36th Automorphic Forms Workshop
Oklahoma State University
May 20-24, 2024

Below are the details of the presentations scheduled for the 36th Automorphic Forms Workshop at Oklahoma State University.

- **Michael Allen** (Louisiana State University) allenm3@lsu.edu

  Title: A General Approach to the Modularity of Hypergeometric Motives

  Abstract: In the 1990's Rodriguez Villegas observed that families of rigid Calabi–Yau 3-folds were especially modular. One way to make this precise, due to McCarthy, is to state that the truncations at primes of the classical hypergeometric series arising as period integrals of these CY 3-folds agree with the Fourier coefficients of certain modular forms modulo p^3. As the linear mod p congruence is generically expected by formal commutative group law, we refer to the congruence for this higher than expected modulus as a supercongruence. Rodriguez Villegas' conjectured supercongruences have been obtained by Long, Tu, Yui, and Zudilin, and much additional progress on the modularity of hypergeometric functions has recently been made, particularly through theoretical developments of hypergeometric Galois representations, finite field hypergeometric functions, and hypergeometric motives. We describe a general approach for determining the modularity of hypergeometric Galois representations, and in the process obtain an infinite family of mod p^2 supercongruences. This is joint work with Brian Grove, Ling Long, and Fang-Ting Tu.

- **Debmalya Basak** (University of Illinois Urbana Champaign) dbasak2@illinois.edu

  Title: A Pair Correlation Surface Associated to the Zeros of L-Functions

  Abstract: We discover a surface related to the pair correlation of zeros of L functions. We make a conjecture on the shape of this surface, and present partial results and numerical evidence towards the conjecture. This is joint work with Cruz Castillo, Di Liu and Alexandru Zaharescu.

- **Devjani Basu** (Southern Illinois University Carbondale) devjani.basu@siu.edu

  Title: p-modular Representations of SL(3) over a Finite Field

  Abstract: The modular representations of group G are the representations over a vector space over a field of nonzero characteristic ℓ when ℓ divides the (pro-)order of the group G. As a consequence, the semisimplicity of the group algebra is lost. For the case, $\ell = p$, to study the p-modular representations of $\mathrm{SL}(3, q)$ in particular, and $G = \mathrm{SL}(n, q)$ in general, we first concentrate on those modules (or vector spaces) which are realized within the group algebra FG, where F is the algebraic closure of $\mathbb{F}_q$. A natural approach to studying the simple FG-modules is to describe them as a restriction of simple modules for the algebraic group $\mathrm{SL}(n, F)$ to that of $\mathrm{SL}(3, q)$.

As a finite group of Lie type, $\mathrm{SL}(3,q)$, is a close relative of the groups of rational points of algebraic groups defined over $\mathbb{F}_q$. Therefore, we have adapted the methodology developed by Cedric Bonnafe for $\mathrm{SL}(2,q)$ to describe the p-modular representations of $\mathrm{SL}(3,q)$ explicitly.

- **Steven Creech** (Brown University) steven_creech@brown.edu

Title: Mass Equidistribution: Cocompact Vs. Non-Cocompact Surfaces

Abstract: Given a weight k Hecke-cusp form f on $\mathrm{SL}_2(\mathbb{Z})\backslash\mathbb{H}$, one can define a measure μ_f on the surface. The celebrated mass equidistribution theorem of Holowinsky and Soundararajan states that as $k \to \infty$, the measure μ_f approaches the uniform measure on the surface. Given a cocompact Riemann surface, one can ask the analogous problem, but this remains an open problem. In this talk, I will compare the classical mass equidistribution conjecture to the cocompact case, highlighting where difficulties arise. I will discuss some recent work of Nelson that relates mass equidistribution to a certain kind of shifted convolution sum. Time permitting, I will talk about my current work on the problem suggesting an average statement of the conjecture in the cocompact case.

- **Francis Dunn** (University of Oregon) fdunn@uoregon.edu

Title: Rankin-Cohen Type Differential Operators on Automorphic Forms

Abstract: In the classical setting, the derivative of a holomorphic modular form of integral weight on the complex upper half-plane is not in general a modular form since the derivative fails to satisfy the correct transformation properties. However, R. A. Rankin and H. Cohen were able to construct particular bilinear differential operators sending modular forms to modular forms. These Rankin-Cohen operators have several interesting properties and have been studied by D. Zagier, Y. Choie, T. Ibukiyama, and others.

In this talk I will discuss the classical Rankin-Cohen operators, and some of their generalizations to automorphic forms in higher dimension, including constructing Rankin-Cohen type differential operators on Hermitian modular forms of signature (n,n).

- **Claire Frechette** (Boston College) frechecl@bc.edu

Title: A Stroll into the Field of Automorphic L-Functions

Abstract: In this talk, we will explore the definition and motivations of automorphic L-functions. These functions are a key ingredient in modern number theory and sit beautifully at the intersection of complex analysis and representation theory approaches to this field. We will discuss a variety of important results proven about or using L-functions, demonstrating their flexibility and power, and end with questions on where the study of L-functions could be heading.

- **Travis Grigsby** (Oklahoma State University) travis.m.grigsby@gmail.com

Title: Fibers of Projected Richardson Varieties

Abstract: In algebraic geometry, Schubert varieties offer insights into Intersection Theory, where their fundamental classes form a basis for the Grassmannian's cohomology ring. Richardson varieties are the

transverse intersection of two Schubert varieties. One of the most intriguing aspects of Schubert and Richardson varieties is how the combinatorics of the Weyl group often describes their geometric properties. Given a linear algebraic group G, a Borel subgroup B, and a parabolic subgroup P containing B, there is a natural projection map from the flag variety G/B to the partial flag variety G/P. As it turns out, whether the restriction of this map to a Richardson variety has equidimensional fibers can be characterized via the Weyl group. In this talk, we give a condition on the Weyl group, describing when the projection from a Richardson variety to a partial flag variety has equidimensional fibers.

- **Brian Grove** (Louisiana State University) briangrove30@gmail.com

Title: Explicit Modularity Results via Hypergeometric Methods

Abstract: One of the first applications of hypergeometric functions over finite fields was the observation that the trace of Frobenius for a Legendre elliptic curve can be expressed as a special value of a finite field ${}_2F_1$ function. This observation connects finite field ${}_2F_1$ functions and the weight two newforms that the Modularity Theorem guarantees. A similar connection, now between finite field ${}_4F_3$ functions and certain weight four newforms, is given by the resolution of conjectures made by Rodriguez-Villegas.

However, the connections between finite field ${}_3F_2$ functions and weight three newforms are only known in a few cases. Recently, Dawsey and McCarthy conjectured fifteen new relations between finite field ${}_3F_2$ functions and weight three newforms. In this talk, we discuss progress on the conjectures of Dawsey and McCarthy and then mention some of the key tools used in our approach. This is joint work with Michael Allen, Ling Long, and Fang-Ting Tu.

- **Michael Hanson** (University of North Texas) michael.hanson@gmail.com

Title: The First Low Point in the Theta Cycle of Modular Forms Modulo p^2

Abstract: The theta cycle of a modular form modulo a prime $p \geq 5$ is well understood, and in particular, its first low point characterizes U_p-congruences. The theta cycle modulo a power of p is still mysterious and experimentally erratic. We determine the theta cycle of a modular form modulo p^2 up to its first low point, which we show coincides with the one modulo p. Furthermore, we exhibit the entire theta cycle of the classical normalized Eisenstein series E_{p-1} modulo p^2, which emerges as highly regular in contrast to the observed behavior for modular forms in general. Our results are enabled by a novel congruence modulo p^2 for the quasimodular Eisenstein series E_2.

- **Robert Hough** (Stony Brook University) robert.hough@stonybrook.edu

Title: Subconvexity of M. Sato's Zeta Functions

Abstract: Mikio Sato introduced a large class of zeta functions which has been extended by several authors to include zeta functions enumerating low degree rings and number fields, Epstein zeta functions and Hecke L-functions, multiple Dirichlet series including Selberg's Eisenstein series and the standard L-functions. I will discuss a method developed jointly with Eun Hye Lee of proving subconvexity in Sato's class of zeta functions. This work 'won the game' and 'won everything'.

- **Karin Ikeda** (Kyushu University) ikeda.karin.236@s.kyushu-u.ac.jp

  Title: On Real Zeros of the Hurwitz Zeta Function

  Abstract: In this talk, I will present a solution to the problem of real zeros of the Hurwitz zeta function, which has remained unsolved in previous studies. After reviewing the works of Spira, Nakamura, Matsusaka, and Endo-Suzuki, I discuss the remaining case, namely the zeros in the interval $(4, 0)$. This work shows that all real zeros of the Hurwitz zeta function, like the Riemann zeta function, are simple. I also present an observation of a curious behavior of a family of polynomials used in the proof.

- **Abhash Kumar Jha** (IIT(BHU) Varanasi India) abhash.mat@iitbhu.ac.in

  Title: Differential Operators Acting on Jacobi Forms and Jacobi Poincaré Series

  Abstract: In this talk, we discuss Rankin-Cohen differential operator acting on the space of Jacobi forms. We prove that if a Rankin-Cohen bracket of a Jacobi form φ and a complex-valued holomorphic function ψ defined on $\mathbb{H} \times \mathbb{C}$ is a Jacobi form, then the function ψ is a Jacobi form. We also discuss the relation between Rankin-Cohen brackets of Jacobi forms and Jacobi Poincaré series.

- **Katsumi Kina** (Kyushu University) kina.katsumi.147@s.kyushu-u.ac.jp

  Title: Double Eisenstein Series and Modular Forms of Level 4

  Abstract: In this talk, we study the $\mathbb{Q}$-vector space generated by the double zeta values with character of conductor 4. For this purpose, we define associated double Eisenstein series and investigate their relation with modular forms of level 4.

- **Yaacov Kopeliovich** (University of Connecticut) ykopeliovich1@gmail.com

  Title: Revisiting the Igusa Mapping

  Abstract: The Igusa mapping is a famous mapping from Siegel automorphic forms to Polynomial Invariants defined via Thomae type formulas for theta functions. However the mapping isn't defined for Siegel modular forms vanishing identically on the Hyper-elliptic locus. In this talk I will suggest to extend the mapping to Siegel modular forms that are vanishing identically using the formulas generalizing Thomae formulas to higher order theta derivatives discovered recently by J. Bernatska (this work is joint with her) in certain cases.

- **Krishnarjun Krishnamoorthy** (Beijing Institute of Mathematical Sciences and Applications) krishnarjunmaths@outlook.com

  Title: Determination of Hilbert Modular Forms Using Squarefree Coefficeints

  Abstract: Let F (over $\mathbb{Q}$) be a totally real number field of narrow class number 1. We generalize a result of Kohnen on the determination of half integral weight modular forms by their Fourier coefficients supported on squarefree (algebraic) integers. We also give a soft proof that infinitely many Fourier coefficients supported on squarefree integers are non-vanishing. This is a joint work with Rishabh Agnihotri.

- **Nhat Hoang Le** (National University of Singapore) e0196692@u.nus.edu

  Title: The Local Twisted Gan-Gross-Prasad Conjecture

  Abstract: The Gan-Gross-Prasad (GGP) conjecture studies a family of restriction problems for classical groups and proposes precise answers to these problems using the local and global Langlands correspondences. It also has a twisted variant in the Fourier-Jacobi case, which is called the twisted Gan-Gross-Prasad conjecture. In this talk, I will report my progress on the local twisted GGP conjecture for tempered representations. The strategy is to adapt Waldspurger and Beuzart-Plessis's method to develop a local relative trace formula as well as a twisted trace formula and compare their elliptic parts. Although the geometric sides of both trace formulae have not been developed, one can use a partial comparison and an instance of an elliptic L-packet to prove the statement.

- **Wing Hong Leung** (Texas A&M University) joseph1027@tamu.edu

  Title: Beyond Endoscopy, Functional Equation and Converse Theorem

  Abstract: In Langland's 'Beyond endoscopy' paper, he proposed a method to understand functoriality by studying the poles of L-functions via a trace formula. This idea is further refined and with the use of Kuznetsov trace formula, Venkatesh showed in his thesis the following: The dihedral forms of GL(2) are distinguished by the fact that their symmetric square L-functions have a pole at $s = 1$. This beyond endoscopy philosophy extends to more general settings and applications, and the underlying principle is that the trace formula is strong enough to see the behavior of an individual form in the family. To this end, it is believed that analytic continuation and functional equations of L-functions, and converse theorems can be directly shown by the Kuznetsov trace formula. In the GL(2) setting, I will briefly review the literature and discuss the joint work in progress with Chung-Hang Kwan on the functional equation. In the GL(3) setting, I will discuss the joint work with Valentin Blomer on the GL(3) converse theorem.

- **Ayan Maiti** (Purdue University) maitia@purdue.edu

  Title: Unitarizibility for Metaplectic Group of Small Order

  Abstract: Hanzer and Matic (2010) has provided a mechanism to investigate the composition series of the induced admissible representations of the metaplectic group $\widetilde{Sp(2)}$ over a p-adic field F. In this way they have determined the non-unitary and unitary duals of $\widetilde{Sp(2)}$ module the cuspidal representations. To find the composition series they have used the techniques of Tadic's structure formula for the metaplectic covers. It provides equations to find semi-simplification of the normalized Jacquet module with respect to maximal parabolic. We will talk about these methods and then discuss how to extend this methodologies to provide a list of unitary duals of $\widetilde{Sp(3)}$ modulo the cuspidal representations. It is a work in progress with Yeansu Kim.

- **Marcella Manivel** (University of Minnesota) maniv013@umn.edu

  Title: A Zoo of Automorphic Differential Operators

Abstract: Around 1915, Polya and Hilbert independently speculated that self-adjoint operators could explain zeros of L-functions. Reincarnating this idea, Colin de Verdière in the 1980's suggested a physics-oriented way of making inhomogeneous equations into homogeneous ones, i.e. ones with genuine eigenvalues. To make this line of inquiry rigorous, Bombieri and Garrett showed that the simplest instance of Colin de Verdière's idea does not succeed because the discrete spectrum is small. This motivates understanding analogous operators with a large discrete spectrum. This talk will go through several operators, discuss how we can understand their spectrum, and end with new results and open questions about certain automorphic differential operators.

- **Peter Marcus** (Tulane University) pmarcus1@tulane.edu

Title: Improvements to Sturm Bounds

Abstract: Bounds on the order of vanishing of modular forms are useful for studying congruences and are relevant to the existence of Weierstrass points and linear dependence of Poincare series. We will survey and synthesize known improvements to Sturm's original bound and analyze when they are sharp.

- **Kimball Martin** (University of Oklahoma) kimball.martin@ou.edu

Title: Distribution of Rationality Fields

Abstract: Maeda's Conjecture predicts the shape of rationality fields of Hecke eigenforms in full level. I will discuss expectations about rationality fields when one varies the level, and some of these predictions may be initially surprising. Much of this is joint work with Alex Cowan.

- **Jolanta Marzec-Ballesteros** (Adam Mickiewicz University in Poznań) jmarzec@amu.edu.pl

Title: Doubling Method for Self-dual Linear Codes

Abstract: The doubling method has been a very fruitful tool for constructing L-functions for various automorphic forms and has paved the way for proofs of analytic and algebraic properties both for these L-functions and the Klingen-type Eisenstein series. During the talk, we present an adaptation of the doubling method to the setting of self-dual linear codes. In particular, we comment on various analogies between (Siegel) modular forms and certain important invariants of linear codes (complete weight enumerators); they include Fourier expansion, cusp forms, and the action of a group. This is based on joint work with Thanasis Bouganis.

- **Dermot McCarthy** (Texas Tech University) dermot.mccarthy@ttu.edu

Title: Siegel Eigenforms Constructed from Igusa Theta Constants

Abstract: We give a brief introduction on constructing Siegel modular forms from Igusa theta constants. We then discuss recent work where we provide multiplicative relations among certain Fourier coefficients of degree two Siegel eigenforms constructed from Igusa theta constants with half-integral characteristics. We also provide simple relations between their eigenvalues and their Fourier coefficients.

- **Finn McGlade** (UCSD) finnmcglade@gmail.com

  Title: Fourier Coefficients and Algebraic Cusp Forms on $\mathrm{U}(2,n)$

  Abstract: We establish a theory of scalar Fourier coefficients for a class of non-holomorphic, automorphic forms on the real Lie group $\mathrm{U}(2,n)$. By studying the theta lifts of holomorphic modular forms from $\mathrm{U}(1,1)$, we apply this theory to obtain examples of non-holomorphic cusp forms on $\mathrm{U}(2,n)$ whose Fourier coefficients are algebraic numbers.

- **Xinchen Miao** (Max Planck Institute for Mathematics, Bonn) miao0011@umn.edu

  Title: Local Integrability of Bessel Functions on $\mathrm{GL}(n)$

  Abstract: The study of Bessel functions plays an important role in number theory, representation theory, automorphic forms and Langlands program. In my talk, we will focus on the Bessel functions over non-archimedean local fields. I will report on my work which proves that the Bessel function is locally integrable on $\mathrm{GL}_n(\mathbb{Q}_p)$ for all $n \geq 2$, where $\mathbb{Q}_p$ is a non-archimedean local field. The proof involves various tools in number theory and representation theory.

- **Steven J. Miller** (Williams College) sjm1@williams.edu

  Title: Upper Bounds for the Lowest First Zero in Families of Cuspidal Newforms

  Abstract: Assuming the Generalized Riemann Hypothesis, the non-trivial zeros of L-functions lie on the critical line with real part $1/2$. We seek answers to the following natural question: where on the critical line do we see the first zero? We focus on finding an upper bound of the lowest first zero in families of cuspidal newforms of prime level tending to infinity. We obtain explicit bounds using the n-level densities derived from random matrix theory and results towards the Katz-Sarnak density conjecture. Extending the analysis of Mestre and Goes-Miller for elliptic curves and families of elliptic curves, We prove that as the level tends to infinity, there is at least one form with a normalized zero within $1/4$ of the averge spacing. We also obtain the first-ever bounds on the percentage of forms in the family with a fixed number of zeros within a small distance near the central point. This is joint work with Emily Tang.

- **Amiya Kumar Mondal** (IISER Berhampur, India) amiya96@gmail.com

  Title: The Doubling Construction for Integral Representations of L-functions

  Abstract: In this talk, we will introduce the doubling construction for integral representations of L-functions. An explicit construction will be given for quasi-split special orthogonal groups.

- **Caner Nazaroglu** (University of Cologne) cnazarog@uni-koeln.de

  Title: Precision Asymptotics for Partitions Featuring False-Indefinite Theta Functions

  Abstract: Indefinite and false theta functions appear in a myriad of applications from mathematical physics to combinatorics. A class of functions beyond these two is the so-called 'false-indefinite theta

functions', which in certain special cases can be naturally studied with mock Maass theta functions developed by Zwegers and related to Maass waveforms. It is then natural to ask to what extent their modular behavior can be used to replicate the successes of ordinary modular forms. In this talk, we will investigate this question for a class of integer partition functions developed by Andrews and demonstrate that one can derive an asymptotic formula that includes all the exponentially growing parts of the asymptotic behavior.

- **Tianyu Ni** (Clemson University) tni@g.clemson.edu

Title: Explicit Linear Relations between Special Values of Derivatives of L-Functions

Abstract: Let S_k denote the space of cuspform of weight k for the full modular group, and let $f \in S_k$. Goldfeld (1995) and Diamantis (1999, 2001) have shown that it is possible to construct maps which are related to the values of derivatives of the completed L-functions $L^*(f, s)$ and which satisfy certain cocycle relations. However, not much seems to be known about the explicit linear relations between these special values. In this talk, we will present the Eichler-Shimura-Manin type relations between these special values.

- **Amit Ophir** (UCSD) aophir@ucsd.edu

Title: Stable Lattices in Representations over p-adic Fields

Abstract: p-adic representations of Galois groups are prominent in number theory. In such representations, lattices that are stable under the action of the group encode arithmetical information. Interestingly, the collection of stable lattices (up to homothety) can be equipped with the structure of a simplicial complex, and there is an interplay between the geometry of this complex, and some properties of stable lattices. My focus will be on generalizations of a lemma by Ribet. I will survey known results and discuss some recent results in a joint work with Ariel Weiss.

- **Sudhir Pujahari** (Nationational Institute of Science Education and Research) spujahari@niser.ac.in

Title: Sato-Tate Conjecture in Arithmetic Progressions for Certain Families of Elliptic Curves

Abstract: In this talk we will study moments of the trace of Frobenius of elliptic curves if the trace is restricted to a fixed arithmetic progression. In conclusion, we will obtain the Sato-Tate distribution for the trace of certain families of Elliptic curves. As a special case we will recover a result of Birch proving Sato-Tate distribution for certain family of elliptic curves. Moreover, we will see that these results follow from asymptotic formulas relating sums and moments of Hurwitz class numbers where the sums are restricted to certain arithmetic progressions. This is a joint work with Kathrin Bringmann and Ben Kane.

- **Subha Sandeep Repaka** (SRM University) subhasandeep.r@srmap.edu.in

Title: A Reducibility Problem for Even Unitary Groups: the Depth Zero Case

Abstract: We study a problem concerning parabolic induction in certain p-adic unitary groups. More precisely, for E/F a quadratic extension of p-adic fields the associated unitary group $\mathrm{U}(n, n)$ contains a parabolic subgroup P with Levi component L isomorphic to $\mathrm{GL}_n(E)$. Let π be an irreducible supercuspidal representation of L of depth zero. We use Hecke algebra methods to determine when the parabolically induced representation $\iota_P^G \pi$ is reducible.

- **Erick Ross** (Clemson University) erickr@clemson.edu

  Title: Nonvanishing of the Second Coefficient of the T_m Hecke Polynomials

  Abstract: Given a Hecke operator $T_m(N,k)$, a well-known open problem is to determine when the trace of this Hecke operator is vanishing. Recall that the trace of $T_m(N,k)$ is just the first coefficient of its associated Hecke polynomial. So we consider a slightly different problem: when will the second coefficient of the $T_m(N,k)$ Hecke polynomial vanish? In this talk, we show that for any given m, the second coefficient of the $T_m(N,k)$ Hecke polynomial is nonvanishing for all but finitely many (N,k). We also compute the complete list of such (N,k) for T_2 and T_3.

- **Shivansh Pandey** (NISER, Bhubaneswar India) shivansh.pandey@niser.ac.in

  Title: Converse Theorem for Jacobi Forms of Half-integral Weight

  Abstract: A converse theorem in the context of automorphic forms studies the equivalence of analytic properties of L-functions and modular properties of automorphic forms. In this talk we discuss L-functions associated with Jacobi forms of half-integrak weights. We will also discuss their analytic continhation and a converse theorem.

- **Constantinos Papachristoforou** (University of Sheffield) cpapachristoforou1@sheffield.ac.uk

  Title: Representation Theory of p-adic Groups

  Abstract: Driven by the Langlands program, the representation theory of reductive p-adic groups has been significantly developed during the last few decades. I will give an overview on various aspects of the theory, with particular emphasis on decomposition of categories of smooth representations. I will also discuss passing from the classical case of complex representations to more general coefficient rings.

- **Lucas Perryman-Deskins** (Oregon State University) perrymal@oregonstate.edu

  Title: q-series Identities Connected to Ideals in Quadratic Fields

  Abstract: A certain q-hypergeometric series σ has been shown to have an interpretation in terms of counting ideals in $\mathbb{Z}(\sqrt{6})$. This interpretation has demonstrated unique combinatorial and analytic characteristics, along with some interesting q-series identities. Some of these identities reflect a correspondence, predicted by class field theory, between characters on the ideals of each quadratic subfield of a biquadratic field. While Cohen has described that there are many quadratic fields where similar identities are theoretically discoverable, with few exceptions, those which have been established relate to $\mathbb{Q}(\sqrt{2})$, $\mathbb{Q}(\sqrt{3})$, and $\mathbb{Q}(\sqrt{6})$, as was the case in the earliest research on this phenomenon. Cohen also constructed from σ a related Maass waveform φ_0. Zwegers, and others who have continued to build on his work, have shown that a class of functions, constructed to generalize φ_0, can be characterized as mock Maass theta functions, with actual Maass forms appearing as special cases. In this talk, I will discuss this history as well as my current approach working towards generating further identities in other fields.

- **Carsten Peterson** (Paderborn University) clhpeterson1870@gmail.com

  Title: Quantum Ergodicity in the Level Aspect on Higher Rank Real and p-adic Locally Symmetric Spaces

  Abstract: Originally, quantum ergodicity concerned equidistribution properties of Laplacian eigenfunctions with large eigenvalue on manifolds for which the geodesic flow is ergodic. More recently, several authors have investigated quantum ergodicity for sequences of spaces which "converge" to their common universal cover and when one restricts to eigenfunctions with eigenvalues in a fixed range. Previous authors have considered this type of quantum ergodicity in the settings of regular graphs, rank one locally symmetric spaces, and some higher rank locally symmetric spaces. We prove analogous results in the case when the underlying common universal cover is the Bruhat-Tits building associated to $\mathrm{PGL}(3, F)$ where F is a non-archimedean local field. This may be seen as both a higher rank analogue of the regular graphs setting as well as a non-archimedean analogue of the symmetric space setting. We shall also mention ongoing joint work with Farrell Brumley, Simon Marshall, and Jasmin Matz dealing further with higher rank locally symmetric spaces.

- **Zachary Porat** (Wesleyan University) zporat@wesleyan.edu

  Title: Additional Computations of the Hecke Action on the Cuspidal Cohomology of Congruence Subgroups of $\mathrm{SL}(3, \mathbb{Z})$

  Abstract: Ash, Grayson, and Green computed the action of Hecke operators on a certain subspace of the cohomology of low-level congruence subgroups of $\mathrm{SL}(3, \mathbb{Z})$. This subspace contains the cuspidal cohomology, which is of primary interest. For prime level less than 100, they found four levels at which nonzero cuspidal classes arose and determined local factors for the L-functions. In this talk, we extend their work, introducing a method that allows for computing the action of Hecke operators directly on the cuspidal cohomology. Using this method, we obtain data for prime level less than 1500, finding four additional levels at which nonzero cuspidal classes appear and calculating local factors for two of these levels.

- **Peikai Qi** (Michigan State University) qipeikai@msu.edu

  Title: Iwasawa λ Invariant and Massey Products

  Abstract: How does the class group of the number field change in field extensions? This question is too wild to have a uniform answer, but there are some situations where partial answers are known. I will compare two such situations. First, in Iwasawa theory, instead of considering a single field extension, one considers a tower of fields and estimates the size of the class groups in the tower in terms of some invariants called λ and μ. Second, in a paper by Lam-Liu-Sharifi-Wake-Wang, they relate the relative size of Iwasawa modules to values of a "generalized Bockstein map", and further relate these values to Massey products in Galois cohomology in some situations. I will compare these two approaches to give a description of the cyclotomic Iwasawa λ-invariant of some imaginary quadratic fields and cyclotomic fields in terms of Massey products.

- **Brundaban Sahu** (NISER Bhubaneswar) brundaban.sahu@niser.ac.in

  Title: Evaluation of Convolution Sums and Modular Forms

Abstract: We derive a simple extension of Ramanujan-Serre derivative map and use it to get a general method to derive certain convolution sums of the divisor functions. We shall provide explicit expressions for four types of double convolution sums and evaluate triple convolution sums. This is a joint work with B. Ramakrishnan and Anup K. Singh.

- **Ralf Schmidt** (University of North Texas) ralf.schmidt@unt.edu

Title: Dimension Formulas for Siegel Modular Forms of Level 4

Abstract: Determining the dimensions of the spaces of Siegel modular forms of degree 2 and weight k with respect to a congruence subgroup Γ is in general an open problem. In some cases, such as $\Gamma_0(N)$, formulas are only available for square-free N. For the Klingen congruence subgroup $\Gamma_0'(N)$, only the case of prime level has been known. In this work we contribute a new dimension formula for $\Gamma_0'(4)$. The method consists in counting numbers of automorphic representations of GSp(4), using already existing dimension formulas for other congruence subgroups. This is joint work with Manami Roy and Shaoyun Yi.

- **Swati** (University of South Carolina) s10@email.sc.edu

Title: Congruence Properties Modulo Prime Powers for a Class of Partition Functions

Abstract: In this talk, we show that the generating function of $p[1, p](n)$ in certain arithmetic progression lies in a subspace consisting of integer-weight modular forms arising as multiples of a fixed eta-product. Further, we make use of Hecke invariance of these subspaces to prove explicit congruences for a family of partition functions modulo arbitrary prime powers. This is a joint work with Matthew Boylan.

- **Karen Taylor** (Bronx Community College, CUNY) karen.taylor59@gmail.com

Title: A New Class of Period Functions

Abstract: In 1978, Knopp initiated the study of rational period functions. These functions are related to hyperbolic Eisenstein series. Starting with an observation of Knopp's we construct and discuss period functions related to hyperbolic Poincaré series.

- **Mohit Tripathi** (Texas Tech University) mohittripathi411@gmail.com

Title: Splitting Hypergeometric Functions over Roots of Unity

Abstract: In this talk, I will discuss a formula which splits the hypergeometric function into a sum of lower order functions whose arguments differ by roots of unity. I will provide multiple applications of these results, evaluations of special values of these functions which apply in both the finite field and p-adic settings, and new relations to Fourier coefficients of modular forms.

- **Kin Ming Tsang** (University of British Columbia) kmtsang@math.ubc.ca

  Title: Refinements on Strong Multiplicity One for GL(2)

  Abstract: In this talk, we will discuss the strong multiplicity one theorem for GL(2), which basically states that if the local components of two cuspidal unitary automorphic representations are isomorphic for all but finitely many places, then they are globally equivalent. Ramakrishnan improved the result by showing that if two representations agree at places of Dirichlet density 7/8, then they are globally equivalent. We will discuss questions of similar flavor and possible approaches to these questions.

- **Zhining Wei** (Brown University) zhining_wei@brown.edu

  Title: Effective Open Image Theorem for Pairs of Elliptic Curves

  Abstract: In 1972, Serre proved the celebrated Open Image Theorem, claiming that for a non-CM elliptic curve E over Q, the residue modulo ℓ Galois representation associated with E is surjective for sufficiently large prime ℓ. An effective version of this theorem seeks to bound such least non-surjective prime ℓ. In the talk, I will review some results concerning the effective Open Image Theorem. Then I will present a work in progress on the effective open image theorem for pairs of elliptic curves, especially the semisable elliptic curve case. This is joint with Tian Wang.

- **Erin Williams** (Portland State University) etw@pdx.edu

  Title: The Non-vanishing of Traces of Hecke Operators

  Abstract: A long standing conjecture asks whether the Fourier coefficients $\tau(n)$ of the Δ function are non-vanishing. More generally one can ask when the trace of the Hecke operator T_n acting on the space of weight k cusp forms of level N vanishes. When $n \geq 1$ is non-square and N is coprime to n, it's conjectured that the trace vanishes when the space of cusp forms is trivial. We give a survey of results in this direction and present a proof of the non-vanishing of T_3 in the level 1 case, based on a joint paper with Chiriac and Kurzenhauser.

- **Tian An Wong** (University of Michigan-Dearborn) tiananw@umich.edu

  Title: Stable Transfer Factors

  Abstract: Stable transfer is the study of transfer of stable distributions between reductive groups. It is a key component in accessing Langlands' functoriality beyond the endoscopic cases. As in endoscopy, such a transfer is built on certain transfer factors or transfer operators. Assuming the local Langlands correspondence, their construction is straightforward, but without this assumption little is known. In this talk, I will introduce these ideas and a potential way to constructing stable transfer factors without local Langlands.

- **Amy Woodall** (University of Illinois Urbana-Champaign) amyew3@illinois.edu

  Title: The Weil Bound for Generalized Kloosterman Sums of Half-integral Weight

  Abstract: Let L be an even lattice of odd rank with discriminant group L'/L, and let $\alpha, \beta \in L'/L$. We prove the Weil bound for the Kloosterman sums $S_{\alpha,\beta}(m,n,c)$ of half-integral weight for the Weil Representation attached to L. We obtain this bound by proving an identity that relates a divisor sum of Kloosterman sums to a sparse exponential sum. This identity generalizes Kohnen's identity for plus space Kloosterman sums with the theta multiplier system.

- **Pengcheng Zhang** (Max Planck Institute for Mathematics) pzhang@mpim-bonn.mpg.de

  Title: Converse Theorems for Hilbert Modular Forms

  Abstract: The L-functions of automorphic forms usually satisfy nice analytic properties such as Euler products and functional equations. One may then naturally ask about the converse, i.e., whether one can recover automorphic forms from nicely behaved L-series, which is the subject of converse theorems. In this talk, we will talk about two results on converse theorems for Hilbert modular forms. The first one recovers a Hilbert modular form (of some level) from an L-series satisfying functional equations twisted by all the unramified Hecke characters. The second one assumes both the "unramified" functional equations and an Euler product, and recovers a Hilbert modular form of the expected level predicted by the shape of the functional equations.

- **Shifan Zhao** (The Ohio State University) zhao.3326@osu.edu

  Title: Weighted Low-lying Zeros of L-functions Attached to Siegel Modular Forms

  Abstract: The famous Katz-Sarnak heuristic predicts that the n-level density of low-lying zeros of families of automorphic L-functions is governed by certain classical compact groups. In this talk we study the weighted 1-level density of spinor and standard L-functions of degree 2 Siegel modular forms of weight k. We prove that the corresponding symmetry type is symplectic, for test functions whose Fourier transform within certain range. We further extend the range of support by performing an extra average over k. Finally, we show how these results can be applied to study non-vanishing of central L-values.