Prof. Dr. Werner Bley
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Wintersemester 2022/23

## Arithmetische und Algebraische Geometrie

Mittwoch 16-18, LMU Theresienstr. 39, Raum B251 oder TUM, Boltzmannstr. 3, Raum ???

19.10.2022 .
Title:
Abstract:

26.10.2022 .
Title:
Abstract:

02.11.2022 .
Title:
Abstract:

08.11.2022 Daniel Vallieres (California State University Chico). (ACHTUNG: Dienstag)
Title: An analogue of Kida's formula in graph theory.
Abstract: In the 1950s, Iwasawa proved his celebrated result on the behavior of the $p$-part of the class number in some infinite towers of number fields. During the past few years, it has been observed that some graph theoretical invariants, such as the number of spanning trees, behave similarly. It is thus possible to talk about the Iwasawa invariants associated to some towers of graphs, and the question arises as how do these invariants behave with respect to various constructions in graph theory. In this talk, we will present a result that describes the relationship between the Iwasawa lambda invariant of a tower of graphs and the Iwasawa lambda invariant of another tower obtained by pullback along a finite Galois cover of graphs whose Galois group is a $p$-group. The precise formula describing this relationship can be viewed as an analogue of Kida's formula in classical Iwasawa theory.

This is joint work with Anwesh Ray.

15.11.2022 Alexander Ivanov (Bonn). (ACHTUNG: Dienstag)
Title: $p$-adische Deligne–Lusztig Theorie
Abstract: Die klassische Deligne–Lusztig Theorie erlaubt eine Konstruktion und eine Klassifikation von irreduziblen Darstellungen von endlichen Gruppen vom Lie-Typ (wie zum Beispiel $\mathrm{GL}_n(\mathbb{F}_p)$). In diesem Vortrag erkläre ich wie man eine analoge Theorie für $p$-adische reduktive Gruppen (wie $\mathrm{GL}_n(\mathbb{Q}_p)$) aufsetzt. Auch diskutiere ich die Geometrie der resultierenden $p$-adischen Deligne–Lusztig Räume.

23.11.2022 .
Title:
Abstract:

30.11.2022 .
Title:
Abstract:

07.12.2022 Anurag Singh (University of Utah) (ACHTUNG: ONLINE !!!)
Title: When are the natural embeddings of classical invariant rings pure?
Abstract: Consider a reductive linear algebraic group $G$ acting linearly on a polynomial ring $S$ over an infinite field; key examples are the general linear group, the symplectic group, the orthogonal group, and the special linear group, with the classical representations as in Weyl's book: for the general linear group, consider a direct sum of copies of the standard representation and copies of the dual; in the other cases take copies of the standard representation. The invariant rings in the respective cases are determinantal rings, rings defined by Pfaffians of alternating matrices, symmetric determinantal rings, and the Plücker coordinate rings of Grassmannians; these are the classical invariant rings of the title, with $S^G \subseteq S$ being the natural embedding.

Over a field of characteristic zero, a reductive group is linearly reductive, and it follows that the invariant ring $S^G$ is a pure subring of $S$, equivalently, $S^G$ is a direct summand of $S$ as an $S^G$-module. Over fields of positive characteristic, reductive groups are typically no longer linearly reductive. We determine, in the positive characteristic case, precisely when the inclusion of $S^G$ in $S$ is pure. This is joint work with Melvin Hochster, Jack Jeffries, and Vaibhav Pandey.

14.12.2022 Andreas Nickel (Duisburg-Essen).
Title: An unconditional proof of the abelian equivariant Iwasawa main conjecture
Abstract: We explain the statement of the equivariant Iwasawa main conjecture for totally real fields and sketch an unconditional proof thereof in the case, where the underlying Galois group is abelian. Crucially, this result does not depend on the vanishing of any mu-invariant. As applications,we deduce the Coates–Sinnott conjecture away from its 2-primary part and new cases of the equivariant Tamagawa number conjecture for Tate motives. This is joint work with Henri Johnston.

21.12.2022 .
Title:
Abstract:

11.01.2023 .
Title:
Abstract:

18.01.2023 Herbert Gangl (Durham).
Title: Zagier's Polylogarithm Conjecture Revisited
Abstract: Instigated by work of Borel and Bloch, Zagier formulated his Polylogarithm Conjecture in the late eighties and proved it for weight 2. After a flurry of activity and advances at the time, notably by Goncharov who provided not only a proof for weight 3 but set out a vast program with a plethora of conjectural statements for attacking it, progress seemed to be stalled for a number of years. More recently, a solution to one of Goncharov's central conjectures in weight 4 has been given. Moreover, by adopting a new point of view, Goncharov and Rudenko provided a proof of the original conjecture in weight 4. In this impressionist talk I intend to give a rough idea of the developments from the early days on, avoiding most of the technical bits, and also hint at a number of recent results for higher weight (joint with S.Charlton and D.Radchenko).

25.01.2023 Tommy Hofmann (Universität Siegen).
Title: Norm relations and number fields
Abstract: In this talk, I will present joint work with Jean-Francois Biasse, Claus Fieker

and Aurel Page on the application of norm relations to computational problems in number fields. For a finite group $G$, I will introduce a generalization of norm relations in the group algebra $\mathbf{Q}[G]$ and their classification. These norm relations can be used to obtain relations between arithmetic invariants of the subfields of an algebraic number field with Galois group $G$. As an application we consider the problem of determining the $S$-unit group and class group of a number field.

01.02.2023 .
Title:
Abstract:

08.02.2023 Ana Maria Botero (Uni Regensburg)
Title: Toroidal $b$-divisors and applications in differential and arithmetic geometry
Abstract: We define toroidal $b$-divisors on a quasi projective variety over a field. These can be seen as conical functions on a balanced polyhedral space. We show the existence of an intersection pairing for so called nef toroidal $b$-divisors, which gives rise to a Monge-Ampere type measure on the polyhedral space. Moreover, using the theory of Okounkov bodies, we show that a Hilbert-Samuel type formula holds in this setting. We then show some applications of this theory.