Abstract



Jan. 20 (Mon.)

9:30 – 10:30 Seiji Kuga (Sophia University)

Title: An asymptotic formula of spectral average of central L-values on GSp_2 for square-free levels

Abstract: Recently, Furusawa and Morimoto completely solved an important case of the refined GGP conjecture for the Bessel periods on PGSp₂. In this talk, we will give an weighted equidistribution theorem of Satake parameters for the family of Siegel cusp forms of varying weights and square-free levels by developing a new kind of relative trace formula involving the Bessel periods and the Rankin-Selberg integrals of Andrianov type on the spectral side. This is a joint work with Masao Tsuzuki.

10:45 – 11:45 Yao Cheng (Tamkang University)

Title: Archimedean Whittaker functions of GL_n via theta lifting

Abstract: In the study of ordinary differential equations, a Whittaker function is a special solution to the Whittaker equation, introduced by Whittaker around 1903. Later, Jacquet (1966–1967) generalized this concept to Whittaker functions associated with reductive groups G over local fields F. The functions studied by Whittaker correspond to the specific case where $G = SL_2$ and $F = \mathbb{R}$.

Nowadays, Whittaker functions play a significant role in both representation theory and number theory. In particular, they are instrumental in the study of Fourier coefficients of automorphic forms. For this purpose, explicit formulas for Whittaker functions are considered indispensable.

Due to its connection with the classical modular forms, the case where $G = GL_n$ and F is Archimedean is particularly interesting and has been studied by several mathematicians for its explicit (recursive) formulas, as well as arithmetic and analytic applications.

In this talk, I will report on an ongoing joint work with Shih-Yu Chen, where we aim to obtain explicit (recursive) formulas for the Whittaker functions associated with every element in the minimal K-type of certain representations, using the local theta lifting of type II dual pairs.

13:15 – 14:15 Bin Xu (Sichuan University)

Title: Concrete Constructions of Automorphic Representations and Central Values of L-Functions

- Abstract: The central values of L-functions play a significant role in number theory and automorphic representation theory. In this talk, we will review some relationships among global packets, automorphic periods, and automorphic L-functions. Then, in the case of PGL(2), we introduce a new approach to demonstrate the existence of different quadratic twists with non-zero central L-values. This approach is based on concrete constructions of automorphic representations. This talk is based on joint work with Baiying Liu.
- 14:30 15:30 Cris Poor (Fordham University)
- Title: Formal series of Jacobi forms
- **Abstract:** We prove for general paramodular level that formal series of scalar Jacobi forms with an involution condition necessarily converge and are therefore the Fourier-Jacobi expansions at the standard 1-cusp of paramodular Fricke eigenforms.

15:45 – 16:45 Siegfried Böcherer (University of Mannheim)

Title: On mod p^m singular vector-valued modular forms (joint work with T.Kikuta)

Abstract: In previous work we established a structure theorem for mod p^m singular scalar-valued Siegel modular forms of degree n, weight k and p-rank r.

As a first step towards a version for vector-valued modular forms we show that the congruence

$$2k - r \equiv 0 \mod (p - 1)p^{m - 1}$$

also holds for the vector-valued case. The main point is to extract a congruence for suitable scalar valued modular forms.

Jan. 21 (Tue.)

9:30 – 10:30 **Ryota Tajima** (Kyushu University)

Title: The *p*-adic constant for mock modular forms associated to CM forms

- Abstract: For a normalized newform $g \in S_k(\Gamma_0(N))$ with complex multiplication by an imaginary quadratic field K, there is a mock modular form F^+ corresponding to g. K. Bringmann, P. Guerzhoy, and B. Kane corrected F^+ to obtain the p-adic modular form by a certain p-adic constant α_g . In addition, they showed that if p is split in \mathcal{O}_K and $p \nmid N$, then $\alpha_g = 0$. In my previous work, the speaker showed that α_g is a p-adic unit for an inert prime p satisfying that $p \nmid 2N$ when dim_{\mathbb{C}} $S_k(\Gamma_0(N)) = 1$. In this talk, the speaker determine the p-adic valuation of α_g for an inert prime p under mild condition, when g has weight 2 and all Fourier coefficients of g are rational integers. I will explain this result.
- 10:45 11:45 Shih-Yu Chen (National Tsing Hua University)
- **Title:** On critical values of tensor product *L*-functions for $GSp_4 \times GSp_4$
- Abstract: Let f and g be elliptic newforms, and consider their Rankin–Selberg L-function $L(s, f \otimes g)$. It is known to Shimura that the algebraicity of the critical values of $L(s, f \otimes g)$ can be expressed in terms of the Petersson norm of f or g. Alternatively, these Petersson norms can be replaced by certain adjoint L-values associated with f or g. In this talk, we present our results on the generalization to the degree 16 tensor product L-function $L(s, F \otimes G)$, where F and G are Siegel cusp eigenforms of degree two. In this case, we conjecture that the algebraicity of the critical values can be expressed as a mixture involving both Petersson norms and adjoint L-values of F or G. We provide a proof of this statement under certain regularity conditions on the weights of F and G.
- 13:15 14:15 Robin Zhang (Massachusetts Institute of Technology)
- Title: *p*-adic Shimura classes and Stark units
- Abstract: The Harris–Venkatesh plus Stark conjecture says that for adjoint Deligne–Serre representations associated to weight-1 cusp forms, the action of the derived Hecke algebra describes Stark units modulo p for all but finitely many primes p. These derived Hecke operators $H^0 \to H^1$ on the cohomology of modular curves are defined using Shimura classes arising from the cover of $X_1(p)$ over $X_0(p)$. I will report on in-progress work to describe p-adic Shimura classes, define derived Hecke operators on completed cohomology, and formulate a similar conjecture for p-adic regulators of Stark units.

14:30 – 15:30 Yukako Kezuka (Kanazawa University)

Title: Non-commutative Iwasawa theory over global function fields

Abstract: Non-commutative Iwasawa theory has emerged as a powerful framework for understanding the deep relation between arithmetic over a large class of p-adic Lie extensions of number fields and special values of complex L-functions, typified by the conjecture of Birch and Swinnerton-Dyer and its generalisations. We will introduce some key conjectures concerning non-commutative Iwasawa theory for elliptic curves over number fields, discuss known results and challenges. We will then explain how some of these conjectures can be proven for abelian varieties over global function fields.

15:45 – 16:45 Ming-Lun Hsieh (National Taiwan University)

Title: Hida families of Yoshida lifts and the Rankin-Selberg convolution

Abstract: This talk is to explain a general framework of our project on the Yoshida congruence and its application to Selmer groups for the Rankin-Selberg convolution. In the algebraic side of this project joint with Palvanna Bharathwaj, we construct non-trivial elements in the Selmer group for the Rankin-Selberg convolution from the congruence between Yoshida lifts and stable forms, the Yoshida congruence. The analytic side is a work with Zheng Liu in progress, where we aim to apply an explicit Furusawa's pull-back formula due to Zheng Liu to obtain non-trivial Yoshida congruence modulo the Rankin-Selberg *L*-values.

Jan. 22 (Wed.)

- 9:30 10:30 (PDT 16:30 17:30, Jan. 21 (Tue.)) (talk given by online via zoom) **Zheng Liu** (University of California, Santa Barbara)
- **Title:** *p*-adic *L*-functions for $GSp(4) \times GL(2)$
- **Abstract:** I'll explain a construction of *p*-adic *L*-functions for $GSp(4) \times GL(2)$ by using Furusawa's integral and the proof of its interpolation formula. I'll describe how local functional equations are used to compute the zeta integrals at *p* and how the archimedean integrals are computed by using Yoshida lifts together with *p*-adic Rankin-Selberg *L*-function and *p*-adic standard *L*-function of Sp(4). I'll also discuss its applications in studying congruences for Yoshida lifts.
- 10:45 11:45 Chris Williams (University of Nottingham)
- **Title:** Non-vanishing of *p*-refined Friedberg–Jacquet integrals
- **Abstract:** Let π be an automorphic representation of $G = \operatorname{GL}(2n)$, and let $H = \operatorname{GL}(n) \times \operatorname{GL}(n)$ diagonally embedded. In 1993, Friedberg–Jacquet studied period integrals for π over H, and showed that they are non-vanishing only when π admits a Shalika model, or equivalently (thanks to subsequent work of Asgari–Shahidi) π is a global functorial transfer from $\operatorname{GSpin}(2n+1)$.

I will discuss joint work with Daniel Barrera and Andrew Graham, where we give a local 'p-refined' analogue of this result, arising from the study of p-adic L-functions and p-adic families. When studying p-adic variation, one is led naturally to 'P-twisted' local Friedberg–Jacquet integrals at p, attached to p-refined eigenvectors in π_p and parametrised by standard parabolics P in G. I will describe a criterion for non-vanishing of this P-twisted local integral (and hence of p-adic L-functions constructed via Shalika methods) in terms of being a local transfer from GSpin(2n+1) at P-parahoric level.

The proof for this result (and motivation for a conjectural generalisation) goes through parabolic eigenvarieties for GL(2n). In particular it uses GL(2n)-analogues of conjectures of Calegari–Mazur and Ash–Pollack–Stevens on the existence of classical families of automorphic forms (for Bianchi modular forms and GL(3) respectively).

13:15 – 14:15 Zhiyu Zhang (Stanford University)

Title: Asai *L*-functions and twisted arithmetic fundamental lemma

Abstract: Let E/F be a CM quadratic extension of number fields. We will discuss relations between Asai L-functions for $GL_{n,E}$, special cycles on locally symmetric spaces, and period integrals involving Weil representations, in the context of (arithmetic) twisted Gan-Gross-Prasad conjecture and Beilinson-Bloch-Kato conjecture. Descending everything to maximal totally real subfields E_0/F_0 via hermitian spaces and applying relative trace formulas, we encounter unitary Shimura varieties and their local analogs. Interestingly, we find the use of certain "Shimura cycle" for non-reductive groups. We will establish a local relation (a new arithmetic fundamental lemma) between arithmetic and derived orbital integrals, which are useful for proving global relations.

14:30 – 15:30 Yu-Sheng Lee (University of Michigan)

Title: Congruences of automorphic forms and Euler systems

Abstract: An Euler system is a collection of Galois cohomology classes satisfying certain norm relations, extensively used in studying the structure of Selmer groups since Kolyvagin's work on Heegner points on modular elliptic curves. On the other hand, Ribet's method and its generalizations show that when there are congruences between automorphic representations associated with Galois representations, one can often deform the Galois representation into an essentially irreducible family and obtain nontrivial Galois cohomology classes. In this talk, I will explain Urban's general framework for constructing Euler systems, which combines a systematic application of Ribet's method with input from *p*-adic local Langlands. I will then present a specific case involving the construction of anticyclotomic Euler systems associated with Hecke characters of CM fields and discuss their applications to Iwasawa theory.

15:45 – 16:45 Hiraku Atobe (Kyoto University)

Title: Local Intertwining Relations

Abstract: The local intertwining relations are the second main local theorem in Arthur's theory of endoscopic classification. They are identities that give precise information about the action of normalized intertwining operators on parabolically induced representations. In this talk, I will explain the tempered generic case, the untwisted case for general linear groups, and the co-tempered case for quasi-split classical groups. These are required as the seed cases in the inductive proof of the endoscopic classification for quasi-split classical groups due to Arthur and Mok. This talk is based on a joint work with Atsushi Ichino (Kyoto), Wee Teck Gan (Singapore), Alberto Minguez (Vienna), Tasho Kaletha (Bonn), and Sug Woo Shin (UC Berkeley).

Jan. 23 (Thu.)

- 9:30 10:30 (PDT 16:30 17:30, Jan. 22 (Wed.)) (talk given by online via zoom) Francesc Castella (University of California, Santa Barbara)
- **Title:** Congruences with Eisenstein series and Iwasawa main conjectures
- Abstract: In a landmark paper from 2005, Bertolini-Darmon introduced an approach to Kolyvagin's methods based on level-raising congruences, leading to a proof of one divisibility in the coherent/definite anticyclotomic Iwasawa main conjecture for p-ordinary elliptic curves under some hypotheses. Since then, several authors (including Howard, Pollack-Weston, Chida-Hsieh, Liu-Tian-Xiao-Zhang-Zhu, and Sweeting, among others) have refined and vastly generalized the Bertolini-Darmon level-raising method in different directions. In this talk I will outline a proof, in joint work in progress with Raul Alonso and Kim Tuan Do, of the coherent anticyclotomic Iwasawa main conjecture for p-ordinary elliptic curves using a different circle of ideas, and including the first general results for Eisenstein primes p.

10:45 – 11:45 Shilin Lai (University of Texas at Austin)

Title: Non-vanishing of Eisenstein series on U(2,1)

Abstract: Using CM points instead of Fourier-Jacobi expansions, we give a different proof of Hsieh's result that a specific Klingen Eisenstein series is non-zero mod p. This talk will focus on the automorphic period calculations. This is joint work with Raul Alonso and Ashay Burungale.

14:00 – 15:00 Hiro-aki Narita (Waseda University)

Title: Köcher principle for quaternionic discrete series

Abstract: Usually we impose the moderate growth property on the defining conditions of automorphic forms. This condition makes automorphic forms reasonable research targets as is indicated by Harish-Chandra's established theory, e.g. finite dimensionality for automorphic forms (given analytic property and automorphy). When we think of holomorphic automorphic forms of multi-variables, this defining condition can be removed, which we call "Köcher principle". Baily and Borel provided a geometric proof of this in their well-known work on compactifications of modular varieties, i.e. we can say that this phenomenon is interesting in terms of geometry as well as automorphic forms. In this talk we prove that the same principle holds for quaternionic modular forms in the sense of Aaron Pollack, except for the exceptional group of type G_2 and special orthogonal group of SO(4, N). We should note that these modular forms are real analytic but non-holomorphic. The method of the proof is the Fourier-Jacobi expansion for automorphic forms generating quaternionic discrete series representations. Our method explains why one is not able to prove the Köcher principle for the cases of G_2 and the special orthogonal groups mentioned above. Our result can be viewed as a generalization of the previous result for the case of the quaternion unitary group Sp(1, q).

15:15 – 16:15 Tomoyoshi Ibukiyama (Osaka University)

- **Title:** Solutions of certain holonomic system of rank 8 arising from differential operators on Siegel modular forms
- **Abstract:** For a certain holonomic system of three variables of rank 8 with certain parameters, we write all 8 solutions explicitly. This system is a generalization of the Gegenbauer differential equations and arises from a theory of differential operators on Siegel modular forms. This is a part of long lasting joint work with Don Zagier.
- 16:15 16:30 Announcement for the next year
- 18:00 20:00 **Banquet**

Jan. 24 (Fri.)

9:30 – 10:30 Masahiro Watanabe (Kyoto University)

Title: Ramified Siegel Series: Difference Equations and Hypergeometric Identities

Abstract: The ramified Siegel series appears as a p-Euler factor of the Siegel-Eisenstein series and plays an important role, especially in recent research. Gunji's work suggests that the ramified Siegel series corresponding to U(p)-eigenfunctions satisfies a simple recursion formula. However, deriving this formula involves solving a specific difference equation, which is a key bottleneck. In this talk, I will discuss the derivation of this difference equation and its significance. Furthermore, by taking the basis of the space of ramified Siegel series as spherical functions, and comparing the coefficients of the intertwining operator, we recently derived a new equality for hypergeometric series, specifically, an addition formula for the q-Krawtchouk polynomial. I will also present these recent developments.

10:45 – 11:45 Keiichi Gunji (Chiba Institute of Technology)

Title: On the Fourier coefficients of Siegel Eisenstein series of an odd prime level

Abstract: Siegel Eisenstein series are one of the basic objects in the theory of Siegel modular forms, however the explicit forms of their Fourier coefficients are not yet known. The Fourier coefficient has an Euler product expression, whose p-factor for a prime p is called the Siegel series. In the full modular case, the famous paper by Katsurada gives a recursion formula of the Siegel series, to get an explicit formula. For that he used two main ingredients, one is the inductive relation and the other is the functional equation. Our interest is to give an explicit formula for the Siegel Eisenstein series with level and characters. The Euler p-factor with p dividing the level is called the ramified Siegel series. Recently the speaker found the functional equation of Siegel Eisenstein series of level p, to get the functional equations of ramified Siegel series. Moreover M. Watanabe found the inductive relations of the ramified Siegel series. Combining them, we succeeded to get recursion formulas of ramified Siegel series for an odd prime p by the same arguments of Katsurada.