monomials using the braid group actions on $\widehat{A}_{\mathfrak{g}}$, and define a new family of subalgebras, denoted by $\widehat{A}_{\mathfrak{g}}(b)$, for any element b in the (generalized) Braid group corresponding to $\mathfrak{g}$. The algebras $\widehat{A}_{\mathfrak{g}}(b)$ can be understood as a natural extension of quantum unipotent coordinate rings $A_q(\mathfrak{n}(w))$, and the PBW monomials form an orthogonal basis of $\widehat{A}_{\mathfrak{g}}(b)$. This is a joint work with Se-jin Oh (arXiv:2401.04878).

WEAKLY TRIANGULAR CATEGORIES

Hebing Rui (Tongji University, China)

Abstract: We introduce the notion of an upper finite weakly triangular decomposition for a locally unital and locally finite dimensional algebra A over an algebraically closed field. We prove that the category A-lfdmod of locally finite dimensional left A-modules is an upper finite fully stratified category in the sense of Brundan-Stroppel. As an application, we prove that the locally unital algebra associated to the cyclotomic Kauffman category A admits an upper finite weakly triangular decomposition. This enables us to use the full subcategory of A-lfdmod in which each object admits a finite standard flag to categorify certain infinite dimensional

g-module where g is the classical limit of type AIII i-quantum group. This is a joint work with M. Gao and L. Song.

THE SPIN BRAUER CATEGORY

Alistair Savage (University of Ottawa, Canada)

Abstract: The Brauer category is a diagrammatic monoidal category describing the representation theory of the orthogonal and symplectic groups. Its endomorphism algebras are Brauer algebras, which replace the group algebra of the symmetric group in the orthogonal and symplectic analogues of Schur-Weyl duality. However, the Brauer category is missing one important piece of the picture—the spin representation. We will introduce a larger category, the spin Brauer category, that remedies this deficiency. This is joint work with Peter McNamara.

ON THE COCENTER OF THE CYCLOTOMIC QUIVER HECKE ALGEBRAS

Lei Shi (Beijing Institute of Technology, China)

Abstract: This talk is based on joint work with Jun Hu. We give some explicit homogeneous elements which span the cocenter of cyclotomic quiver Hecke algebra R_β^Λ over arbitrary field. As applications, we give a necessary and sufficient condition under which the corresponding cyclotomic KLR algebra (of arbitrary type) is nonzero and give a basis of degree zero part of the cocenter.

AFFINE WEB AND SCHUR CATEGORIES

Linliang Song (Tongji University, China)

Abstract: Building on the polynomial web category, we introduce the affine web category, a diagrammatic monoidal category, along with its cyclotomic quotients. We establish connections with finite W-algebras in type A. Utilizing the affine web category as a foundational element, we further develop the affine Schur category. The cyclotomic Schur categories provide the first diagrammatic presentation of the (degenerate) Dipper-James-Mathas cyclotomic Schur algebras. Basis theorems for all these categories will be presented. This is joint work with Weiqiang Wang.

CALOGERO-MOSER SYSTEMS AND QUANTUM COHOMOLOGY OF THE SPRINGER RESOLUTION

Changjian Su (Tsinghua University, China)

Abstract: We give a ring presentation for the quantum cohomology ring of the Springer resolution. Combined with the previous work of Braverman, Maulik, and Okounkov, we get an explicit formula for the classical trigonometric Calogero–Moser system. This is a joint work with Changzheng Li and Rui Xiong.

FRACTAL BEHAVIOR IN MONOIDAL CATEGORIES

Daniel Tubbenhauer (University of Sydney, Australia)

Abstract: This talk is an introduction to analytic methods in tensor categories with the focus on counting the number of summands in tensor products of representations and related structures.

NON SYMMETRIC QUANTUM LOOP GROUPS AND CRITICAL CONVOLUTION ALGEBRAS

Michela Varagnolo (Université de Cergy-Pontoise, France)

Abstract: I will explain how to realize quantum loop groups and shifted quantum loop groups of arbitrary type, possibly non symmetric, using critical convolution algebras. This generalizes Nakajima's famous construction of symmetric quantum loop groups via quiver varieties. It also provides the first geometrical description of certain families of simple modules such as Kirillov-Reshetikhin or the prefundamental modules (for negative shifted quantum loop groups).

COHOMOLOGICAL HALL ALGEBRAS OF QUIVERS AND YANGIANS

Eric Vasserot (Université de Cergy-Pontoise, France)

Abstract: We construct an isomorphism between the preprojective cohomological Hall algebra of an arbitrary quiver and a positive half of the corresponding Maulik-Okounkov Yangian, which intertwines the respective actions on the cohomology of the Nakajima quiver varieties.

We use this to prove a conjecture of Okounkov relating the character of the Maulik-Okounkov Lie algebra to Kac polynomials.

REFLECTIONS ON QUANTUM INTEGRABILITY–THE CYLINDRICAL STRUCTURES AT THE ORIGIN OF TRIGONOMETRIC K-MATRICES

Bart Vlaar (Beijing Institute of Mathematical Sciences and Applications, China)

Abstract: The original motivation for quantum groups was the search for a framework of solutions (R-matrices) of the parameter-dependent Yang-Baxter equation appearing in quantum integrability. Whereas quantum groups of finite type play this role for the constant Yang-Baxter equation, affine quantum groups can be used to generate so-called trigonometric R-matrices in finite-dimensional modules of the corresponding quantum loop algebra. Similar questions can be asked about the parameter-dependent reflection equation, whose solutions (K-matrices) describe compatible boundary conditions for quantum integrable systems. In recent joint works with A. Appel we introduce the notion of a cylindrical structure on a quasitriangular bialgebra, yielding a universal solution of a generalized reflection equation. Extending and developing constructions by Bao-Wang and Balagović-Kolb, we show that such a structure arises for any affine quantum symmetric pair. In this case, the framework leads to a compelling parallelism with the R-matrix story: for any finite-dimensional module V of the corresponding quantum loop algebra, an End(V)-valued formal Laurent series solution is induced, which, if V is irreducible, simplifies to a rational function (trigonometric K-matrix).

A DRINFELD PRESENTATION OF TWISTED YANGIANS VIA DEGENERATION

Weiqiang Wang (University of Virginia)

Abstract: It has been a long-standing open problem to find Drinfeld type current presentations for twisted Yangians. We obtain such presentations for twisted Yangians (of split type) via degeneration of Drinfeld presentations of affine i-quantum groups (associated with split Satake diagrams). For type AI, it matches with the Drinfeld presentation of twisted Yangian obtained via Gauss decomposition in our recent work. This is joint work with Kang Lu (Virginia) and Weinan Zhang (Hong Kong).

EMBEDDINGS OF AFFINE GRASSMANNIAN SLICES VIA COULOMB BRANCHES

Alexander Weekes (University of Saskatchewan, Canada)

Abstract: Braverman, Finkelberg and Nakajima (BFN) proved that affine Grassmannian slices of finite ADE type admit a fascinating alternative description: they arise as Coulomb

branches of quiver gauge theories for finite ADE quivers. Remarkably, this construction works for arbitary quivers, in particular providing a candidate definition for affine Grassmannian slices for affine Kac-Moody types. BFN propose that a version of the Geometric Satake Equivalence should hold in this context, which has been proven by Nakajima in affine type A. In this talk we will discuss another piece of evidence that this Coulomb branch definition is reasonable: the resulting varieties embed into one another in a natural way, extending a basic property from the finite ADE case. This is based on joint work with Dinakar Muthiah.

DIFFERENTIAL OPERATORS ON THE BASE AFFINE SPACE AND QUANTIZED COULOMB BRANCHES

Harold Williams (University of Saskatchewan, Canada)

Abstract: We discuss joint work with Tom Gannon, showing that the algebra $D(SL_n/U)$ of differential operators on the base affine space of SL_n is the quantized Coulomb branch of a certain 3d $\mathcal{N} = 4$ quiver gauge theory. In the semiclassical limit this confirms a conjecture of Dancer-Hanany-Kirwan on the universal hyperkähler implosion of SL_n. In fact, we prove a generalization interpreting an arbitrary unipotent reduction of T^*SL_n as a Coulomb branch. These results also provide a new interpretation of the Gelfand-Graev Weyl group symmetry of $D(SL_n/U)$.

RELATIVE BRAID GROUP SYMMETRIES ON I-QUANTUM GROUPS

Weinan Zhang (Hongkong University, China)

Abstract: Introduced by Lusztig in the 1990s, the braid group symmetries have played an essential role in the theory of quantum groups. The i-quantum groups are coideal subalgebras of quantum groups arising from quantum symmetric pairs, which can be viewed as generalizations of quantum groups. The Weyl group for Lie algebras has a natural generalization known as the relative Weyl group in the theory of symmetric pairs. In this talk, I will talk about our construction of relative braid group symmetries (associated to the underlying relative Weyl group) on i-quantum groups and their modules. These new symmetries exhibit many properties and applications similar to Lusztig's braid group symmetries. This is joint work with Weiqiang Wang.

SIMPLE TRANSITIVE 2-REPRESENTATIONS OF SOERGEL BIMODULES FOR FINITE COXETER TYPES

Xiaoting Zhang (Capital Normal University, China)

Abstract: Simple transitive 2-representations were introduced by Mazorchuk and Miemietz in the representation theory of finitary 2-categories. They proved that for every finitary 2-representation there exists a Jordan-Hölder filtration with simple transitive 2-representations as subquotients. In this talk, I will focus on the classification problem of those 2-representations for the 2-category of Soergel bimodules of finite Coxeter types, where the latter gives a categorification of the corresponding Hecke algebras. This is based on a joint work with Marco Mackaay, Volodymyr Mazorchuk, Vanessa Miemietz and Daniel Tubbenhauer.

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