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Wintersemester 18/19

## Arithmetische und Algebraische Geometrie

Mittwoch 16-18, Theresienstr. 39, B 251

24.10.2018

Title:

Abstract:

31.10.2018 Yukako Kezuka, Regensburg.

Title: On the weak Leopoldt conjecture for a non-cyclotomic  $\mathbb{Z}_2$  extension.

Abstract: Take  $q$  to be any prime number congruent to 7 modulo 8, and let  $K = \mathbb{Q}(\sqrt{-q})$ . The prime 2 splits in  $K$ , and take  $\mathfrak{p}$  to be one of the primes of  $K$  above 2. Let  $H$  be the Hilbert class field of  $K$  and write  $K_\infty$  for the unique  $\mathbb{Z}_2$ -extension of  $K$  unramified outside  $\mathfrak{p}$ . We will show that the weak  $\mathfrak{p}$ -adic Leopoldt conjecture holds for the compositum  $J_\infty = JK_\infty$  where  $J$  is an arbitrary quadratic extension of  $H$ , and discuss its implications. This is a joint work with J. Choi and Y. Li.

07.11.2018 Werner Bley, LMU

Title: The local epsilon constant conjecture for unramified twists of  $\mathbb{Z}_p(1)$

Abstract: Let  $N/K$  be a finite Galois extension of  $p$ -adic number fields. We will give an explicit reformulation of the equivariant local epsilon constant conjecture, formulated previously by various authors (Kato, Benois and Berger, Fukaya and Kato and others), in the special case of certain 1-dimensional unramified twists of  $\mathbb{Z}_p(1)$ . In joint work with A.Cobbe we have shown the validity of this conjecture for certain wildly and weakly ramified abelian extensions  $N/K$ .

Comparing the twisted conjecture to a conjecture of Breuning we obtain an explicit conjectural description of a certain Euler characteristic related to local fundamental classes which already occurs in the formulation of Chinburg's  $\Omega_2$ -conjecture. This part of the talk concerns joint work in progress with D.Burns.

14.11.2018

Title:

Abstract:

21.11.2018 Olivier Benoist, ENS Paris.

Title: Density of sums of three squares

Abstract: Hilbert has proven that a real polynomial in two variables that takes only nonnegative values is a sum of four squares of rational functions. Cassels, Ellison and Pfister have shown that this result is optimal: there exist such polynomials that are not sums of three squares of rational functions. In this talk, we will explain why those polynomials that can be written as sums of three squares are dense in the set of those that are nonnegative. The proof relies on the study of real Noether-Lefschetz loci.

28.11.2018

Title:

Abstract:

05.12.2018 Luca Tasin, Bonn.

Title: On the minimal model program for the moduli space of curves

Abstract: In this talk I will report on a recent work with G. Codogni and F. Viviani in which we investigate the first possible steps of the minimal model program for the moduli space of stable curves  $M$ . In particular, we show that such steps have a modular interpretation and we relate them to the so Hassett-Keel program, which predicts that the log canonical models of  $M$  (with natural boundaries) have also a modular interpretation.

12.12.2018 Tommy Hofmann, TU Kaiserslautern.

Title: Computing isomorphisms between lattices

Abstract: Let  $\Lambda$  be an order in a finite-dimensional semisimple algebra over a number field. A common theme in Galois module theory is the investigation of the  $\Lambda$ -structure of arithmetic objects, including, for example, the ring of integers or ambiguous ideals in number fields. In recent years these questions have also been investigated from a computational point of view. In this talk I will report on recent work with H. Johnston on the algorithmic problem of computing isomorphisms between  $\Lambda$ -lattices.

19.12.2018 José Ibrahim Villanueva Gutiérrez, Universität Heidelberg.

Title: Logarithmic arithmetic and the Tamagawa number conjecture

Abstract: The Tamagawa Number Conjecture (TNC), as formulated by Bloch and Kato, is an extraordinary generalization of the class number formula. Roughly speaking Iwasawa theory can be described as an equivariant version of the TNC for a suitable coefficient ring. Logarithmic arithmetic studies more general families of arithmetic invariants of number fields. Classical arithmetic corresponds to one of these families. We shall present the most studied non-classical family. As in the classical case, we can use classical Iwasawa theory to describe the class groups associated to such families along  $\mathbb{Z}_p$ -extensions. We formulate properties that the  $L$ -functions associated to logarithmic families should satisfy and we give an insight of the advantages of considering the TNC in the logarithmic setting.

09.01.2019 Matthias Paulsen, LMU

Title: Density of Noether–Lefschetz loci and rationality of quadric surface bundles

Abstract: Is rationality a deformation invariant property of smooth complex projective varieties? Recently, certain families of quadric surface bundles provided a negative answer to this question. Generalizing these counterexamples, it can be shown for a large and natural class of quadric surface bundles over  $\mathbb{P}^2$  that the very general member is stably irrational. In this talk, I will explain how to prove that for any of these families, the locus of rational fibres is analytically dense in the moduli space. This leads to the study of Noether–Lefschetz loci in variations of Hodge structure.

16.01.2019 Sören Kleine, UniBw München

Title: On the growth of ideal class groups in multiple  $\mathbb{Z}_p$ -extensions

Abstract: The growth of  $p$ -primary ideal class groups  $A_n$  of the intermediate number fields in a multiple  $\mathbb{Z}_p$ -extension can be described asymptotically in terms of the generalised Iwasawa invariants of the Iwasawa module  $A = \varprojlim A_n$  (this is due to work of Cuoco and Monsky and generalises a famous theorem of Iwasawa for  $\mathbb{Z}_p^1$ -extensions).

Using Galois cohomology, the generalised Iwasawa invariants can be estimated by studying suitable quotients of the elementary  $\Lambda$ -module  $E_A$  of  $A$ . In this talk, we strengthen algebraic results of Cuoco and Monsky which relate these quotients of  $E_A$  to analogous

quotients of  $A$ . This yields a better asymptotic estimate for the growth of ideal class groups in certain multiple  $\mathbb{Z}_p$ -extensions. Moreover, since the quotients of  $A$  are accessible via numerical computations of finite layers  $A_n$ , we obtain new upper bounds on generalised Iwasawa invariants.

23.01.2019 Gunter Malle, Kaiserslautern

Title: Offene Probleme in der Darstellungstheorie endlicher reductiver Gruppen

Abstract: Im Vortrag moechte ich zunaechst in groben Zuegen Lusztigs Resultate zur Darstellungstheorie endlicher reductiver Gruppen erlaeuern. Eine vorherige Kenntnis dieser Theorie wird nicht vorausgesetzt. Im Anschluss werde ich einige offene Fragen zur gewoehnlichen als auch zur modularen Darstellungstheorie vorstellen, die zur Zeit untersucht werden.

30.01.2019 Hsueh-Yung Lin, Bonn

Title: The Kodaira problem for compact Kähler threefolds

Abstract: Let  $X$  be a compact Kähler manifold. The so-called Kodaira problem asks whether  $X$  has arbitrarily small deformations to some projective varieties. While Kodaira proved that such deformations always exist for surfaces, starting from dimension 4 there are examples constructed by Voisin which answer the Kodaira problem in the negative. In this talk, we will focus on threefolds and explain our positive solution to the Kodaira problem in this situation.

06.02.2019 Michael Stoll, Bayreuth.

Title:

Abstract: