

TORA XV Schedule

Venue: All talks will take place in PHSC 108.

Friday April 17

4:00 OU Math department Colloquium : Ramin Takloo-Bighash (PHSC 1105)

5:00 TORA registration (Room PHSC 108)

5:30 Graduate student prep session – led by Chary Addanki and Gefei Dang

Saturday April 18

9:00 Melissa Emory, *At Most One: Local Multiplicity and the Gan-Gross-Prasad Conjectures for $GSpin$ Groups*

9:30 Brian Conrey, *Critical zeros of families of L -functions*

10:30 Tea

11:00 Jiaqi Hou, *L^q norm bounds for Hecke-Maass forms*

11:30 Siddharth Ramakrishnan, *Atkin-Lehner decompositions for quaternionic modular forms*

11:50 Erin Pierce, *Fourier coefficients of paramodular Siegel Eisenstein series*

12:10 David Luo, *Distinguished Simple Supercuspidal Representations of p -adic $GL(n)$*

12:30 Lunch

2:00 Bryan Hu, *Arithmeticity for L -functions on Exceptional Groups*

3:00 Dani Szpruch, *How to associate a gamma-factor to representations of covering groups?*

3:30 Tea

4:00 Speed TORA

5:00 Graduate student Q&A session

6:30 Banquet, Oklahoma Memorial Union, University Club

Sunday April 19

9:00 Farid Hosseinijafari, *ρ -Schwartz Spaces and Modulation Groups*

9:30 Ramin Takloo-Bighash, *Automorphic form twisted Shintani zeta function*

10:30 Tea

11:00 Jialiang Zou, *Theta Correspondence and Springer Correspondence*

11:30 Ergun Suer, *Signs of Irreducible Self-Dual Representations of $SL(n, F)$*

11:50 Matthew Ortiz, *Weighted Recursions for Hurwitz Class Numbers*

12:10 Sreejani Chaudhary, *On a question of Totaro: Rational points and zero-cycles on torsors*

12:30 Lunch and good bye

- i) Sreejani Chaudhary, Emory University

Title: On a question of Totaro: Rational points and zero-cycles on torsors

Abstract: For a linear algebraic group G , several of its fundamental problems can be unified into the problem of characterizing G -torsors over an arbitrary field k . In 1994, Serre asked the question : For a smooth connected linear algebraic group G over a field k , if a G -torsor X admits a zero cycle of degree 1, does it have a k -rational point?

Since a G -torsor X has a k -rational point if and only if its corresponding cohomology class in $H^1(k, G)$ is trivial, the cohomological version of this question is of great interest. Pioneering results by Springer, Bayer-Lenstra, Jodi, Nivedita have shown several affirmative answers to this question. In 2004, Totaro generalized Serre's question for zero cycles of degree $d \geq 1$. In its generality, Totaro's question has counterexamples due to Parimala (projective homogeneous spaces), Reed and Suresh (PHS under adjoint groups) in special cases. However, Jodi and Parimala's work shows affirmative results to Totaro's question for semi-simple simply connected groups in low rank. In this talk, I plan to give a survey of the works done related to these questions. I will focus on talking about some of the techniques from the theory of quadratic and hermitian forms that help us to get some affirmative answers to Totaro's question for low rank absolutely simple adjoint classical linear algebraic groups. We will also discuss some of the cases for which this question is still open and some broader connection to arithmetic of algebraic groups.

- ii) Brian Conrey, American Institute of Mathematics

Title: Critical zeros of families of L -functions

Abstract: We discuss some theorems about zeros on the critical line for $GL(r, Q)$ L -functions twisted by degree 1 twists for $r = 1, 2, 3$ with a discussion of open questions that this audience may be in a position to solve.

- iii) Melissa Emory, Oklahoma State University

Title: At Most One: Local Multiplicity and the Gan-Gross-Prasad Conjectures for $GSpin$ Groups

Abstract: A central theme in modern representation theory is understanding how an irreducible representation of a reductive group restricts to a subgroup. The Gan-Gross-Prasad (GGP) conjectures provide a precise and far-reaching prediction for classical groups: that certain branching spaces are at most one-dimensional—a local multiplicity one statement. In this talk, I will present new results establishing this local “at most one” multiplicity for $GSpin$ groups, extending the GGP framework beyond the classical group setting. The proof draws on tools from the representation theory of p -adic groups—including Bernstein-Zelevinsky theory and Harish-Chandra's method of descent—alongside the rich Lie-theoretic structure of $GSpin$ groups. I will motivate the problem, explain the specific challenges posed by $GSpin$ groups, and sketch the key ideas behind the multiplicity bound. This talk is designed to be accessible to graduate students while highlighting the broader significance of these results within the Langlands program.

- iv) Farid Hosseinijafari, Duke University

Title: ρ -Schwartz Spaces and Modulation Groups

Abstract: Kazhdan, and Ngô conjectured the existence of a ρ -Schwartz space attached to a representation of the L -group of a reductive group over a local field F , equipped with a suitable notion of Fourier transform. We construct the Fourier transform for arbitrary fields. Over non-Archimedean fields, we construct the Schwartz space, and in the Archimedean case, we construct an approximation to it. We then explain how Schwartz spaces for certain spherical varieties are naturally representations of a group that we call the modulation group. This provides a broad generalization of the defining representation of the metaplectic group. In this talk, I will focus on the first part of the project. This is a joint work J. Getz, A. Terradillos, S. Lee, A. Slipper, M. Tomé, G. Xi, H. Yao, and A. Zhao as part of the Duke Research Scholars program.

- v) Jiaqi Hou, Louisiana State University
Title: L^q norm bounds for Hecke-Maass forms
Abstract: I will talk about the problems of L^q norm bounds for Laplace eigenfunctions with large eigenvalues on compact Riemannian manifolds. The classical local bound was proved by Sogge, which is sharp on spheres but is expected to be improved with some negative curvature assumption. For Hecke-Maass forms on compact arithmetic congruence hyperbolic surfaces, Iwaniec and Sarnak used the method of arithmetic amplification to obtain a power saving for the sup-norm bound. In the same compact setting, we improve the L^6 norm bound of Hecke-Maass forms by using microlocal decompositions and proving new improved microlocal Kakeya-Nikodym estimates. This is joint work with Xiaoqi Huang.
- vi) Bryan Hu, UC San Diego
Title: Arithmeticity for L-functions on Exceptional Groups
Abstract: We discuss arithmeticity results for L-functions associated to automorphic forms on quaternionic groups. We describe a method, originating from Shimura, to attack Deligne's conjecture for special values of L-functions. In particular, we investigate quaternionic modular forms (QMFs), which are non-holomorphic automorphic forms associated to the so-called quaternionic discrete series studied by Gross and Wallach. We describe recent joint work on the arithmeticity of Fourier coefficients for QMFs, as well as a notion of Maass-Shimura operators for QMFs.
- vii) David Luo, Univ of Minnesota
Title: Distinguished Simple Supercuspidal Representations of p -adic $\mathrm{GL}(n)$
Abstract: Let E/F be a quadratic extension of non-Archimedean local fields with odd residual characteristic. In this talk, we show that twisted gamma factors can detect distinction by $\mathrm{GL}(n, F)$ for a supercuspidal representation of $\mathrm{GL}(n, E)$. Furthermore, we prove that the collection of twisted gamma factors associated to a simple supercuspidal representation π of $\mathrm{GL}(n, E)$, taken over all unitary, tamely ramified quasi-characters of E^\times that are trivial on F^\times , suffices to determine whether π is distinguished by $\mathrm{GL}(n, F)$.
- viii) Matthew Ortiz, University of North Texas
Title: Weighted Recursions for Hurwitz Class Numbers
Abstract: We establish new recursions for Hurwitz class numbers with polynomial weights. In contrast to previous recursions, our results decouple class numbers of even and odd discriminants. Our main tool is the vector-valued holomorphic projection operator applied to mock modular forms. We invoke representation theory to connect the relevant spaces of vector-valued modular forms to spaces of classical new and old forms. We thereby leverage the vanishing of spaces of vector-valued cusp forms not available in the scalar case. This is joint work with Martin Raum and Olav Richter.
- ix) Erin Pierce, University of North Texas
Title: Fourier coefficients of paramodular Siegel Eisenstein series
Abstract: Eisenstein series play an important role in number theory, particularly in the study of automorphic forms. It is an interesting problem to calculate the Fourier coefficients of various types of Eisenstein series. In this talk, we will introduce an Eisenstein series derived from the Siegel parabolic of $\mathrm{GSp}(4)$, corresponding to a Siegel modular form with paramodular level. We will discuss the adelic method for computing its Fourier coefficients and present a novel approach for calculating them.
- x) Siddharth Ramakrishnan, University of Oklahoma
Title: Atkin-Lehner decompositions for quaternionic modular forms
Abstract: In this talk, I will discuss Atkin-Lehner decompositions for quaternionic modular forms. Building on Casselman's work, we use representation-theoretic results for local quaternionic division algebras to study these forms and describe their newspaces. Finally, I will outline applications of these results, including connections to classical modular forms and Eichler's basis problem.

- xi) Dani Szpruch, Open University of Israel
Title: How to associate a gamma-factor to representations of covering groups?
Abstract: The Langlands-Shahidi method associates a gamma-factor to representations of quasi-split reductive groups, exploiting the local uniqueness of the Whittaker model. In this talk we shall give a speculative definition for a gamma-factor in the context of covering groups in the spirit of this method although the uniqueness of the Whittaker model fails. We shall give some evidence for the validity of our definition.
- xii) Ergun Suer, University of Oklahoma
Title: Signs of Irreducible Self-Dual Representations of $SL(n, F)$
Abstract: In the presence of Schur's Lemma, an irreducible self-dual (complex) representation of a group preserves either a symmetric or anti-symmetric form on its underlying space. Accordingly, the representation is said to have sign $+1$ (symmetric case) or -1 (anti-symmetric case). In this talk, I will discuss a method for studying the signs of irreducible smooth self-dual representations of $SL(n, F)$ when F is a non-Archimedean local field. The method combines a) a reduction to tempered data via the Langlands classification, b) a transfer to a corresponding problem on a Levi subgroup of $GL(n, F)$, and c) a twisted version of a technique due to D. Prasad. It yields explicit formulas for the signs in almost all cases.
- xiii) Ramin Takloo-Bighash, Univ of Illinois at Chicago
Title: Automorphic form twisted Shintani zeta function
Abstract: In this talk I will explain a recent work, joint with Eun-Hye Lee, in which we prove the analytic continuation of the Shintani zeta function of the prehomogeneous vector space of binary cubic form twisted with a $GL(2)$ automorphic form over an arbitrary number field, obtaining uniform results independent of the automorphic form and the number field. Our result generalizes works by Robert Hough and Hough-Lee for unramified classical Maass forms and Eisenstein series.
- xiv) Jialing Zou, MIT
Title: Theta Correspondence and Springer Correspondence
Abstract: Let V and W be an orthogonal and a symplectic space, respectively. The action of $G = O(V) \times Sp(W)$ on $V \otimes W$ provides an example of the G -hyperspherical varieties introduced by Ben-Zvi, Sakellaridis, and Venkatesh (BZSV). From the perspective of quantization, this can be viewed as the classical limit of the theta correspondence. I will explain a geometric construction motivated by theta correspondence over finite fields, which describes how principal series representations behave under theta correspondence via the Springer correspondence. This is joint work with Jiajun Ma, Congling Qiu, and Zhiwei Yun. BZSV proposed a relative Langlands duality linking certain G -hyperspherical varieties M with their dual G^v -hyperspherical varieties M^v . A notable instance of this duality is that the hyperspherical variety underlying theta correspondence is dual to the one underlying the branching problem in the Gan-Gross-Prasad conjecture. I will discuss how our results fit into this broader framework of relative Langlands duality.

Speed TORA

- i) John Bergdall, U of Arkansas – *On the distribution of modular points on deformation rings*
ii) Joseph DiCapua, LSU – *The Weyl-Heisenberg Group and WH-covariant SICs*
iii) Erick Ross, Clemson U – *Boundary CM points and class groups of small exponent*
iv) Praneel Samanta, U of Kentucky – *Partition Functions and Perfect Powers*
v) Sayantan Santra, OU – *On the Evenness of Coefficients of Newforms*
vi) Ralf Schmidt, UNT – *Automorphic Representations Generated by Eisenstein Series*
vii) Ze Sen Tang, UT Dallas – *Reciprocity for Moments of L-Function*
viii) Yunchuan Zhou, OU – *Frobenius-Shur indicators of representations of division algebras*