

Oppenheim Lecture and Workshop on Representation Theory & Automorphic Forms

(held in conjunction with the Oppenheim Lecture)

Date: *Tuesday 27 January to Thursday 29 January 2015*

Venue: *Institute for Mathematical Sciences (IMS), Auditorium
National University of Singapore (27 January & 28 January morning)*

*Department of Mathematics, Block S17, Seminar Room 1 (#04-06)
National University of Singapore (28 January afternoon & 29 January)*

*Jointly
organized by*



Department of Mathematics
Faculty of Science



Programme

Tuesday, 27 January 2015

Venue: IMS Auditorium

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|-------------------|--|
| 9.30am – 10.30am | A refined notion of arithmetically equivalent number fields
Dipendra Prasad, Tata Institute of Fundamental Research |
| 10.30am - 11:00am | Refreshments |
| 11:00am – 12:00pm | Speculations on the Langlands correspondence
Chung Pang Mok, Purdue University and Morningside Center of Mathematics |
| 2.00pm – 3.00pm | Remarks on non-linear Fourier transforms
Wen-Wei Li, Chinese Academy of Sciences |
| 3.00pm – 3.30pm | Refreshments |
| 3.30pm – 4.30pm | On the geometric construction of the test function related to local L-factor
Ngo Bao Chau, University of Chicago and Vietnam Institute for Advanced Study in Mathematics |

Wednesday, 28 January 2015

Venues: 9am to 12pm at IMS Auditorium / 2pm onwards at Department of Mathematics, Seminar Room 1 (#04-06)

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|-------------------|---|
| 9.30am – 10.30am | On packets for inner forms of $SL(N)$
Kaoru Hiraga, Kyoto University |
| 10.30am - 11:00am | Refreshments |
| 11:00am – 12:00pm | Twisted Automorphic Descents and Global Vogan Packets on Special Odd Orthogonal Groups
Lei Zhang, NUS |
| 12.00pm | Lunch reception at IMS |
| 2.00pm – 3.00pm | Oppenheim Lecture
On the average rank of elliptic curve over function field
Ngo Bao Chau, University of Chicago and Vietnam Institute for Advanced Study in Mathematics |
| 3.00pm – 4.00pm | Refreshments
Oppenheim Lecture and Workshop dinner (time and venue to be advised) |

Thursday, 29 January 2015

Venue: Department of Mathematics, Seminar Room 1 (#04-06)

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|-------------------|--|
| 9.30am – 10.30am | Langlands parameters for covering groups
Martin Weissman, Yale-NUS |
| 10.45am – 11.45am | Twisted geometric Langlands program: setting and first results
Sergey Lysenko, Institut Elie Cartan Nancy |
| 12.00pm – 1.00pm | Mixed motives in Shimura varieties and automorphic forms
Arvind Nair, Tata Institute of Fundamental Research |

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Abstract

Oppenheim Lecture

On the average rank of elliptic curve over function field

Ngo Bao Chau, University of Chicago and Vietnam Institute for Advanced Study in Mathematics

Following ground breaking work of Bhargava and Shankar on the average rank of elliptic curves over \mathbb{Q} , we give a proof of similar result valid over on function fields. Our proof is based on a geometric setup very similar to the fundamental lemma.

Workshop On Representation Theory & Automorphic Forms

A refined notion of arithmetically equivalent number fields

Dipendra Prasad, Tata Institute of Fundamental Research

Number fields with the same zeta functions have been of interest for a long time, inspiring similar constructions in a variety of context, the most common of which is to construction of Riemannian manifolds with the same spectrum. This is done via a certain construction with finite groups. By a variant of this, we construct examples of number fields which are not isomorphic but for which their adelic groups, ideles, and idele class groups are isomorphic. We also construct examples of projective algebraic curves which are not isomorphic but whose Jacobians are.

Speculations on the Langlands correspondence

Chung Pang Mok, Purdue University and Morningside Center of Mathematics

In this talk we give a selected overview of the major results on the Langlands correspondence, and suggest some open questions as possibilities for future development.

Remarks on non-linear Fourier transforms

Wen-Wei Li, Chinese Academy of Sciences

Braverman and Kazhdan proposed certain "non-linear" versions of the Fourier transform in order to generalize Godement-Jacquet theory to more general L-functions, which reappear in L. Lafforgue's recent approach to functoriality. This is largely conjectural and relies upon a suitable notion of Schwartz space of functions on the reductive group in question. I will talk about several alternative viewpoints on these transforms that might help to clarify the big picture.

On the geometric construction of the test function related to local L-factor

Ngo Bao Chau, University of Chicago and Vietnam Institute for Advanced Study in Mathematics

We will explain the relation between the test function giving rise to unramified local L-factor and singularity in the formal arc space of certain algebraic monoid.

On packets for inner forms of $SL(N)$

Kaoru Hiraga, Kyoto University

I will describe a local A-packets for inner forms of $SL(N)$. The "correct" S-groups of the A-parameters on inner forms of $SL(N)$ are not generally abelian nor products of $Z/2Z$. (So the S-groups of this case is different from the one for classical groups.) I will describe the A-packets using the S-group and the endoscopy. This is a joint work with H.Saito.

Abstract

Twisted Automorphic Descents and Global Vogan Packets on Special Odd Orthogonal Groups

Lei Zhang, National University of Singapore

In this talk, we will introduce a new method called the twisted automorphic descent, which extends the automorphic descent method of Ginzburg, Rallis and Soudry from quasisplit classical groups to much more general classes of classical groups. The goal of this method is to construct actual models for cuspidal automorphic representations in global Arthur packet with generic global Arthur parameters. As a special case, this new method recovers the classical Jacquet-Langlands correspondence. If time is permitted, we will discuss with some details for special odd orthogonal groups of five variables. This is a joint project with Prof. Dihua Jiang.

Langlands parameters for covering groups

Martin Weissman, Yale-NUS College

I will describe Langlands parameters for covering groups and related results and predictions in representation theory. The class of covering groups uses a framework of Brylinski and Deligne, and includes all covers of quasisplit groups over local and global fields. The Langlands parameters include a few novel features: a "Galois gerbe" used to twist the L-group, and a "metaGalois group" whose representations have independent arithmetic interest.

Twisted geometric Langlands program: setting and first results

Sergey Lysenko, Institut Elie Cartan Nancy

I will present a setting for a geometric version of the Weissman-Langlands program (in the nonramified case). It can be seen as a part of the quantum geometric Langlands program. I will describe the twisted version of the Satake equivalence giving the metaplectic dual group, and then give an overview of some recent results on the geometric Eisenstein series in this setting.

Mixed motives in Shimura varieties and automorphic forms

Arvind Nair, Tata Institute of Fundamental Research

The cohomology of noncompact Shimura varieties is a source of interesting extensions between pure motives/Galois representations. We will describe a general approach to understanding these extensions in terms of automorphic forms and show how to use it to make some new computations of extension classes for unramified mixed Tate motives appearing in the cohomology of $\mathrm{Sp}(2g, \mathbb{Z})$.
