ARITHMETIC GEOMETRY DAYS

- Date and venue: November 12 - 13 at Dept. of Mathematical Sciences, University of Copenhagen. All talks take place in Auditorium 10.

1. Schedule

1.1. Thursday, November 12.

- 10:00 - 11:00 J.-B. Bost

- 11:00 - 11:30 Coffee

- 11:30 - 12:30 D. Petersen

- 12:30 - 14:00 Lunch

- 14:00 - 15:00 S. Schroeer

- 15:00 - 15:15 Break

- 15:15 - 16:15 S. Tanimoto

- 16:15 - 16:45 Break

- 16:45 - 17:45 K. Hulek

- 19:00 Dinner at B'India Triangeln.

1.2. Friday, November 13.

- 09:00 - 10:00 G. Wiese

- 10:00 - 10:30 Coffee

- 10:30 - 11:30 M. Westerholt-Raum

- 11:30 - 11:45 Break

- 11:45 - 12:45 M. Stoll

2. ABSTRACTS

2.1. **Martin Westerholt-Raum.**

- Title: *Generating functions of non-critical L-values.*

- Abstract: Critical L-values admit a generating series whose transformation properties are completely understood: Period polynomials. After Manin's result about rational linear realations of periods, they were introduced systematically in a paper by Kohnen and Zagier. As opposed to the critical ones, the arithmetic of non-critical L-values is not very well understood, which is basically because they are expected to correspond to regulators in a geometric picture. Using techniques from the theory of harmonic weak Maass forms, it is possible to describe their generating series in analogy with period polynomials. We discuss the resulting concept of "mock period functions".

2.2. **Klaus Hulek.**

- Title: *Intermediate Jacobians of cubic threefolds and their degenerations.*

- Abstract: Cubic threefolds have played an important role in algebraic geometry ever since Clemens and Griffiths showed that these are unirational but not rational varieties. The proof of Clemens and Griffiths relies on a careful analysis of the intermediate Jacobian. The map which associates to a cubic threefold X its intermediate Jacobian $IJ(X)$ defines an injective map from the GIT moduli space of smooth cubics to the moduli space A_5 of principally polarized abelian 5-folds. In this paper we want to investigate the behaviour of this map when the cubic threefold acquires singularities. The main result is that the intermediate Jacobian map extends to a regular morphism $\overline{IJ} : \widetilde{M} \to A_5^{\mathrm{Vor}}$ from the wonderful blow-up of the GIT moduli space of cubic threefolds to the second Voronoi compactification of A_5. This is joint work with S. Casalaina-Martin, S. Grushevsky and R. Laza.

2.3. **Stefan Schroeer.**

- Title: *Wild quotient singularities.*

- Abstract: We introduce and analyse a class of wild quotient singularities in arbitrary characteristics and dimensions, which generalizes the wild quotient surface singularities in characteristic two of Artin. This is joint research with Dino Lorenzini.

2.4. **Michael Stoll.**

- Title: *Uniform bounds for the number of rational points on curves of small Mordell-Weil rank.*

- Abstract: We show that there is a bound N(d,g,r) for the number of K-rational points on curves C of genus g when the degree of the number field K is d and the Mordell-Weil rank r of the Jacobian of C is at most g-3. The proof uses an extension of the method of Chabauty-Coleman, based on p-adic integration on (p-adic) disks and annuli covering the p-adic points of the curve. Our original result was for hyperelliptic curves; by now there is a generalization to arbitrary curves due to E. Katz, J. Rabinoff and D. Zureick- Brown.

2.5. **Sho Tanimoto.**

- Title: *Towards a refinement of Manin's conjecture.*

- Abstract: Manin's conjecture predicts the generic distribution of rational points on algebraic varieties. I will explain our attempt to obtain a refinement of Manin's conjecture using the minimal model program and the boundedness of log Fano varieties. This is joint work with Brian Lehmann and Yuri Tschinkel.

2.6. **Gabor Wiese.**

- Title: *On Galois representations of mod p Hilbert eigenforms of weight one*

- Abstract: The talk will summarise the main ideas underlying the recent joint work with Mladen Dimitrov, proving that the existence of Hecke operators T_P, for P dividing p, implies that the Galois representation attached to a mod p Hilbert modular eigenform of parallel weight one and prime-to-p level is unramified above p. This applies, in particular, to non-liftable mod p eigenforms, and can be seen as a refinement of the weight aspect in generalisations of Serre's Modularity Conjecture to Hilbert modular forms.

2.7. **Dan Petersen.**

- Title: *Tautological classes with twisted coefficients on the moduli space of curves*

- Abstract: The tautological ring of the moduli space of curves was introduced by Mumford as the subalgebra of the Chow ring generated by certain natural classes called kappa-classes. I will explain that one can also define the notion of tautological class with coefficients in a representation of the symplectic group. These twisted tautological groups govern in a sense the tautological rings of the fibered powers of the universal curve. I will describe some results (joint with Tavakol) and some conjectures.

2.8. **Jean-Benoît Bost.**

- Title: *Theta invariants, infinite dimensional hermitian vector bundles, and Diophantine geometry*

- Abstract: In the classical analogy between number fields and function fields, an euclidean lattice $(E, \|.\|)$ may be seen as the counterpart of a vector bundle V on a smooth projective curve C over some field k. Then the arithmetic counterpart of the dimension $h^0(C, V) := \dim_k \Gamma(C, V)$ of the space of sections of V is the non-negative real number

$$h^0_\theta(E, \|.\|) := \log \sum_{v \in E} e^{-\pi \|v\|^2}.$$

   In this talk, firstly I will discuss diverse properties of the invariant h^0_θ and of its extensions to certain infinite dimensional generalizations of euclidean lattices. Then I will present applications of this formalism to transcendence theory and to algebraization theorems in Diophantine geometry.