

# Workshop : “Arithmetic of automorphic forms and special $L$ -values”

Durham, 26<sup>th</sup> and 27<sup>th</sup> of March, 2018.

## Programme

All talks will take place in CM221, in the Department of Mathematical Sciences.

### Monday, 26<sup>th</sup> of March

- 9:30 - 10:30, Jacques Tilouine: *Integral period relations and special values of the twisted adjoint  $L$  function*,
- 10:30-11:00 Coffee/Tea Break
- 11:00-12:00, Tobias Berger: *Paramodularity of abelian surfaces*,
- 12:00-13:00, Lunch Break
- 13:00-14:00, Alexei Panchishkin: *Admissible measures for Hermitian modular forms*,
- 14:00-15:00, Jolanta Marzec: *On algebraic properties of  $L$ -functions attached to Jacobi forms of higher index*
- 15:00-15:30 Coffee/Tea Break
- 15:30-16:30 Short talks session
  1. Francesca Bianchi :  *$p$ -adic heights in families of elliptic curves and  $p$ -adic  $L$ -functions*
  2. Rob Little: TBA
  3. Salvatore Mercuri : TBA
  4. Andreea Mocanu : *Fourier coefficients of Jacobi-Eisenstein series*
  5. Di Zhang: *Theta lifting of Bianchi modular forms to Siegel modular forms*

### Tuesday, 27<sup>th</sup> of March

- 9:30 - 10:30, Jens Funke: *Indefinite theta series*
- 10:30-11:00 Coffee/Tea Break
- 11:00-12:00, Claudia Alfes-Neumann: *Shintani theta lifts of harmonic Maass forms*,
- 12:00-13:00, Lunch Break
- 13:00-14:00, Fredrik Stromberg : *On computation of special values for twisted Shimizu  $L$ -functions*,
- 14:00-14:30 Coffee/Tea Break
- 14:30-15:30, Michael Neururer: *Mahler measures of elliptic surfaces*

## Abstracts

1. J. Tilouine, Integral period relations and special values of the twisted adjoint L function,

In a joint work with E. Urban, we establish integral period relations for the quadratic base change of a modular form. These imply conjectures by Hida (1997) for the special value of the twisted adjoint L function of a modular form. In the real quadratic case, our result is complete; in the imaginary quadratic case, it is partial and raises an interesting question.

2. T. Berger, Paramodularity of abelian surfaces,

I will report on joint work with Kris Klosin on the modularity of Galois representations  $G_{\mathbf{Q}} \rightarrow \mathrm{GSp}_4(\mathbf{Q}_p)$  that are residually reducible, namely, the proof of the paramodularity of a particular abelian surface over  $\mathbf{Q}$  with a rational torsion point of order  $p$ . In addition, I plan to outline a strategy using congruences for Saito-Kurokawa lifts to prove this more generally.

3. A. Panchishkin, Admissible measures for Hermitian modular forms,

For a prime  $p$  and a positive integer  $n$ , the standard zeta function  $L_F(s)$  is considered, attached to an Hermitian modular form  $F = \sum_H A(H)q^H$  on the Hermitian upper half plane  $\mathcal{H}_m$  of degree  $n$ , where  $H$  runs through semi-integral positive definite Hermitian matrices of degree  $n$ , i.e.  $H \in \Lambda_m(\mathcal{O})$  over the integers  $\mathcal{O}$  of an imaginary quadratic field  $K$ , where  $q^H = \exp(2\pi i \mathrm{Tr}(HZ))$ . Analytic  $p$ -adic continuation of their zeta functions constructed by A. Bouganis in the ordinary case, is extended to the admissible case via growing  $p$ -adic measures. Previously this problem was solved for the Siegel modular forms. Main result is stated in terms of the Hodge polygon  $P_H(t) : [0, d] \rightarrow \mathbb{R}$  and the Newton polygon  $P_N(t) = P_{N,p}(t) : [0, d] \rightarrow \mathbb{R}$  of the zeta function  $L_F(s)$  of degree  $d = 4n$ . Main theorem gives a  $p$ -adic analytic interpolation of the  $L$  values in the form of certain integrals with respect to Mazur-type measures.

4. J. Marzec, On algebraic properties of L-functions attached to Jacobi forms of higher index,

Jacobi forms, though closely related to Siegel modular forms, are defined on a non-reductive group and thus do not easily fit in the Langlands framework. Nevertheless, it turns out that their standard L-function does satisfy good analytic and algebraic properties. During the talk we will focus on the latter and put more light on the related challenges, but necessary analytic results will be also mentioned. The results that will be presented are the effect of joint work with Thanasis Bouganis.

5. J. Funke, Indefinite theta series

In this talk, we discuss recent developments in the construction of theta series associated to indefinite quadratic forms from a geometric point of view. This is joint work with Steve Kudla.

6. C. Alfes-Neumann, Shintani theta lifts of harmonic Maass forms,

In this talk we define a Shintani lift for harmonic Maass forms. We show that it maps weight  $2k + 2$  harmonic Maass forms to harmonic Maass forms of weight  $3/2 + k$  and describe its Fourier coefficients in terms of traces of CM values and regularized cycle integrals of the input harmonic Maass forms. Moreover, we explain some applications of this construction.

7. F. Stromberg , On computation of special values for twisted Shimizu L-functions,

It is well-known that the parabolic term in the standard dimension formula for holomorphic modular forms for the modular group can be expressed using the Riemann zeta function evaluated at  $s=-1$ . In the analogue formula for Hilbert modular forms the zeta function which appear is the so-called Shimizu L-function. In the case of a real quadratic field formulas for evaluating special values of this function was obtained by Siegel. In this talk I will discuss recent progress on computations of special values of a twisted version of the Shimizu L-function which appears in dimension formulas for vector-valued Hilbert modular forms. This is joint work with Michalis Neururer.

8. M. Neururer, Mahler measures of elliptic surfaces,

The (logarithmic) Mahler measure of a polynomial  $P$  in  $n$  variables is defined as the mean of  $\log|P|$  restricted to the real  $n$ -torus. In 1997 Deninger noticed a remarkable connections between the Mahler measure of a polynomial and period integrals of the associated algebraic variety. When  $P$  defines certain elliptic curves these period integrals are related to  $L$ -values by Beilinson's conjectures. In the following years many conjectured relations between Mahler measures of polynomials defining elliptic curves and the  $L$ -values (at  $s = 2$ ) of these curves were proved. In my talk I will give an overview of this topic and discuss my current joint work with François Brunault, where we study the Mahler measure of a polynomial defining a  $K3$ -surface and relate it to the  $L$ -value (at  $s = 3$ ) of the surface.