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Sommersemester 2021

Arithmetische und Algebraische Geometrie
Dienstag 16-18, Theresienstr. 39, B 251 (zur Zeit online)

20.04.2021 .
Title:
Abstract:

27.04.2021 Alexandre Maksoud (Luxemburg)
Title: Generalized p-adic Stark conjectures and Iwasawa main conjectures for Artin motives
Abstract: We will state a precise conjecture describing a generator of the Greenberg-style Selmer group attached to an Artin motive that is unramified at an odd prime p, and which is shown to imply the p-part of the Bloch-Kato conjecture at $s = 0$. This conjecture involves a new L-invariant and generalizes various classical conjectures in Iwasawa theory. In particular, in the case of a monomial representation it is essentially equivalent to some Iwasawa-theoretic conjectures for Rubin-Stark elements recently formulated by Burns, Kurihara and Sano.

04.05.2021 Christian Maier (LMU)
Title: Konstruktion und algorithmische Berechnung von lokalen Fundamentalklassen
Abstract: Sei $L|K$ eine Galoiserweiterung p-adischer Zahlkörper. Die Inverse des Reziprozitätsisomorphismus von $L|K$ ist durch das Cupprodukt mit der lokalen Fundamentalklasse $u_{L|K}$ gegeben. Damit nimmt $u_{L|K}$ eine bedeutende Rolle in der lokalen Klassenkörpertheorie ein. Die explizite Bestimmung von $u_{L|K}$ ist ber die Invariantenabbildung $inv_{L|K}$ zunächst nur fr unverzweigte Erweiterungen $L|K$ möglich. Eine alternative Beschreibung von $inv_{L|K}$ erlaubt die Konstruktion der lokalen Fundamentalklasse fr beliebige Erweiterungen. Die Theorie der zentral einfachen Algebren liefert eine Variante dieser Konstruktion. Die beiden daraus abgeleiteten Algorithmen werden in meiner Masterarbeit verglichen.

11.05.2021 Takenori Kataoka (Keio University)
Title: Finite submodules of unramified Iwasawa modules for multi-variable extensions
Abstract: Given a two-variable extension of an imaginary quadratic field, we have the unramified Iwasawa module, which is a fundamental object of study in Iwasawa theory. In this talk, we discuss the structure of the maximal finite submodule of that Iwasawa module. As the first main result, we introduce a novel method to obtain a certain upper bound of the size (or even the vanishing) of the maximal finite submodule. This is a generalization of preceding results of Bleher-Chinburg-Greenberg-Kakde-Pappas-Sharifi-Taylor and of Kurihara. As the second main result, we also obtain a way to check the non-vanishing of the maximal finite submodule. This enables us to construct numerical examples for which the non-vanishing holds, which are the first examples as far as I am aware.

18.05.2021 Marcin Lara

Title: Fundamental groups of rigid spaces, geometric arcs and specialization morphism
Abstract: We introduce a new category of coverings in rigid geometry, called geometric coverings, and show it is classified by a certain topological fundamental group. Geometric coverings generalize the class of étale coverings, introduced by de Jong, and its various natural modifications, and have certain desirable properties that were missing from those older notions: they are étale local and closed under taking infinite disjoint unions. The definition is based on the property of unique lifting of "geometric arcs". On the way, we answer some questions from the foundational paper of de Jong. In a separate project, for a formal scheme over a complete rank one valuation ring, we prove existence of a specialization morphism from the de Jong fundamental group of the rigid-analytic generic fiber to the pro-étale fundamental group of the special fiber. This is joint work with Piotr Achinger and Alex Youcis.

25.05.2021 Alexandre Daoud (King's College London)

Title: On a conjecture of Coleman concerning Euler systems
Abstract: In 1989 Robert Coleman formulated a rather remarkable conjecture which amounts to a precise prediction on the structure of the module of Euler systems for the multiplicative group over $\mathbb{Q}$. In this talk I will give Coleman's original distribution-theoretic formulation of his conjecture and describe the relation to Euler systems. I will then report on recent joint work with David Burns and Soogil Seo in which we prove this conjecture.

01.06.2021 Johnny Nicholson (University College London)

Title: Cancellation for projective modules over integral group rings
Abstract: In the 1960s, R. G. Swan asked for which finite groups G does the integral group ring $\mathbb{Z}[G]$ have the property that $P \oplus \mathbb{Z}[G] \cong Q \oplus \mathbb{Z}[G]$ implies $P \cong Q$ for projective modules P and Q. Much progress was made by Jacobinski, Fröhlich and Swan in the 1960s-80s, with applications both to number theory and algebraic topology. However, important aspects of the classification remain unresolved.

In this talk, I will present a general cancellation theorem for projective $\mathbb{Z}[G]$-modules and which I conjecture will lead to a complete answer to Swans question.

08.06.2021 Dominik Bullach (King's College London)

Title: Universal norms for p-adic representations in higher-rank Iwasawa theory
Abstract: I will explain how classical results of Kuz'min and Greither on universal norms generalise to p-adic representations and the higher-rank setting, and how these methods lead to a refinement of the classical cyclotomic Iwasawa Main Conjecture. This is joint work with Alexandre Daoud.

15.06.2021 Cristian Popescu (UC San Diego)

Title: An Equivariant Tamagawa Number Formula for Drinfeld Modules and Beyond
Abstract: I will present a generalization of Taelman's 2012 celebrated class-number formula for Drinfeld modules to the setting of (rigid analytic) L-functions of Drinfeld modular motives with Galois equivariant coefficients. I will discuss applications (e.g. a proof of the Drinfeld module analogue of the Brumer-Stark conjecture, constructions of new v–adic L–functions etc.) and potential extensions of this formula to the category of t–modules and t–motives. This lecture is based on the paper:
https://arxiv.org/abs/2004.05144, joint with J. Ferrara, N. Green and Z. Higgins

22.06.2021 Michael Lönne (Bayreuth)

Title: A classification result for monodromy groups of Jacobian elliptic $K3$ surfaces
Abstract: A Jacobian elliptic $K3$ surface S for the talk is a complex projective surface with a fibration map f to the projective line and a section to f called the 0-section.

All regular fibres are elliptic curves, the finitely many singular fibres map to the finite discriminant subset D of the base. Kodaira investigated the relation between the functional invariant j defined by the j-invariant of fibres, the geometry of singular fibres and the homological invariant which is the monodromy of the topological torus bundle given by the complement in S of the singular fibres. We consider surfaces with certain geometrical types of singular fibres only and get a classification of monodromy groups in that case. We end with a discussion of the geometry of the corresponding moduli spaces and possible applications. (This talk is based on joint work with Klaus Hulek)

29.06.2021 Matthias Paulsen (Hannover)
Title: The construction problem for Hodge numbers
Abstract: The Hodge diamond of a smooth projective variety consists of all Hodge numbers and thus collects important numerical invariants. One might ask which Hodge diamonds can appear in a given dimension. Since unexpected inequalities between the Hodge numbers occur in some cases, a complete classification of the possible Hodge diamonds seems to be very complicated. However, I will explain in this talk that the question is completely understood from a number theoretic point of view. Concretely, if we consider the Hodge numbers modulo an arbitrary integer, any Hodge diamond satisfying Serre symmetry, and additionally Hodge symmetry in characteristic zero, is realisable by a smooth projective variety. A consequence of this result is that there are no non-trivial polynomial relations between the Hodge numbers in any given dimension. This is joint work with Stefan Schreieder in characteristic zero and with Remy van Dobben de Bruyn in positive characteristic.

06.07.2021 Felix Janda (Notre Dame)
Title: Counting curves on quintic threefolds
Abstract: Gromov-Witten invariants are a way to count maps from curves with specified genus and degree to a projective variety X. When X is a Calabi-Yau threefold, such as a quintic threefold, there are intriguing conjectures inspired from physics about the structure of the invariants.

In my talk, I will give an overview over the conjectures and the algebraic geometry behind the (now standard) computation of the genus zero invariants of quintic threefolds, and explain why it does not easily extend to higher genus. I will then proceed to discuss a construction (joint with Q. Chen and Y. Ruan) of new moduli spaces that can control the failure of the naive approach. In joint work with S. Guo and Y. Ruan, we use them to prove some of the conjectures about the structure of Gromov-Witten invariants of quintic threefolds.

13.07.2021 Gebhard Martin (Bonn)
Title: Automorphism schemes of projective surfaces
Abstract: Given a proper variety X over a field k, its automorphism functor Aut_X is representable by a group scheme locally of finite type over k. While the abstract automorphism group $\mathrm{Aut}_X(k)$ has always been an object of interest in classical algebraic geometry, the automorphism scheme Aut_X itself is usually not well-studied in positive characteristic, where it contains more information than $\mathrm{Aut}_X(k)$. However, the scheme structure of Aut_X is of fundamental importance in the moduli and deformation theory of X. In this talk, I will describe techniques that can be used to determine Aut_X, give an overview of what is known about Aut_X if X is a (smooth) projective surface, and report on recent results on automorphism schemes of projective surfaces of special type, such as del Pezzo surfaces, elliptic surfaces, and surfaces of Kodaira dimension 0.