

Anaparastaseis: Orbits, Hecke algebras, and representations
 5th Nisyros Conference on Automorphic Representations & Related Topics
 Nisyros island, Greece, 13–19 July 2023

Schedule

| | 13/7 | 14/7 | 15/7 | 16/7 |
|-------|--------------|-------------------|-----------------|------------------------|
| 9:30 | | Adams/Mason-Brown | Adler | Informal discussions |
| 10:30 | Coffee break | Coffee break | Coffee break | and optional excursion |
| 11:00 | | Okada | Dawydiak | |
| 12:00 | Lunch | Lunch | Lunch | |
| 14:00 | Losev | Aubert | Ivanov | Lunch |
| 15:00 | Coffee break | Coffee break | Coffee break | Informal discussions |
| 15:15 | Gan | Zhao | Ganapathy | |
| 20:00 | | | Dinner in Páloi | |

| | 17/7 | 18/7 | 19/7 |
|-------|--------------|-----------------|------------------------|
| 9:30 | Schwein | Savin | Informal discussions |
| 10:30 | Coffee break | Coffee break | and optional boat tour |
| 11:00 | Gourevitch | Chan | |
| 12:00 | Lunch | Lunch | |
| 14:00 | Romano | Beuzart-Plessis | |
| 15:00 | Coffee break | Coffee break | |
| 15:15 | Nevins | Kaletha | end of conference |

Titles and abstracts

Jeff Adler

Hecke algebra isomorphisms for tame types.

Abstract: Under reasonable tameness hypotheses, every Bernstein block is equivalent to a block of depth zero. This is joint work in progress with Fintzen, Mishra, and Kazuma Ohara.

Anne-Marie Aubert

A Langlands correspondence for affine Hecke algebras.

Abstract: The enhanced Langlands parameters of a p -adic reductive group G are partitioned into Bernstein series indexed by Galois inertial classes. To each such inertial class \mathfrak{s}^\vee , we will attach an affine Hecke algebra $\mathcal{H}(\mathfrak{s}^\vee)$ (possibly extended by a finite R-group), the simple modules of which are in bijection with the elements of the Bernstein series associated to \mathfrak{s}^\vee .

If \mathfrak{s}^\vee corresponds via the local Langlands correspondence to an inertial class \mathfrak{s} for smooth representations of G , then $\mathcal{H}(\mathfrak{s}^\vee)$ is expected to be almost Morita equivalent with the (extended) affine Hecke algebra $\mathcal{H}(\mathfrak{s})$ associated to \mathfrak{s} .

When G is a symplectic, (special) orthogonal, general (s)pin, unitary group or the exceptional group G_2 , the algebras $\mathcal{H}(\mathfrak{s}^\vee)$ and $\mathcal{H}(\mathfrak{s})$ are actually isomorphic.

Raphaël Beuzart-Plessis

On the formal degree conjecture for classical groups.

Abstract: The formal degree conjecture, due to Hiraga, Ichino and Ikeda, expresses the formal degree of a discrete serie on a real or p -adic reductive group in terms of its (enhanced) Langlands parameter essentially through its adjoint gamma factor. For real groups this can be deduced from the work of Harish-Chandra whereas for p -adic classical groups, this conjecture has been established for odd orthogonal and unitary groups by two completely different methods. In this talk, I plan to explain another approach for even orthogonal and symplectic groups that can actually also be adapted to unitary or odd orthogonal groups. It is based on the theory of twisted endoscopy as well as standard notions in harmonic analysis (orbital integrals and Plancherel formulas) and builds on previous ideas of Shahidi and Hiraga–Ichino–Ikeda.

Kei Yuen Chan

Schur–Weyl duality for some real general linear groups and applications.

Abstract: Based on work of Arakawa-Suzuki and Ciubotaru-Trapa, we construct an exact functor from the Harish-Chandra category of $\mathrm{GL}_n(\mathbb{C})$ to the category of finite-dimensional modules of graded Hecke algebras of type A. This functor preserves parabolically induced modules, standard modules, irreducible modules, unitary modules and Dirac series. It also links up Bernstein-Zelevinsky type derivatives for graded Hecke algebras to tensor problems for $\mathrm{GL}_n(\mathbb{C})$. The functor hence gives a Hecke algebra approach to some problems for $\mathrm{GL}_n(\mathbb{C})$, and in particular, generalizes some instances of the classical tensor product for finite-dimensional representations to some Harish-Chandra modules.

The talk is based on a joint work arXiv:2305.15766 with Daniel Wong.

Stefan Dawydiak

The asymptotic Hecke algebra and rigidity.

Abstract: Lusztig's asymptotic Hecke algebra J is a subalgebra of a certain completion of an affine Hecke algebra H , and serves to implement many independence phenomena with respect to the parameter q . In particular, elements of J can be written as certain infinite linear combinations $\sum_{x \in \tilde{W}} a_{x,w} T_x$ where $\{T_x\}$ is the standard basis of H . Several years ago, Braverman and Kazhdan proposed that J be related to the representation theory of p -adic groups, where it should serve as an algebraic version of the Harish-Chandra Schwartz algebra, and that the coefficients $a_{x,w}$ should enjoy a positivity property. We will share some recent results that hint at what the $a_{x,w}$ may be counting, and offer a new perspective on some surprising features of the structure of J .

Wee Teck Gan

The BZSV duality and hyperspherical generalized Gelfand-Graev models.

Abstract: The recent work of Ben-Zvi, Sakellaridis and Venkatesh gives rise to an extension of the relative Langlands program and suggests a duality theory of branching problems. I will discuss the ongoing work of my student Bryan Wang which works out this duality theory for the generalized Gelfand-Graev models associated to nilpotent orbits of classical groups.

Radhika Ganapathy

On the Bernstein center of Hecke algebras at deeper level.

Abstract: This talk is based on joint work with Reda Boumasmoud. We will discuss results that describe the Bernstein center of the Hecke algebra $\mathcal{H}(G(F), K)$ via the theory of types, where G is a connected, reductive group over a nonarchimedean local field F (that satisfies some additional hypothesis), and K belongs to a nice family of compact open subgroups of $G(F)$. Along the way, we will also describe the center of the Hecke algebra of a type attached to a Bernstein block.

Dmitry Gourevitch

Multiplicities and periods beyond spherical pairs.

Abstract: I would like to report on some recent results that provide qualitative multiplicity bounds in terms of the wave-front set of the representation. One (older) result, j.w. E. Sayag, gives a geometric necessary condition for distinction, while another result, j.w. A. Aizenbud, gives a sufficient condition for a given representation to be included in functions on non-spherical a G -space X with (at most) finite multiplicity. I view this result as a generalization of the notion of spherical space. If time permits, I would also like to describe conjectural automorphic analogues, and in particular propose a version of the Ginzburg–Friedberg dimension formula.

Alexander Ivanov

p -adic Deligne–Lusztig spaces

Abstracts: I will explain how the cohomology of p -adic Deligne–Lusztig spaces realizes some (supercuspidal) representations of p -adic groups. And how various representation- and group-theoretic phenomena are (in some cases) reflected by the geometry of these spaces. Two examples of such phenomena I have in mind are: 1) the fact that supercuspidals are compactly induced. 2) stable vs. rational conjugacy classes of tori (and of corresponding representations).

Tasho Kaletha

Covers of reductive groups and functoriality.

Abstract: When studying problems arising from Langlands’ functoriality principle, one often encounters groups that are extensions of complex reductive groups by Galois groups, but that do not necessarily satisfy all properties to be L -groups of reductive groups. We will show, in the case of a local base field F , that such group can be understood as L -groups of covers of reductive groups. This generalizes to the case of arbitrary local fields work of Adams–Vogan for real groups.

These covers, for a fixed connected reductive group G , can be understood either as arising from a certain “universal” cover of the topological group $G(F)$ by a certain “fundamental” group $\tilde{\pi}_1(G)$, or as special cases of the covers constructed by Yifei Zhao.

We will present two concrete applications of this, one that gives a characterization of the local Langlands correspondence for supercuspidal L -parameters when p is sufficiently large, and one to the construction of transfer factors in the theory of endoscopy.

Ivan Losev

Quantizations and Harish-Chandra modules.

Abstract: I will discuss an approach to classification of certain irreducible Harish-Chandra modules (that should be related to unitary representations) as quantizations of singular lagrangian subvarieties in singular symplectic varieties. The approach allows to classify these Harish-Chandra modules in terms of some basic geometric data assuming, roughly speaking, that the lagrangian subvariety in question is not too singular. This is based on some of my solo work, 1605.00592, 1810.07625, the joint monograph with Mason-Brown and Matvieievskiy, 2108.03453, and my work in preparation with Shilin Yu.

Lucas Mason-Brown

Arthur packets and generalized endoscopy for real reductive groups.

Abstract: Let G and H be real reductive groups. To any L -homomorphism $e : H^L \rightarrow G^L$ one can associate a map e_* from virtual representations of H to virtual representations of G . This map was predicted by Langlands and defined (in the real case) by Adams, Barbasch, and Vogan. Without further restrictions on e , this map can be very poorly behaved. A special case in which e_* exhibits especially nice behavior is the case when H is an endoscopic group. In this talk, I will introduce a more general class of groups which exhibit similar behavior. I will explain how this generalized version of endoscopic lifting can be used to prove the unitarity of many Arthur packets. This is based on joint work with Jeffrey Adams and David Vogan.

Monica Nevins

The p -adic local character expansion as branching rules.

Abstract: The character of an admissible representation π of a p -adic group G can be expressed, in a neighbourhood of the identity, as a linear combination of functions arising from the finitely many nilpotent orbits. In this talk, we propose an interpretation of the local character expansion as branching rules of the restriction of π to a maximal compact open subgroup. Along the way, we explore the asymptotic cone on a semisimple element, which relates to the wavefront set through a result of Kim and Murnaghan. We elaborate with the example of $SL(2)$.

Emile Okada

On some recent progress on wavefront sets in depth-0 and positive depth.

Abstract: This talk will consist of two halves (depth-0/positive depth). In the first half I will report on some recent results joint with D. Ciubotaru and L. Mason-Brown where we obtain precise expressions for the wavefront set of certain

depth-0 representations using Lusztig's construction of the LLC for unipotent representations. In the second half I will present new results joint with D. Ciubotaru where we extend Barbasch and Moy's results on the local character expansion to positive depth. This leads to a new approach to computing the wavefront set for positive depth representations with connections to Vinburg–Levy theory and Borho's theory of G-sheets. As an application of these results we show that the very cuspidal supercuspidal representations considered by DeBacker and Reeder have singleton geometric wavefront sets when the residue characteristic of the field is sufficiently large.

Beth Romano

On the epipelagic zone of the local Langlands correspondence.

Abstract: I'll talk about new work related to a construction of supercuspidal representations of p-adic groups by Reeder–Yu. For a certain special case of their construction, I parametrize the resulting representations and give information about corresponding Langlands parameters, including proving these parameters have trivial image of $SL(2)$, trivial adjoint L-function, and minimal Swan conductor.

Gordan Savin

Exceptional theta correspondences.

Abstract: Survey of minimal representations and exceptional dual pairs, to start. Recent results with Gan that have resolved some key problems in the theory of exceptional theta correspondences: Howe duality conjecture and an exceptional Siegel–Weil formula. Relationship with Langlands correspondences, to finish. (Alternative abstract: How I wasted 30 years of my life.)

David Schwein

Rigid inner forms and the Bernstein decomposition for enhanced L -parameters.

Abstract: Aubert, Moussaoui, and Solleveld have formulated a version of the Bernstein decomposition for enhanced L -parameters. Their results are the first step in a general strategy to reduce local Langlands correspondences to the supercuspidal case. In this talk I'll explain how to modify the theory, which uses Arthur's enhancements of L -parameters, to fit into Kaletha's framework of rigid inner forms. Along the way I'll give a more conceptual description of the generalized Springer correspondence for disconnected groups, one which is surely known to experts but has not appeared in the literature. This is joint work with Peter Dillery.

Yifei Zhao

Langlands parametrization for covering groups.

Abstract: The Langlands program posits that automorphic forms/smooth representations associated to a reductive group are parametrized by spectral data involving its dual group. About ten years ago, M. Weissman, W.-T. Gan, and F. Gao proposed an extension of the Langlands program which incorporated covering groups of reductive groups. In this talk, I will explain an approach to some parts of their program based on étale cohomology.