MAX PLANCK INSTITUTE
FOR MATHEMATICS

Workshop on ”Dualisable Categories & Continuous K-theory”

Program

Mon, 09 Sep 2024

09:00 - 10:00	**Registration**
10:00 - 11:00	MPIM Lecture Hall Akhil Mathew (University of Chicago) **Lecture 1: Introduction to dualisable categories and their K-theory, I**
11:00 - 11:30	MPIM Tea Room **Tea and Coffee Break**
11:30 - 12:30	MPIM Lecture Hall Akhil Mathew (University of Chicago) **Lecture 2: Introduction to dualisable categories and their K-theory, II**
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	MPIM Lecture Hall **Exercise Session**
15:00 - 16:00	MPIM Lecture Hall **Discussion**
16:00 - 16:30	MPIM Tea Room **Tea and Coffee Break**
16:30 - 17:30	MPIM Lecture Hall Peter Scholze (MPIM) **Talk 1: Refined TC^- over perfectoid rings**

Tue, 10 Sep 2024

10:00 - 11:00	MPIM Lecture Hall Akhil Mathew (University of Chicago) **Lecture 3: Introduction to dualisable categories and their K-theory, III**
11:00 - 11:30	MPIM Tea Room **Tea and Coffee Break**
11:30 - 12:30	MPIM Lecture Hall Alexander Efimov (Einstein Institute of Mathematics, Hebrew University of Jerusalem) **Lecture 4: Dualizable categories and localizing motives, I**
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	MPIM Lecture Hall **Exercise Session**
15:00 - 15:15	MPIM Lecture Hall Benjamin Dünzinger (University of Regensburg) **Contributed talk: Dualizability in the context of invariants for C^*-algebras**
15:15 - 15:30	MPIM Lecture Hall Georg Lehner (University of Regensburg) **Contributed talk: Norm, Assembly and Coassembly**
15:30 - 15:45	MPIM Lecture Hall Matteo Montagnani (SISSA) **Contributed talk: Smooth and proper categories in analytic geometry**
15:45 - 16:00	MPIM Lecture Hall Ferdinand Wagner (MPIM Bonn/University of Bonn) **Contributed talk: Refined TC^- over ku and derived q-Hodge complexes**
16:00 - 16:30	MPIM Tea Room **Tea and Coffee Break**
16:30 - 17:30	MPIM Lecture Hall Maria Yakerson (Oxford University) **Talk 2: Universality of algebraic K-theory**

Wed, 11 Sep 2024

10:00 - 11:00	MPIM Lecture Hall Akhil Mathew (University of Chicago) **Lecture 5: Introduction to dualisable categories and their K-theory, IV**
11:00 - 11:30	MPIM Tea Room **Tea and Coffee Break**
11:30 - 12:30	MPIM Lecture Hall Alexander Efimov (Einstein Institute of Mathematics, Hebrew University of Jerusalem) **Lecture 6: Dualizable categories and localizing motives, II**
19:00 - 21:00	**Dinner with subsequent discussion round**

Thu, 12 Sep 2024

10:00 - 11:00	MPIM Lecture Hall Akhil Mathew (University of Chicago) **Lecture 7: Introduction to dualisable categories and their K-theory, V**
11:00 - 11:30	MPIM Tea Room **Tea and Coffee Break**
11:30 - 12:30	MPIM Lecture Hall Alexander Efimov (Einstein Institute of Mathematics, Hebrew University of Jerusalem) **Lecture 8: Dualizable categories and localizing motives, III**
12:30 - 14:00	**Lunch Break**
14:00 - 15:00	MPIM Lecture Hall **Exercise Session**
15:00 - 16:00	MPIM Lecture Hall **Discussion**
16:00 - 16:30	MPIM Tea Room **Tea and Coffee Break**
16:30 - 17:30	MPIM Lecture Hall Maxime Ramzi (University of Copenhagen) **Talk 3: Motives as a localization of categories**

Fri, 13 Sep 2024

10:00 - 11:00	MPIM Lecture Hall Alexander Efimov (Einstein Institute of Mathematics, Hebrew University of Jerusalem) **Lecture 9: Dualizable categories and localizing motives, IV**
11:00 - 11:30	MPIM Tea Room **Tea and Coffee Break**
11:30 - 12:30	MPIM Lecture Hall Alexander Efimov (Einstein Institute of Mathematics, Hebrew University of Jerusalem) **Lecture 10: Dualizable categories and localizing motives, V**

Abstracts

Peter Scholze

Talk 1: Refined TC^- over perfectoid rings

For p-adic formal schemes, there is a tight link between prismatic cohomology and TC^-. A little more than a year ago, I was trying to understand how prismatic cohomology should work for rigid-analytic varieties, and realized that Efimov's result that localizing motives form a dualizable category allows one to decomplete the functor TC^-. This refined TC^- induces a nontrivial functor for localizing motives over the generic fibre; yielding in particular such a functor for rigid-analytic varieties over $\mathbb{C}_p$ (by applying it to the dualizable category of nuclear modules). I will explain this construction, and will try to say something about the (still somewhat mysterious) relation to the (now existent) theory of prismatic cohomology for rigid-analytic varieties.

Benjamin Dünzinger

Contributed talk: Dualizability in the context of invariants for C^*-algebras

The goal of this talk is to introduce E-theory for C^*-algebras, which is a slight variant of C^*-algebraic KK-theory, and explain why E-theory is dualizable.

Georg Lehner

Contributed talk: Norm, Assembly and Coassembly

A major open problem in topology are (rational) injectivity results about assembly in K- and L-theory, e.g. the Borel and Novikov conjectures. Malkiewich showed that given a ring R and finite group G there exists a so called coassembly map going from the K-theory of the group ring $R[G]$ to the homotopy fixed points of the K-theory spectrum of R equipped with the trivial action. Moreover the composition of the assembly map with this coassembly map agrees with the norm map. This implies that for a finite group G, the assembly map is rationally and $K(n)$-locally injective. In recent work with Alex Müller and Holger Reich, we generalize this fact to arbitrary additive invariants of either stable or Poincaré categories, while also allowing for twisted coefficients. In particular, Malkiewich's theorem is true more generally for THH, TC, Grothendieck-Witt and L-theory. The fundamental insight is that the content of the theorem is fundamentally about the interaction of the algebraic theory of G-actions with the algebraic theory of E_∞-monoids. The general nature of this approach allows one to ask the question if there exists a generalization to more general groups, using the framework of dualizable categories.

Matteo Montagnani

Contributed talk: Smooth and proper categories in analytic geometry

In this talk, I will initially introduce the definition of smooth and proper category, and then explore how it can be used in algebraic and analytic geometry. This definition fits very well within the algebraic setting, as it allows for the characterization of smooth and proper algebraic varieties by examining their category of quasi-coherent sheaves. In the analytic context, such a characterization is more challenging to achieve; during the talk, I will aim to explain the difficulties and some results that we can obtain in this setting.

Ferdinand Wagner

Contributed talk: Refined TC^- over ku and derived q-Hodge complexes

As a consequence of his proof of rigidity of the category of localising motives, Efimov has constructed refinements of localising invariants. Such refined invariants often contain a lot more information than the original ones. For example, the refined TC^- of the rational numbers is not a rational spectrum; it contains very subtle p-complete information as well. In this talk, we'll explain how to compute it after base change to ku. The computation involves a surprising connection to q-de Rham cohomology, and in partcular, to the question of whether there exists a "q-Hodge filtration" on q-de Rham cohomology. This is joint work with Samuel Meyer.

Maria Yakerson

Talk 2: Universality of algebraic K-theory

Among various features of algebraic K-theory, there is known to be covariance with respect to finite flat morphisms of schemes. In this talk we will see, in which sense K-theory is universal as a cohomology theory with such covariance. Time permitting, we will discuss an analogous universality property for hermitian K-theory. This is joint work with Marc Hoyois, Joachim Jelisiejew, Denis Nardin, and Burt Totaro.

Maxime Ramzi

Talk 3: Motives as a localization of categories

The category of localizing motives is the recipient of the universal localizing invariant, and will be one of the main characters of this conference. I will report on joint work with Vova Sosnilo and Christoph Winges, where we give a new perspective on this category, closer in spirit to the operator theoretic KK-category. Namely, we prove that this category is a localization of the category of stable categories. I will discuss a proof of this result as well as applications thereof.