

Geometric and categorical representation theory

Report of Contributions

Contribution ID: 1

Type: **not specified**

Arkhipov-Bezrukavnikov for p-adic groups

Thursday, October 26, 2023 4:00 PM (1h 20m)

We are going to explain joint work with Johannes Anschütz, Zhiyou Wu, and Jize Yu concerning the Arkhipov–Bezrukavnikov equivalence in mixed characteristic. Kazhdan–Lusztig constructed an isomorphism between the Grothendieck group of equivariant coherent sheaves on the dual Springer variety, and that of equivariant perverse sheaves on the Iwahori flag variety in the function field case. Arkhipov–Bezrukavnikov later lifted this to an isomorphism of the corresponding bounded derived categories, building on Gaitsgory’s construction of central sheaves via nearby cycles. Recently, it became possible to carry out the same program for p-adic groups, due to the construction of Witt flag varieties due to Zhu and Bhatt–Scholze, and of the $B_{\text{dR}}^{\text{+}}$ -affine Grassmannian due to Scholze–Weinstein. Relying on previous work with Anschütz, Gleason, and Richarz on p-adic local models, we are able to define a p-adic avatar of Gaitsgory’s central functor and also of the Arkhipov-Bezrukavnikov functor. Some of our proofs are new out of necessity due to the constraints of our setup and we will try to highlight the differences. We will also discuss some perfectoid geometry along the way.

Presenter: LOURENÇO, João

Contribution ID: 2

Type: **not specified**

Braid group action on the cohomology of Deligne-Lusztig varieties

Monday, October 23, 2023 4:00 PM (1h 20m)

If B is the braid group associated with the Weyl group W of a split reductive group G over F_q , and if b is in B , we construct a categorical action of the centralizer $C_B(b)$ on the cohomology of the Deligne-Lusztig variety $X(b)$ associated with b . If $b=1$, we retrieve the classical algebraic action of the Hecke algebra on the permutation representation of the finite flag variety. As another particular case, we retrieve a geometric action defined by Broué-Michel in 1996.

In this talk, we explain the construction of this action, some of its properties (action of the Frobenius, compatibility with Deligne-Lusztig parabolic induction, ...) and we investigate natural questions (for instance, does the image of $C_B(b)$ generate the endomorphism algebra?).

Presenter: BONNAFÉ, Cédric

Contribution ID: 3

Type: **not specified**

The anti-spherical Hecke category for Hermitian symmetric pairs

Friday, October 27, 2023 10:20 AM (1h 20m)

In this talk, I will discuss the representation theory of the anti-spherical Hecke categories for Hermitian symmetric pairs (W, P) over a field k of characteristic p . Minimal coset representatives for Hermitian symmetric pairs are fully commutative elements (as defined by Stembridge) and we will see how this property implies a much simplified diagrammatic presentation for the corresponding Hecke categories. I will explain how the representation theory can be reduced to the simply laced cases via explicit graded Morita equivalences.

In the simply laced cases, the light leaves basis elements for the Hecke categories can be described in terms of certain generalisations of oriented Temperley-Lieb algebras. It follows from this description that the graded decomposition numbers, that is the p -Kazhdan-Lusztig polynomials for Hermitian symmetric pairs, are all characteristic free.

This is based on joint works with C. Bowman, N. Farrell, A. Hazi and E. Norton.

Presenter: DE VISSCHER, Maud

Contribution ID: 4

Type: **not specified**

The integral motivic Satake equivalence

Monday, October 23, 2023 5:30 PM (1h 20m)

The geometric Satake equivalence describes the representation theory of the Langlands dual of a split reductive group in terms of sheaves on the affine Grassmannian. Numerous versions of this equivalence are known for different base schemes and cohomology theories, each having their own applications in geometric representation theory. In this talk we discuss a Satake equivalence for integral motivic sheaves which unifies previous versions and refines the rational motivic equivalence of Richarz and Scholbach. This is joint work with Scholbach and van den Hove.

Presenter: CASS, Robert

Contribution ID: 5

Type: **not specified**

Quantum category O vs affine Hecke category

Thursday, October 26, 2023 5:30 PM (1h 20m)

I will establish an equivalence between a block of the quantum category O at an odd root of unity and the heart of the “new” t-structure on a suitably singular affine Hecke category

Presenter: LOSEU, Ivan

Contribution ID: 6

Type: **not specified**

Representations of p-adic groups - 1

Monday, October 23, 2023 11:00 AM (1h 20m)

The mini course will provide an introduction to the representation theory of p-adic groups via type theory. The course will include:

- basic definitions surrounding representations of p-adic groups
- an introduction to Bruhat-Tits theory and Moy-Prasad filtrations
- construction of supercuspidal representations: depth-zero representations, (a glimpse of) Yu's construction
- Bernstein decomposition
- types and non-supercuspidal Bernstein blocks
- equivalences between Bernstein blocks, reduction to depth-zero

Presenter: FINTZEN, Jessica

Contribution ID: 7

Type: **not specified**

A Fourier transform for unipotent representations of p -adic groups

Wednesday, October 25, 2023 4:00 PM (1h 20m)

In the representation theory of finite reductive groups, an essential role is played by Lusztig's non-abelian Fourier transform, an involution on the space of unipotent characters of the group. For reductive p -adic groups, the unipotent local Langlands correspondence gives a natural parametrization of irreducible smooth representations with unipotent cuspidal support. However, many questions about the characters of these representations are still open. In joint work with Anne-Marie Aubert and Dan Ciubotaru, we propose a potential lift of Lusztig's Fourier transform to the setting of split p -adic groups and their pure inner twists. Our work generalizes a construction of Mœglin–Waldspurger for orthogonal groups. In my talk, I will introduce some of these ideas via examples.

Presenter: ROMANO, Beth

Contribution ID: 8

Type: **not specified**

The loop space and representations - 1

Monday, October 23, 2023 9:00 AM (1h 20m)

I will talk about (relatively) recent ways to apply the affine Grassmannian as an algebro-geometric or topological object to representation theory of the reductive group in positive characteristic or quantum group at a root of unity.

Based on works (mostly in progress) with Boixeda Alvarez, McBreen, Yun, Shan, Vasserot and Arinkin.

Presenter: BEZRUKAVNIKOV, Roman

Contribution ID: 9

Type: **not specified**

Representations of p-adic groups - 2

Wednesday, October 25, 2023 9:00 AM (1h 20m)

The mini course will provide an introduction to the representation theory of p-adic groups via type theory. The course will include:

- basic definitions surrounding representations of p-adic groups
- an introduction to Bruhat-Tits theory and Moy-Prasad filtrations
- construction of supercuspidal representations: depth-zero representations, (a glimpse of) Yu's construction
- Bernstein decomposition
- types and non-supercuspidal Bernstein blocks
- equivalences between Bernstein blocks, reduction to depth-zero

Presenter: FINTZEN, Jessica

Contribution ID: 10

Type: **not specified**

Representations of p-adic groups - 3

Thursday, October 26, 2023 11:00 AM (1h 20m)

The mini course will provide an introduction to the representation theory of p-adic groups via type theory. The course will include:

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- an introduction to Bruhat-Tits theory and Moy-Prasad filtrations
- construction of supercuspidal representations: depth-zero representations, (a glimpse of) Yu's construction
- Bernstein decomposition
- types and non-supercuspidal Bernstein blocks
- equivalences between Bernstein blocks, reduction to depth-zero

Presenter: FINTZEN, Jessica

Contribution ID: 11

Type: **not specified**

The loop space and representations - 2

Tuesday, October 24, 2023 11:00 AM (1h 20m)

I will talk about (relatively) recent ways to apply the affine Grassmannian as an algebro-geometric or topological object to representation theory of the reductive group in positive characteristic or quantum group at a root of unity.

Based on works (mostly in progress) with Boixeda Alvarez, McBreen, Yun, Shan, Vasserot and Arinkin.

Presenter: BEZRUKAVNIKOV, Roman

Contribution ID: 12

Type: **not specified**

The loop space and representations - 3

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Based on works (mostly in progress) with Boixeda Alvarez, McBreen, Yun, Shan, Vasserot and Arinkin.

Presenter: BEZRUKAVNIKOV, Roman

Contribution ID: 13

Type: **not specified**

Dg trace and center of Hecke categories - 1

Tuesday, October 24, 2023 9:00 AM (1h 20m)

In this minicourse we will consider the categorification of some quintessential constructions in linear algebra and representation theory, particularly the notion of (co)center of an algebra, and applications to Hecke categories.

Talk 1 will introduce a dg version of the usual Drinfeld center and “horizontal trace” of a monoidal category.

Talk 2 will discuss dg analogues of highest weight structures, and their application to the dg traces of Hecke categories.

Talk 3 will introduce the Curved (or γ -ified) Hecke category, its dg trace, and the connection to the Hilbert scheme of points in \mathbb{C}^2 .

These talk are based on joint work (some of it still in progress) with Elias, Gorsky, Makisumi, and Mellit.

Presenter: HOGANCAMP, Matt

Contribution ID: 14

Type: **not specified**

Dg trace and center of Hecke categories - 2

Wednesday, October 25, 2023 11:00 AM (1h 20m)

In this minicourse we will consider the categorification of some quintessential constructions in linear algebra and representation theory, particularly the notion of (co)center of an algebra, and applications to Hecke categories.

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These talk are based on joint work (some of it still in progress) with Elias, Gorsky, Makisumi, and Mellit.

Presenter: HOGANCAMP, Matt

Contribution ID: 15

Type: **not specified**

Dg trace and center of Hecke categories - 3

Friday, October 27, 2023 8:50 AM (1h 20m)

In this minicourse we will consider the categorification of some quintessential constructions in linear algebra and representation theory, particularly the notion of (co)center of an algebra, and applications to Hecke categories.

Talk 1 will introduce a dg version of the usual Drinfeld center and “horizontal trace” of a monoidal category.

Talk 2 will discuss dg analogues of highest weight structures, and their application to the dg traces of Hecke categories.

Talk 3 will introduce the Curved (or γ -ified) Hecke category, its dg trace, and the connection to the Hilbert scheme of points in \mathbb{C}^2 .

These talk are based on joint work (some of it still in progress) with Elias, Gorsky, Makisumi, and Mellit.

Presenter: HOGANCAMP, Matt

Contribution ID: 16

Type: **not specified**

Some finiteness properties of Hecke rings of p -adic groups

Wednesday, October 25, 2023 5:30 PM (1h 20m)

If K is a compact open subgroup of a p -adic group G , the fact that any double K -coset in G is the union of finitely many left K -cosets allows one to define the Hecke ring $Z[K\backslash G/K]$ of the pair (G, K) . When K is a hyperspecial subgroup, the \mathbb{C} -algebra $\mathbb{C}[K\backslash G/K]$ is a f.g. commutative algebra that was described by Satake, and this was the starting point of the Langlands program for automorphic representations. The fact that this description can be made over \mathbb{Z} is in turn fundamental for arithmetic applications such as in the Taylor-Wiles method. For general K , $\mathbb{C}[K\backslash G/K]$ is no longer commutative, but a famous theorem of Bernstein says that it is finite as a module over its center, which is a f.g. \mathbb{C} -algebra. It is conjectured that such a statement should hold over \mathbb{Z} . In the talk I will explain why it holds over $\mathbb{Z}[1/p]$, and how it somehow unexpectedly follows from the recent work of Fargues and Scholze on the geometrization of the local Langlands correspondence. This is joint work with Helm, Kurinczuk and Moss.

Presenter: DAT, Jean-François