

Theta Correspondence

9 September 2024

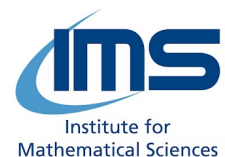
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Department of Mathematics
Faculty of Science



Program Monday

- 10:00am – 11:45am Discussion and collaboration @ Mathematics Department Lounge
- 11:45am - 1:30pm Lunch
- 1:30pm – 2:30pm **Automorphic functional on the space of the minimal representation**
Nadya Gurevich
- 2:30pm – 3:00pm *Break @ Mathematics Department Lounge*
- 3:00pm – 4:00pm **An Extension of the conjecture of Prasad to quaternionic dual pairs**
Hiroataka Kakuham

Monday talks are held in S17, Room 04-06 (level 4, Colloquium Room)

For directions to S17, refer to <https://www.math.nus.edu.sg/contact-us/where-we-are/>

Program Tuesday

9:30am – 10:30am	Theta correspondence over finite fields and its geometrization Jia-Jun Ma
10:30am - 11:00am	<i>Break @ Mathematics Department Lounge</i>
11:00am – 12noon	Finite theta correspondence, unipotent support and orbit correspondence <i>Shu-Yen Pan</i>
12noon – 2:30pm	<i>Lunch</i>
2:30pm – 3:30pm	Local new forms for unramified even unitary groups <i>Hiraku Atobe</i>
3:30pm-4:00pm	<i>Break @ Mathematics Department Lounge</i>
4:00pm-5:00pm	The local theta correspondence: an infomercial talk Shuichiro Takeda

Tuesday talks are held in S17, Room 04-06 (level 4, Colloquium Room)

For directions to S17, refer to <https://www.math.nus.edu.sg/contact-us/where-we-are/>

Program Wednesday

10:00am – 11:30am	Discussion and collaboration @ Mathematics Department Lounge
11:30am – 1:30pm	Lunch
1:30pm – 2:30pm (S17, Room 04-04)	Theta correspondence and simple factors of global Arthur parameters <i>Chenyan Wu</i>
2:30pm – 3:00pm	<i>Break @ Mathematics Department Lounge</i>
3:00pm – 4:00pm (S17, Room 04-06)	Some theorems in representation theory of classical Lie groups <i>Binyong Sun</i>

For directions to S17, refer to <https://www.math.nus.edu.sg/contact-us/where-we-are/>

Program Thursday

10:00am – 11:30am	Discussion and collaboration @ Mathematics Department Lounge
11:30am - 1:30pm	Lunch
1:30pm – 2:30pm	Homological theta lifting and applications <i>Rui Chen</i>
2:30pm – 3:00pm	<i>Break @ Mathematics Department Lounge</i>
3:00pm – 4:00pm	Degenerate principal series representations and real double flag varieties of finite type Kyo Nishiyama

Thursday talks are held in S17, Room 04-06 (level 4, Colloquium Room)

For directions to S17, refer to <https://www.math.nus.edu.sg/contact-us/where-we-are/>

Program Friday

Friday has been reserved for discussion and collaboration. Please feel free to use the Mathematics department lounge.

Abstracts

Hiraku Atobe

Title: Local newforms for unramified even unitary groups

Abstract: In 1973, Casselman established the theory of local newforms of GL_2 , which bridges a gap between elliptic modular forms and automorphic representations of GL_2 over the rational fields. In this talk, we introduce compact open subgroups of quasi-split even unitary groups over p -adic field for each even non-negative integers, and explain the theory of local newforms for irreducible tempered generic representations with a certain condition on the central characters. To do this, we introduce the Fourier-Jacobi modules of irreducible representations.

Rui Chen

Title: Homological theta lifting and applications

Abstract: Following the idea of Adams, Prasad and Savin, one can consider the Ext-analogues of theta lifting. In this talk I will discuss some recent works on this direction, give some applications and exhibit some interesting phenomenon related to local L-functions.

Nadya Gurevich

Title: Automorphic functional on the space of the minimal representation

Abstract: The minimal representation Π_v on a p -adic group $G(F_v)$ often affords a model on the space of functions on a p -adic variety X . A maximal parabolic subgroup, whose unipotent radical is either abelian or Heisenberg, acts on functions in this model by explicit geometric formulas. Such model is important in establishing local theta correspondence for dual pairs in G .

Local models give rise to a global model of the representation Π of the group of adelic points $G(A)$.

The representation Π can be realized automorphically, as residue of some degenerate Eisenstein series.

The goal of the talk is to write an automorphic functional on the global model of Π for split groups of type D_n and E_n , stressing the main term and the boundary terms, and their recursive nature.

Hiroataka Kakuhamama

Title: An extension of the conjecture of Prasad to quaternionic dual pairs

Abstract:

In this talk, I will formulate a conjecture describing the behavior of the internal structures of L-packets under the local theta correspondence for quaternionic dual pairs, which extends the conjecture of Prasad. To do this, we use the local Langlands conjecture for rigid inner twists. Moreover, I will explain the proof in the Archimedean case. In this case, a description of theta correspondence has already been given in terms of certain parameters that are extensions of Harish-Chandra parameters. Thus, the basic strategy of the proof is to translate them in terms of Langlands parameters.

Jia-Jun Ma

Title: Theta correspondence over finite fields and its geometrization

Abstract: Let G_1 and G_2 be a reductive dual pair. The Harish-Chandra series of G_1 and G_2 correspond to each other under the theta correspondence. With Congling Qiu and Jialiang Zou, we explicitly computed this correspondence by analyzing the relevant Hecke algebra bimodules and applying a Tits deformation argument. This provides another proof of Aubert-Michel-Rouquier's conjecture, which was first proved by Shu-Yen Pan. In this talk, we will discuss a geometrization of the picture. Consequently, we obtained a new description of the theta correspondence in terms of the Springer theory. This is an ongoing joint work with Congling Qiu, Jialiang Zou, and Zhiwei Yun.

Kyo Nishiyama

Title: Degenerate principal series representations and real double flag varieties of finite type

Abstract: Let $G = \mathrm{Sp}_{\{2n\}}(\mathbb{R})$ (or $U(n, n)$) and P a maximal parabolic subgroup stabilizing a Lagrangian subspace (Siegel parabolic subgroup). Let $H \simeq \mathrm{GL}_n(\mathbb{R})$ be a Levi subgroup of P , which is also a symmetric subgroup of G . We choose a parabolic subgroup $Q \subset H$.

Let $X = H/Q \times G/P$ be a real double flag variety on which H acts diagonally. We are interested in the geometry of X . For example, there are only finitely many H -orbits on X , so that it is of finite type.

In this talk, we introduce integral kernel operators which intertwine degenerate principal series of $G = \mathrm{Sp}_{\{2n\}}(\mathbb{R})$ and $H = \mathrm{GL}_n(\mathbb{R})$. For the kernel of the operator, we use relative invariants associated with a prehomogeneous vector space naturally arising from the geometry of X . The integrals have complex parameters, and at certain integral parameters we get finite dimensional representations as images.

Shu-Yen Pan

Title: Finite theta correspondence, unipotent support and orbit correspondence

Abstract: In this talk we show that if two irreducible representations are paired by the theta correspondence for a finite symplectic/orthogonal dual pair, then the unipotent supports of their Alvis-Curtis duals are paired by the orbit correspondence. Moreover, if the orthogonal group in the dual pair is even and two representations are special unipotent, we show that the reverse implication also holds.

Binyong Sun

Title: Some theorems in the representation theory of classical Lie groups

Abstract: After introducing some basic notions in the representation theory of classical Lie groups, I will explain three results in this theory: the multiplicity one theorem for classical groups, the conservation relation for local theta correspondence, and the non-vanishing hypothesis at infinity for Rankin-Selberg convolutions. Some relevant or consequent results will also be explained.

Shuichiro Takeda

Title: The local theta correspondence: an infomercial talk

Abstract: This is an infomercial talk on the forthcoming book on the local theta correspondence authored by W.T. Gan, S. Kudla, and the speaker. In this talk, I will give an overview of the local theta correspondence, especially focusing on what is in the book.

Chenyan Wu

Title: Theta correspondence and simple factors of global Arthur parameters

Abstract: Let π be a cuspidal automorphic representation of a classical group or a metaplectic group. We show an exact relation between two invariants associated to π , one being the lowest occurrence index of π with respect to theta lifts and the other the location of the maximal positive pole of an Eisenstein series attached to π . As an application, we use this relation to show that certain global Arthur packets cannot contain cuspidal automorphic representations.