Prof. Dr. Werner Bley
Prof. Dr. Cornelius Greither
Prof. Dr. Christian Liedtke
Prof. Dr. Andreas Rosenschon
Prof. Dr. Stefan Schreieder   Sommersemester 2019

Arithmetische und Algebraische Geometrie
Mittwoch 16-18, Theresienstr. 39, B 251

8.5.2018 Thomas Krämer
Title: A converse to Riemann's theorem on Jacobian varieties
Abstract: Jacobian varieties of curves have been studied a lot since Riemann's theorem, which says that their theta divisor is a sum of copies of the curve. Similarly, for intermediate Jacobians of smooth cubic threefolds Clemens and Griffiths showed that the theta divisor is a sum of two copies of the Fano surface of lines on the threefold. We prove that in both cases these are the only decompositions of the theta divisor, extending previous results of Casalaina-Martin, Popa and Schreieder. Our ideas apply to a much wider context and only rely on the decomposition theorem for perverse sheaves and some representation theory.

15.5.2019 Christian Liedtke
Title: Around p-adic Tate conjectures
Abstract: We explore Tate-type conjectures over p-adic fields. We study a conjecture of Raskind that predicts the surjectivity of

$$(\mathrm{NS}(X_{\bar{K}}) \otimes_{\mathbb{Z}} \mathbb{Q}_p)^{G_K} \longrightarrow H_{et}^2(X_{\bar{K}}, \mathbb{Q}_p(1))^{G_K}$$

if X is smooth and projective over a p-adic field K and has totally degenerate reduction. Sometimes, this is related to p-adic uniformisation. For abelian varieties, Raskind's conjecture is equivalent to the question whether

$$\mathrm{Hom}(A, B) \otimes \mathbb{Q}_p \longrightarrow \mathrm{Hom}_{G_K}(V_p(A), V_p(B))$$

is surjective if A and B are abeloid varieties over K. Using p-adic Hodge theory and Fontaine's functors, we reformulate both problems into questions about the interplay of $\mathbb{Q}$- versus $\mathbb{Q}_p$-structures inside filtered (φ, N)-modules. Finally, we disprove all of these conjectures and questions by showing that they can fail for algebraisable abeloid surfaces. This is joint work with Oliver Gregory.

22.5.2019
Title:
Abstract:

29.5.2019 Kapil Paranjape, Indian Institute of Science Education and Research Mohali
Title: Hodge and Generalised Hodge Conjecture for $K3$ surfaces and some 3-Folds
Abstract: This talk is based on joint work with Madhav Nori which studies the Hodge conjecture for some K3 surfaces with complex multiplication. This leads to the study of the Generalised Hodge Conjecture on certain 3-folds. The conjectures can thus be resolved in some (restricted!) cases.

5.6.2019 Tariq Syed, LMU
Title: Towards a generalization of a theorem by Fasel-Rao-Swan

Abstract: Let R be a smooth affine algebra of dimension d over an algebraically closed field k. If $d = 3$, Asok-Fasel proved that any projective R-module of rank 2 is cancellative; if $d \geq 4$, Fasel-Rao-Swan could prove that at least R^{d-1} is cancellative. In this talk, we revisit their results by means of the generalized Vaserstein symbol: We discuss a new proof of the theorem by Asok-Fasel (for oriented projective modules) and a possible generalization of the cancellation result by Fasel-Rao-Swan.

12.6.2019 Oliver Bräunling, Freiburg
Title: An alternative construction for the noncommutative equivariant Tamagawa numbers of Burns-Flach

Abstract: Instead of working with K-theory of rings per se, one can work with topologized modules over rings. This is not just "for decoration". It changes the K-groups in a very useful way: For example, K_1 of locally compact topological vector spaces over a number field gives Chevalley's id'ele class group (literally; including real and p-adic places and the restricted product, all automatic). Usually, one has to implement these places "by hand". We will explain how this suggests an alternative [but equivalent] construction of Tamagawa numbers.

19.6.2019 Michael Kemeny, Stanford University
Title: Projecting Syzygies of Curves

Abstract: I will talk about the shape of the equations of projective curves. This is highly classical subject, intensely studied by Hilbert, Noether, Petri and others, who framed the problem in terms of homological algebra. In the last two decades much progress has been made so that a clear picture of the structure of the defining equations has gradually been revealed. I will show how to port the classical geometric operation of projection into our homological setting. As an application, we prove a conjecture concerning the geometric origin of the highest linear relations amongst the equations, generalizing conjectures of Ein, Lazarsfeld and Green on the structure of syzygies of curves.

26.6.2019 Iwasawa 2019
Title:
Abstract:

3.7.2019 Adebisi Agboola, UCSB
Title: Relative algebraic K-groups and rings of integers

Abstract: Suppose that F is a number field and G is a finite group. I shall discuss a conjecture in relative algebraic K-theory (in essence, a conjectural Hasse principle applied to certain relative algebraic K-groups) that implies an affirmative answer to both the inverse Galois problem for F and G and to an analogous problem concerning the Galois module structure of rings of integers in tame extensions of F. It also implies the weak Malle conjecture on counting tame G-extensions of F according to discriminant. The K-theoretic conjecture can be proved in many cases (subject to mild technical conditions), e.g. when G is of odd order, giving a partial analogue of a classical theorem of Shafarevich in this setting. While this approach does not, as yet, resolve any new cases of the inverse Galois problem, it does yield substantial new results concerning both the Galois module structure of rings of integers and the weak Malle conjecture. Much of what I shall discuss is joint work with L. McCulloh.

10.7.2019 Takamichi Sano, King's College London
Title: On a new conjecture on Kato's zeta elements

Abstract: In this talk, I will propose a new conjecture on Kato's zeta elements for elliptic curves, which is a generalization of Perrin-Riou's conjecture. I will show that our conjecture implies both the Mazur-Tate conjecture and the Mazur-Tate-Teitelbaum

conjecture. I will also give an application of our conjecture to the descent argument in Iwasawa theory to establish a concrete new strategy for proving the conjectural Birch-Swinnerton-Dyer formula. This is joint work with D. Burns and M. Kurihara.

17.7.2019 Markus Land (Regenburg)
Title: On the K-theory of pullbacks
Abstract: I will report on joint work with Georg Tamme. I will begin the talk with a recollection of algebraic K-theory and the question to what extend algebraic K-theory satisfies a property called excision. The main theorem I want to explain is that one can analyze the failure of excision in K-theory before applying K-theory. The construction is categorical in nature, and thus one obtains excision type results in many invariants of rings or schemes which only depend on the derived module category (such invariants are called localizing).

As applications, I will give a direct proof of Suslins excision theorem in algebraic K-theory and a conceptual proof that periodic cyclic homology (over the rationals), the fibre of the Goodwillie-Jones chern character, and the fibre of the cyclotomic trace satisfy excision, nilinvariance, and cdh-descent this result holds more generally for any truncating invariant.

24.7.2019 Annette Huber-Klawitter (Freiburg)
Title: Differential forms - a new perspective in the singular case
Abstract: We report on joint work with C. Jörder (Char. 0) and S. Kebekus, S. Kelly (Char. p). Differential forms are a powerful source of invariants for algebraic varieties. E.g. they define the genus of curves or the Kodaira dimension for any dimension. While this works very well in the smooth case, the singular case is problematic. There are several ad hoc replacements for Kähler differentials that play a similar role in different applications. We propose a more systematic approach using the h-topolog (Char 0) or its variants (Char p). Besides positive results, we are also going to discuss open problems.