

**Programme on
“Arithmetic Geometry and Automorphic Representations”**

April 7 - May 29, 2015

organized by

Stephen S. Kudla (U Toronto), Michael Rapoport (U Bonn), Joachim Schwermer (U Vienna)

Workshop II, Part 3, on

“Automorphic Forms - Geometry and Arithmetic”

May 18 - 22, 2015

• **Tuesday, May 19, 2015**

10:00 – 11:00 **Bruno Klingler**

Symmetric differentials and ball quotients

11:00 – 11:30 *coffee / tea break*

11:30 – 12:30 **Neven Grbac**

Eisenstein series for unitary groups in view of cohomological applications

12:30 – 14:30 *lunch break*

14:30 – 15:30 **Arvind Nair**

Mixed motives in Shimura varieties and automorphic forms

• **Wednesday, May 20, 2015**

10:00 – 11:00 **Ben Howard**

Orthogonal Shimura varieties and Faltings heights of CM abelian varieties

11:00 – 11:30 *coffee / tea break*

11:30 – 12:30 **Kai-Wen Lan**

Vanishing theorems for coherent automorphic cohomology

12:30 – 14:30 *lunch break*

14:30 – 15:30 **Sophie Morel**

Pseudo-representations for general groups

- **Thursday, May 21, 2015**

10:00 – 11:00 **Erez Lapid**

Irreducibility criteria for induced representations

11:00 – 11:30 *coffee / tea break*

11:30 – 12:30 **Freydoon Shahidi**

On equality of local factors for a general representation of $GL(n, \mathbb{C})$

All talks take place at the ESI, Boltzmann Lecture Hall!

Abstracts

Bruno Klingler (U Paris, Jussieu, France)

Symmetric differentials and ball quotients

In this talk I will describe the relation between the existence of symmetric differentials on a smooth complex projective variety X and the representation theory of its (topological) fundamental group. Computing symmetric differentials in terms of automorphic forms, one obtains new rigidity results for certain congruence complex hyperbolic lattices.

Neven Grbac (University of Rijeka, Croatia)

Eisenstein series for unitary groups in view of cohomological applications

Automorphic cohomology of a reductive group may be expressed in terms of the relative Lie algebra cohomology of the space of automorphic forms. To determine the cohomology explicitly one needs the structure of spaces of automorphic forms, which is closely related to the analytic properties of the Eisenstein series. However, due to cohomological arguments, it is not necessary to understand Eisenstein series completely. Having this in mind, we present in this talk the case of unitary groups. It is a joint work with Joachim Schwermer.

Arvind Nair (Tata Institute Mumbai, India)

Mixed motives in Shimura varieties and automorphic forms

The cohomology of noncompact Shimura varieties is well-known to be a source of interesting extensions between pure motives. We will describe a general approach relating these extensions to automorphic forms and show how to use it to make some specific new computations of extension classes (in mixed Hodge structures) for mixed Tate motives appearing in the cohomology of $Sp(2g, \mathbb{Z})$. In particular, we will show how to compute the stable primitive cohomology of the minimal compactification of the moduli space of abelian varieties, as a rational mixed Hodge structure.

Ben Howard (Boston College, USA)

Orthogonal Shimura varieties and Faltings heights of CM abelian varieties

A conjectural formula of Colmez expresses Faltings heights of CM abelian varieties in terms of derivatives of Artin L-functions. I'll discuss new results in the direction of Colmez's conjecture, obtained from calculations of arithmetic intersections on the integral models of orthogonal Shimura varieties. This is joint work with F. Andreatta, E. Goren, and K. Madapusi Pera.

Kai-Wen Lan (University of Minnesota, USA)

Vanishing theorems for coherent automorphic cohomology

I will report on certain vanishing theorems for the coherent automorphic cohomology of (toroidal compactifications of) locally symmetric varieties, and show some examples. If time permits, I will also explain how to algorithmically determine the vanishing degrees in all cases.

Sophie Morel (Princeton University, USA)

Pseudo-representations for general groups

In his recent paper on the global Langlands correspondence for function fields, V. Lafforgue used a notion of pseudo-representations in general groups with coefficients in a field. I'll explain how to extract a pseudo-representation functor from this and give some of its properties.

Erez Lapid (Weizmann Institute, Rehovot, Israel)

Irreducibility criteria for induced representations

We give combinatorial conditions for the irreducibility of parabolic induction of certain representations of the general linear group over a non-archimedean (not necessarily commutative) local field. Joint work with Alberto Minguez.

Freydoon Shahidi (Purdue University, USA)

On equality of local factors for a general representation of $GL(n, \mathbb{C})$

In this talk I will speculate how the techniques used by Cogdell, Tsai and myself in the cases of exterior and symmetric square factors for $GL(n)$ can be generalized to prove the equality of Artin factors with a set of analytic factors satisfying a number of axioms through the local Langlands correspondence. I will discuss the multiplicativity axiom in particular through some examples and mention cases of exterior cubes for $GL(n)$, $n = 6, 7, 8$, where these factors already exist. General examples should eventually come from the program of Ngo et al which was initiated by Braverman and Kazhdan, for example.