Speakers

Abstracts

Representations and Characters: Revisiting the Works of Harish-Chandra and André Weil

(4–15 July 2022)

1 Jeff Adler

American University, USA

Finite-group actions on reductive groups and buildings II: the unauthorized sequel

Abstract

Let k be a nonarchimedian local field of residual characteristic p, $\widetilde{G}$ a connected reductive k-group, Γ a finite group of automorphisms of $\widetilde{G}$, and $G := (\widetilde{G}^{\Gamma})^{\circ}$ the connected part of the group of Γ-fixed points of $\widetilde{G}$. If one assumes that $|\Gamma|$ is coprime to p, then Prasad-Yu and Kaletha-Prasad show, roughly speaking, that G is reductive, the building $\mathcal{B}(G)$ of G embeds in the set of Γ-fixed points of $\mathcal{B}(\widetilde{G})$, similarly for spherical buildings, and similarly for reductive quotients of parahoric subgroups.

Motivated by the desire for a more explicit understanding of base change and other liftings, we prove similar statements under a different hypothesis on Γ. Our hypothesis does not imply that of Kaletha-Prasad-Yu, nor vice versa. I will include some comments on how to resolve such a totally unacceptable situation.

(This is joint work with Joshua Lansky and Loren Spice.)

2 Spyridon Afentoulidis-Almpanis

Charles University, Czech Republic

Dirac operators for the standard BGG category $\mathcal{O}$

Abstract

Dirac operators were used in Representation Theory by Parthasarathy in 1972, as invariant first order differential operators acting on sections of homogeneous vector bundles over symmetric spaces G/K, such that their squares give a sort of Laplacian. Parthasarathy used these operators to obtain realizations of an important family of G-representations; the discrete series representations.

In a series of lectures in 1997, Vogan introduced an algebraic analogue of Parthasarthy's Dirac operator, defined the so-called Dirac cohomology of irreducible $(\mathfrak{g}, K)$-modules X using this operator and conjectured a relation between the Dirac cohomology of X and its infinitesimal character, proved by Huang and Pandzic in 2001. Since then, Dirac cohomology has been computed for various families of modules, including highest weight modules, $A_{\mathfrak{q}}(\lambda)$ modules, generalized Enright-Varadarajan modules, unipotent representations, etc.

In this talk, we will present some recent results from an ongoing project concerning Dirac operators for modules belonging to the standard BGG category $\mathcal{O}$ of a complex semisimple Lie algebra $\mathfrak{g}$. This category consists of the finitely generated, locally $\mathfrak{n}$-finite weight modules of $\mathfrak{g}$, and is an important part of the representation theory of $\mathfrak{g}$.

3 Anne-Marie Aubert

IMJ-PRG, France

A non-abelian Fourier transform for tempered unipotent representations of p-adic groups

Abstract

The unipotent category of representations of reductive p-adic groups was defined by Lusztig. It can be thought of as being the smallest subcategory of smooth representations that is closed under the formation of L-packets and such that it contains the Iwahori-spherical representations. The local

Langlands correspondence gives a natural parametrization of unipotent irreducible representations. However, many questions about the characters of these representations are still open.

I will report on a joint work with Dan Ciubotaru and Beth Romano which is motivated by the study of the characters on compact elements. It introduces an involution on the spaces of elliptic tempered unipotent representations of pure inner twists of a split simple p-adic group. This generalizes a construction by Moeglin and Waldspurger for elliptic tempered representations of split odd special orthogonal groups.

We conjecture (and give supporting evidence) that the restriction to reductive quotients of maximal compact open subgroups intertwines our involution with a disconnected version of Lusztig's nonabelian Fourier transform for finite reductive groups. The latter is the change of bases matrix between the basis of irreducible characters and the basis of characteristic functions of character sheaves, and plays an essential role in representation theory of finite reductive groups.

4 Petar Bakic

University of Utah, USA

Theta correspondence and Arthur packets: the Adams conjecture

Abstract

In his 1989 paper, Adams conjectured that the theta correspondence should exhibit functorial behavior with respect to Arthur packets. The conjecture is known to be true in "almost all" cases (a sufficient condition is that the rank of the target group be large enough). However, it is also known to fail in certain small rank examples. Thus, determining the precise extent of this conjecture is an interesting question. In this talk, we discuss some recent advances in this direction. The work presented in this talk is joint with M. Hanzer.

5 Dan Barbasch

Cornell University, USA
The orbit method and normality of closures of nilpotent orbits

Abstract

Work of Kraft-Procesi classifies closures of nilpotent orbits that are normal in the cases of classical complex Lie algebras. Subsequent work of Ranee Brylinsky combines this work with the Theta correspondence as defined by Howe to attach a representation of the corresponding complex group. It provides a quantization of the closure of a nilpotent orbit. In joint work with Daniel Wong we carry out a detailed analysis of these representations viewed as (g,K)-modules of the complex group viewed as a real group. One consequence is a "representation theoretic" proof of the classification of Kraft-Procesi.

6 Cheng Chen

University of Minnesota, USA
On the local Gross-Prasad conjecture

Abstract

The local Gross-Prasad conjecture is a refinement of the multiplicity one theorem for Bessel-typed spherical pairs defined by a pair of quadratic spaces. The local conjecture shows that there is exactly one representation having multiplicity equal to one in each Vogan packet (associated to generic parameters) and it also depicts this representation explicitly with an epsilon character. The local conjecture is a necessary ingredient for the global conjecture and the cases over nonarchimedean local fields were proved by Moeglin and Waldspurger. I will introduce my recent work for the local conjecture over archimedean local fields. Part of the work was joint with Z. Luo.

7 Jonathan Cohen

University of North Texas, USA

Siegel fixed vectors in depth zero supercuspidal representations of GSp(4)

Abstract

One strategy to compute dimension formulas of spaces of Siegel modular cusp forms uses both global information (automorphic representations) and local information (dimensions of spaces of fixed vectors). Neither of these steps is fully understood in general. In this talk we will consider a very special case of the latter topic. More explicitly, for (π, V) a depth zero supercuspidal representation of GSp(4) over a nonarchimedean local field, we will explain the computation of the subspaces $V(n)$ of V that are fixed by the Siegel congruence subgroups

$$\begin{bmatrix} \mathfrak{o} & \mathfrak{o} & \mathfrak{o} & \mathfrak{o} \\ \mathfrak{o} & \mathfrak{o} & \mathfrak{o} & \mathfrak{o} \\ \mathfrak{p}^n & \mathfrak{p}^n & \mathfrak{o} & \mathfrak{o} \\ \mathfrak{p}^n & \mathfrak{p}^n & \mathfrak{o} & \mathfrak{o} \end{bmatrix} \cap \mathrm{GSp}(4)$$

for nonnegative integers n. This is joint work with Ralf Schmidt.

8 Jessica Fintzen

Universität Bonn, Germany

Representations of p-adic groups – with a twist

Abstract

A fundamental problem in the representation theory of p-adic groups is the construction of all (supercuspidal irreducible, smooth, complex or mod-ℓ representations of p-adic groups. I will provide an overview of our understanding of the representations of p-adic groups, with an emphasis on recent progress, including some mod-ℓ results and joint work with Kaletha and Spice that introduces a twist to the story.

9 Jan Frahm

Aarhus University, Denmark

Conformally invariant differential operators on Heisenberg groups and minimal representations

Abstract

For a simple real Lie group with Heisenberg parabolic subgroup, we study the corresponding degenerate principal series representations. For a certain induction parameter the kernel of the conformally invariant system of second order differential operators constructed by Barchini, Kable and Zierau is a subrepresentation which turns out to be the minimal representation. To obtain a convenient model for this subrepresentation, we take the Heisenberg group Fourier transform in the non-compact picture and show that it yields a realization of the minimal representation on a space of L^2-functions. The Lie algebra action is given by differential operators of order ≤ 3 and we find explicit formulas for the lowest K-type.

These L^2-models were previously known for the groups $\mathrm{SO}(n,n)$, $E_{6(6)}$, $E_{7(7)}$ and $E_{8(8)}$ by Kazhdan and Savin, for the group $G_{2(2)}$ by Gelfand, for the group $\widetilde{\mathrm{SL}}(3,\mathbb{R})$ by Torasso, and for $\widetilde{\mathrm{SO}}(4,3)$ by Sabourin. Our new approach provides a uniform and systematic treatment of these cases and also constructs new L^2-models for $E_{6(2)}$, $E_{7(-5)}$ and $E_{8(-24)}$ for which the minimal representation is a continuation of the quaternionic discrete series, and for the groups $\widetilde{\mathrm{SO}}(p,q)$ with either $p \geq q = 3$ or $p, q \geq 4$ and $p+q$ even.

If time permits, we also discuss possible dual pair correspondences in these L^2-models.

10 Wee-Teck Gan

National University of Singapore, Singapore
Howe to transfer Harish-Chandra characters via Weil representations

Abstract

In the first lecture, I will discuss the theta correspondence from the view point of quantization and the relative Langlands program.In the second lecture, I will explain a framework which allows one to address the question: how are the characters of two representations related by theta correspondence related? Finally, in my third lecture, I will explain how this framework can also be used to transfer relative charcaters in the context of the relative Langlands program.

11 Jorge Enrique Cely Garcia

Vietnam Institute for Advanced Study in Mathematics, Vietnam
The fundamental lemma for spherical Hecke algebras and motivic integration

Abstract

The fundamental lemma was formulated by Langlands and it is about some identities of integrals related with the Arthur–Selberg trace formula. In the first part of the talk I will give an introduction (and motivation) to the fundamental lemma. Then I will explain the main ideas in our proof of the Langlands–Shelstad fundamental lemma for the spherical Hecke algebra for unramified p-adic reductive groups in large positive characteristic. The proof is based on the transfer principle for constructible motivic functions. As an important and innovative step, we encode the entire spherical Hecke algebra into a single constructible function. This was a joint work with W. Casselman and T. Hales.

12 Maxim Gurevich

Technion - Israel Institute of Technology, Israel
In between finite and p-adic groups in type A

Abstract

Spectrally, a reductive group over a p-adic field may be thought of as a quantum affine version of its finite Weyl group. I would like to discuss some resulting analogies for the case of general linear groups and groups of permutations, where questions on decomposition of representations are amenable to combinatorial analysis.

For one, harnessing categorical equivalences, the restriction functor from an affine Hecke algebra module to its finite Hecke sub-algebra gives a flexible perspective on the analytic wavefront set invariant of the Harish-Chandra-Howe character.

Second, the class of cyclotomic Hecke algebras is a natural interpolation between the finite and p-adic domains. Passing through that bridge, I will exhibit how the class of RSK representations (developed with Erez Lapid) links the local Langlands classification with the classical Specht construction for symmetric groups.

13 Shamgar Gurevich

University of Wisconsin–Madison, USA
Harmonic analysis on GLn over finite fields

Abstract

The talk should be accessible for advanced undergraduate students, and is based on the paper: https://arxiv.org/abs/2105.12369

There are many formulas that express interesting properties of a finite group G in terms of sums over its characters. For estimating these sums, one of the most salient quantities to understand is the character ratio: Trace(π(g)) / dim(π), for an irreducible representation π of G and an element g of G. For example, Diaconis and Shahshahani stated a formula of the mentioned type for analyzing certain random walks on G.

Recently, we discovered that for classical groups G over finite fields there is a natural invariant of representations that provides strong information on the character ratio. We call this invariant **rank**.

Rank suggests a new organization of representations based on the very few "**small**" ones. This stands in contrast to Harish-Chandra's "philosophy of cusp forms", which is (since the 60s) the main organization principle, and is based on the (huge collection) of "LARGE" representations.

This talk will discuss the notion of rank for the group GLn over finite fields, illustrate how it controls the character ratio on certain elements, and explain how one can apply the results to verify mixing time and rate for related random walks.

This is joint work with **Roger Howe (Yale)**. The numerics for this work was carried with **Steve Goldstein (Madison)** and **John Cannon (Sydney)**.

14 Roger Howe

Texas AM University, USA

The theta correspondence - origins, results, and ramifications

Abstract

Around 1830, C. G. Jacobi wrote down his original theta function $\theta(z)$ as a Fourier series, and used it to give a striking new proof of the theorem of Lagrange, from the late 18th century, that every whole number is the sum of four perfect squares. It is easy to see that number of ways to express a given number as a sum of squares of four integers is given by the Fourier coefficients of θ^4, and Jacobi was able to give an explicit formula for these. Both θ and θ^4 are *modular forms*, functions on the complex upper half plane defined by certain transformation conditions. Later in the 19th century, the identification by G. Eisenstein of θ^4 as a special type of modular form (now known as an *Eisenstein series*) shed further light in Jacobi's formula. The strong connection between modular forms and number theory, as well as the geometry of Riemann surfaces, led to further investigations by Hecke, Maass, Siegel, Shimura and others into modular forms, and analogous functions of many variables, called *automorphic forms*.

Also in the first half of the 19th century, investigations into the solutions of algebraic equations led to the study of groups of transformations, and of *invariants* - functions that were not changed by relevant transformations. This developed into a huge field, especially in England, and eventually led to the development of abstract algebra, especially by Hilbert and Noether.

In the first half of the 20th century, interest in invariant theory subsided, but was partly preserved and extended by Weyl, in his book *The Classical Groups*, which established two basic results, which he called the *First (resp. Second) Fundamental Theorem* of invariant theory.

Partly through the above work, but also through developments in mathematical physics, especially quantum mechanics, attention to the way functions behave under transformations led to the development of *representation theory*, which describes how a given group can act on a vector space. At first, the vector space was presumed to be finite dimensional, but under the influence of physics, infinite dimensional representations also came under study.

All of these paths helped lead to *theta correspondences*, which tie many examples from all these fields together into tight packages.

These talks will to survey some of the history, describe some of the results and the techniques used to establish them, and some of the implications they have for these disparate lines of research.

15 Hongyu He

Louisiana State University, USA

Projection of elliptic orbits and branching laws

Abstract

Among many of the well-known results of Harish-Chandra, is his classification of discrete series of semisimple Lie groups. In particular, Harish-Chandra's theorem established a link between discrete series representations and elliptic (coadjoint) orbits. In this talk, I shall discuss the projection of coadjoint orbits and branching laws in representation theory. I shall discuss the examples from Weil representations and discrete series representations. Our focus will be on elliptic orbits and problems related to Gan-Gross-Prasad conjectures over R.

16 Edmund Karasiewicz

University of Utah, USA

The Iwahori-fixed part of the Gelfand-Graev representation of a covering group

Abstract

The uniqueness of Whittaker models plays an important role in the representation theory of linear reductive groups due to its relation to L-functions. However such uniqueness fails in general for nonlinear covering groups. We investigate this failure of uniqueness through the Gelfand-Graev representation, which is the dual of the Whittaker space.

Using the pro-p Iwahori-Hecke algebra, we describe the Iwahori-fixed vectors in the Gelfand-Graev representation of covering groups as a module over the Iwahori-Hecke algebra, generalizing work of Barbasch-Moy and Chan-Savin for linear groups. As applications, we 1) relate the Gelfand-Graev representation to the metaplectic representation of Sahi-Stokman-Venkateswaran; 2) compute the dimension of the space of Whittaker models for constituents of unramified principal series, where the character is regular or unitary.

This is joint work with Fan Gao and Nadya Gurevich.

17 Toshiyuki Kobayashi

The University of Tokyo, Japan

Harish-Chandra's admissibility theorem and beyond

Workshop Abstract

Let G be a real reductive linear Lie group, and K a maximal compact subgroup of G. Harish-Chandra's admissibility theorem asserts that any irreducible unitary representation decomposes into a direct sum of irreducible K-modules with each multiplicity finite. In this talk, we consider a non-compact reductive subgroup G' instead of compact K, and discuss the restriction of an irreducible representation of G to the subgroup G' with focus on G'-admissible property (i.e. discretely decomposable with finite multiplicity) as well as on uniformly bounded multiplicity property.

Proper actions and representation theory

Lecture Abstract

In the series of lectures, I plan to explain some recent topics on proper actions with emphasis on their relation to representation theory. I begin with some geometric problems of group actions including properness criterion for reductive homogeneous spaces. In turn, I introduce a "quantification" of proper actions and bring geometric ideas to analytic representation theory such as temperedness criterion. Basic notions will be illustrated by examples. No special background knowledge will be required.

18 Wen-Wei Li

BICMR, Peking University, China
Localization and higher branching laws for Harish-Chandra modules

Abstract

The higher branching laws proposed by Dipendra Prasad concern the Ext groups for admissible representations of p-adic groups under restriction. I will formulate an algebraic version of this problem, namely for Harish-Chandra (g, K)-modules restricted to reductive spherical subgroups. By localizing them onto the corresponding homogeneous space, the Ext groups in question can be interpreted inside the equivariant derived categories of D-modules. In particular, they will be shown to be finite-dimensional. The main ingredients include: (1) a special construction of equivariant derived categories due to Beilinson-Ginzburg, and (2) regularity of the cohomologies of derived localization, which might be of independent interest. If time permits, I will also try to relate the algebraic and analytic pictures.

19 Hengfei Lu

Universität Wien, Austria
The modular distinction problems

Abstract

The relative Langlands program is quite popular in recent years. Let G/H be a symmetric space defined over a nonarchimedean local field F. The problem

about how to classify those irreducible smooth complex representations of G distinguished by H has been widely investigated by various authors. Much less is known for the modular representations. In this talk we will talk about the case of supercuspidal representations of GL(n) distinguished by H which looks similar for the complex case including the case p=2. The proof relies on the explicit type theory of a supercuspidal representation of GL(n). As a corollary, we extend one modular dichotomy theorem for the Galois pair GL(n,E)/GL(n,F) proved by Vincent Secherre when p is odd, to the case p=2. This is a joint work with Peiyi Cui and Thomas Lanard.

20 Jia-Jun Ma

Xiamen University, China

Generic Hecke algebra and theta correspondence over finite fields

Abstract

In this talk, we consider the theta correspondence of type I dual pairs over a finite field F_q. Aubert-Michel-Rouquier established an explicit formula for theta correspondence between unipotent representations of unitary groups and made a conjecture for the symplectic group-even orthogonal group pair. Recently Shu-Yen Pan proved the conjecture. These proofs rely on the character theory of finite Lie groups due to Lusztig. We will use Hecke algebras to study the theta correspondence between certain parabolically induced representations. We will first show that the normalization of the Hecke algebra is related to the first occurrence index, which leads to another proof of the conservation relation (for cuspidal representation). Then we will construct a generic Hecke algebra bi-module that dictates the correspondence. By specialization at q=1, we can recover AMR and Pan's results and obtain the conservation relation for general representations. The work is joint with Jialiang Zou and Congling Qiu.

21 Allan Merino

University of Ottawa, Canada
Dual pairs in an orhosymplectic Lie supergroup and double commutant theorem for complex pairs

Abstract

In his wonderful paper "Remarks on classical invariant theory", Roger Howe suggested that his classical duality should be extendable to superalgebras/ supergroups. Roughly speaking, by restricting the spinor-oscillator representation (w, H) of the complex orthosymplectic Lie superalgebra spo(V) to some particular super dual pairs (g, g') (or (G, g')), he proved that the action of g' on every G-isotypic components is irreducible. A similar phenomenon has been obtained for other pairs by the works of other mathematicians (Howe, Nishiyama, Sergeev, Cheng-Wang, Howe-Lu, Davidson-Kujawa-Muth ...) but a general theory for the real or complex orthosymplectic Lie superalgebra (or supergroup) is not known yet.

In a recent work with Hadi Salmasian, we obtained a classification of irreducible reductive dual pairs in a real or complex orthosymplectic Lie supergroup SpO(V). Moreover, we proved a "double commutant theorem" for all dual pairs in a complex orthosymplectic Lie supergroup.

Time permitting, I will explain other questions we are currently working on related to the extension of Howe duality to super dual pairs.

22 Monica Nevins

University of Ottawa, Canada
On the local character expansion

Abstract

Harish-Chandra and Howe introduced us to the local character expansion in the 1970s. It is a remarkable formula expressing the character of an admissible representation π of a p-adic group G as a linear combination of functions arising from the finitely many nilpotent orbits (in a neighbourhood of the identity). The maximal orbits that occur with nonzero coefficient define the (analytic) wave front set of π; variants of the expansion using non-nilpotent orbits are part of Murnaghan–Kirillov theory. In this talk, we explore some

connections between the wave front set of π, Murnaghan–Kirillov theory and the restriction of π to a maximal compact subgroup.

23 Kyo Nishiyama

Aoyama Gakuin University, Japan
Hecke algebra actions on a double flag variety

Abstract

Consider a connected reductive algebraic group G and its symmetric subgroup K. Let $\mathfrak{X} = K/B_K \times G/P$ be a double flag variety of finite type, where B_K is a Borel subgroup of K, and P a parabolic subgroup of G. The orbit space $\mathbb{C}\mathfrak{X}/K$ inherits a natural action of the Hecke algebra $\mathscr{H} = \mathscr{H}(K, B_K)$ of double cosets via convolutions. However, it is difficult to find out the explicit structure of the Hecke module. In this talk, we give an explicit action of $\mathscr{H}$ on $\mathbb{C}\mathfrak{X}/K$ in combinatorial way using graphs, for the double flag variety of type AIII, i.e., when $G/K = \mathrm{GL}_n/\mathrm{GL}_p \times \mathrm{GL}_q \quad (n = p + q)$. As a by-product, we also get the description of the representation of the Weyl group on $\mathbb{C}\mathfrak{X}/K$ as a direct sum of induced representations.

The talk is based on the on-going joint work with Lucas Fresse in Université de Lorraine, IECL (France).

24 Masao Oi

Kyoto University, Japan
Characterization of supercuspidal representations via Harish-Chandra characters

Abstract

The Harish-Chandra characters of supercuspidal representations of p-adic reductive groups can be described explicitly by a formula of Adler–DeBacker–Spice. This formula takes a particularly simple form on "sufficiently regular" semisimple elements, which we call very regular semisimple elements. In this talk, I will explain that some classes of supercuspidal representations can be determined uniquely only by their character values on the very regular semisimple locus. This is joint work with Charlotte Chan.

25 Michael Pevzner

Laboratoire de Mathématiques de Reims (LMR) - CNRS UMR 9008, France
From symmetry breaking toward holography in representation theory

Abstract

We shall present the idea of symmetry breaking transform in the framework of branching rules for infinite dimensional representations of real reductive Lie groups and will focus on the dual notion of holographic transform by providing a series of concrete examples.

26 Mamami Roy

Fordham University, USA
Dimensions for the spaces of Siegel cusp forms of degree 2 and level 4

Abstract

Dimension and codimension formulas for the spaces of Siegel cusp forms of degree 2 are studied by many mathematicians. However, the dimensions of the spaces of Siegel cusp forms of non-squarefree levels are mostly not available in the literature. This talk will present new dimension formulas of Siegel cusp forms of degree 2, weight k, and level 4 for two congruence subgroups. Our method relies on counting a particular set of cuspidal automorphic representations of GSp(4) and exploring its connection to dimensions of spaces of Siegel cusp forms of degree 2. This work is joint with Ralf Schmidt and Shaoyun Yi.

27 Hadi Salmasian

University of Ottawa, Canada
The Capelli eigenvalue problem for Lie algebras and beyond

Abstract

The Capelli identity is a remarkable (and mysterious!) relation in the algebra of polynomial-coefficient differential operators that plays a key role in Hermann Weyl's book *The Classical Groups*. For a large class of symmetric

spaces one can define a distinguished basis of the algebra of invariant differential operators that generalizes the operator originally considered by Alfredo Capelli. Computing the eigenvalues of elements of this basis (which we call the *Capelli operators*) is a problem proposed by Kostant and Sahi. Later work of Sahi and Knop revealed interesting connections between Capelli operators and interpolation Jack polynomials.

In this talk I will survey my recent work on extending the Capelli operators beyond symmetric spaces of type A: to Grassmannians, Lie superalgebras, and quantum symemetric spaces. This talk is based on joint projects with Gail Letzter, Siddhartha Sahi, and Vera Serganova.

28 Gordan Savin

University of Utah, USA
Bernstein projectors for unrefined types

Abstract

For representations of a p-adic group G, Moy and Prasad defined a notion of depth, which is a non-negative rational number r. Representations of depth r form a direct summand of the category of all smooth representations of G. Bezrukavnikov, Kazhdan and Varshavsky gave an Euler-Poincare presentation of the projector on the depth r summand. We decompose this projector as a sum of explicit central idempotents parameterized by cuspidal unrefined types. This is a joint work with Allen Moy.

29 Loren Spice

Texas Christian University, USA
Explicit character formulæ for tame supercuspidals via asymptotic expansions

Abstract

Kim and Murnaghan developed a theory of asymptotic expansions of characters, which describe their behaviour near the identity in terms of Fourier transforms of semisimple orbital integrals. In 2016, I showed that, like

Harish-Chandra's local character expansion, these asymptotic expansions could be centred everywhere, thus effectively providing an inductive formula for characters of tame supercuspidal representations of p-adic groups G in terms of the analogous representations of tame, twisted Levi subgroups G'. Applying this work to the construction of supercuspidals due to J.-K. Yu required a modification of that construction, accomplished via the surprisingly delicate construction of a collection of sign characters of points in the reduced Bruhat–Tits building, joint with Fintzen and Kaletha.

Even with that in place, unrolling the induction presented technical difficulties. In this talk, I will describe how those difficulties were overcome by a refined understanding of the Fourier transforms appearing in the asymptotic expansions. This work provides a pleasant simultaneous generalisation of the local character expansion, Kim–Murnaghan asymptotic expansions, the Shalika germ expansion, and an asymptotic result of Waldspurger on Fourier transforms of semisimple orbital integrals.

30 Shaun Stevens

University of East Anglia, UK

Endo-parameters for classical groups and splittings

Abstract

For their construction of cuspidal representations of general linear groups over a nonarchimedean local field, Bushnell and Kutzko defined certain "simple characters" of compact open subgroups which exhibit remarkable transfer properties. These can be described in terms of objects which Bushnell and Henniart called "endo-classes" and which they showed correspond via the Local Langlands Correspondence to irreducible representations of the wild inertia group, up to conjugacy by the Weil group. I will try to explain what these objects are and how to generalise their construction for classical groups (symplectic, orthogonal, unitary) in odd residual characteristic, as well as implications for splittings of the category of smooth representations. This is joint work with Rob Kurinczuk and Daniel Skodlerack.

31 Cheng-Chiang Tsai

Academia Sinica, Taiwan
Uniform bounds of orbital integrals and affine Springer fibers

Abstract

In this presentation, we discuss some known or conjectural algebro-geometric properties of affine Springer fibers which give us sharp bounds of orbital integrals. With an application of Shalika germ expansion, this gives us sharp uniform bounds.

32 Peter Trapa

University of Utah, USA
Relations between Kazhdan-Lusztig polynomials for real and p-adic classical groups

Abstract

A fundamental problem in the representation theory of reductive groups is to write the characters of irreducible representations in terms of (better-understood) characters of standard modules. For complex or real groups, for example, this amounts to computing Kazhdan-Lusztig or Lusztig-Vogan polynomials. For split p-adic groups, Lusztig gave an explicit algorithm to compute the corresponding polynomials for unipotent representations. The real and p-adic algorithms have quite different structure, but the polynomials that emerge are very similar. For example, Ciubotaru-Trapa showed that every p-adic polynomial for $\mathrm{GL}(n, \mathbb{Q}_p)$ is a Lusztig-Vogan polynomial for $\mathrm{GL}(n, \mathbb{R})$ in a natural way. In this talk, we generalize the Ciubotaru-Trapa result to other classical groups and show that the p-adic polynomials are a subset of the corresponding Lusztig-Vogan polynomials in an explicitly computable way. Since the latter are accessible in the `atlas` software, this gives a practical way to compute examples of the p-adic polynomials for classical groups. This is based on joint work with Leticia Barchini.

33 Jiu Kang Yu

The Chinese University of Hong Kong, China
On nilpotent orbits in good characteristic

Abstract

In this talk we will discuss the nilpotent elements in semisimple Lie algebras over an algebraically closed field and their structure theory, in particular the classification and centralizers. It is known that the results are quite uniform across different characteristics as long as the characteristic is good, although sometimes they are verified case-by-case. We will give uniform treatments of some of these results.