Titles and abstracts

Contents

Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9	Haesemeyer	Halpern-Leistner	Etingof	Mathur	Tubbenhauer
10	*morning tea*	*morning tea*	*morning tea*	*morning tea*	*morning tea*
10 : 30	Grossman	Sherman	O'Sullivan	Kahn	Honigs
11 : 30	Pauwels	Harman	Robertson		Raynor
12 : 30					
2	Gurney	Street		Entova-Aizenbud	Neeman
3	*afternoon tea*	*afternoon tea*		*afternoon tea*	*afternoon tea*
3 : 30	Elmanto	Bapat		Kamgarpour	

Asilata Bapat

Title: *Categorical q-deformed rational numbers and compactifications of stability space*

Abstract: We discuss new categorical interpretations of two distinct q-deformations of the rational numbers. The first one was introduced in a different context by Morier-Genoud and Ovsienko, and enjoys fascinating combinatorial, topological, and algebraic properties. The second one is a natural partner to the first, and is new. We obtain these deformations via boundary points of a compactification of the space of Bridgeland stability conditions on the 2-Calabi–Yau category of the A2 quiver. The talk is based on joint work with Louis Becker, Anand Deopurkar, and Anthony Licata.

Elden Elmanto

Title: *The unit motive and algebraic cycles*

Abstract: Morel and Voevodsky constructed the category of motivic spectra as a symmetric monoidal category via mostly formal maneuvers. As a tensor category, it has a unit object which people call the motivic sphere spectrum. Over fields of characteristic zero, taking a "slice", another formal maneuver in the subject, Voevodsky proves that one can produce algebraic cycles (via Bloch's cycle complex) out of the monoidal unit! He conjectures that this should be true over any scheme. We prove this conjecture in joint work with Bachmann and Morrow via prismatic cohomology. I will explain how this goes.

Inna Entova-Aizenbud

Title: *Representation stability for $GL_n(\mathbb{F}_q)$*

Abstract: I will present recent results on the Deligne categories for the family of groups $GL_n(\mathbb{F}_q)$, $n > 0$, based on a joint project with T. Heidersdorf. These Deligne categories interpolate the tensor categories of complex representations of $GL_n(\mathbb{F}_q)$ and have been previously constructed by F. Knop. I will describe some properties of these categories as well as those of their cousin, the category of algebraic representations of the infinite group $GL_\infty(\mathbb{F}_q)$.

Pavel Etingof

Title: *Lie theory in tensor categories with applications to modular representation theory*

Abstract: Let G be a group and k an algebraically closed field of characteristic $p > 0$. If V is a finite dimensional representation of G over k, then by the classical Krull-Schmidt theorem, the tensor power $V^{\otimes n}$ can be uniquely decomposed into a direct sum of indecomposable representations. But we know very little about this decomposition, even for very small groups, such as $G = (\mathbb{Z}/2)^3$ for $p = 2$ or $G = (\mathbb{Z}/3)^2$ for $p = 3$. For example, what can we say about the **number** $d_n(V)$ of such summands of dimension coprime to p? It is easy to show that there exists a finite limit $d(V) := \lim_{n\to\infty} d_n(V)^{1/n}$, but what kind of number is it? For example, is it algebraic or transcendental? Until recently, there was no techniques to solve such questions (and in particular the same question about the **sum of dimensions** of these summands is still wide open). Remarkably, a new subject which may be called "Lie theory in tensor categories" gives methods to show that $d(V)$ is indeed an algebraic number, which moreover has the form

$$d(V) = \sum_{1\le j\le p/2} n_j(V)[j]_q,$$

where $n_j(V) \in \mathbb{N}$, $q := \exp(\pi i/p)$, and $[j]_q := \frac{q^j - q^{-j}}{q - q^{-1}}$. Moreover,

$$d(V \oplus W) = d(V) + d(W),\ d(V \otimes W) = d(V)d(W),$$

i.e., d is a character of the Green ring of G over k. Furthermore,

$$d_n(V) \ge C_V d(V)^n$$

for some $0 < C_V \le 1$ and we can give lower bounds for C_V. In the talk I will explain what Lie theory in tensor categories is and how it can be applied to such problems. This is joint work with K. Coulembier and V. Ostrik.

Pinhas Grossman

Title: *Quadratic fusion categories and modular data*

Abstract: A fusion category is called quadratic if it contains a unique non-trivial orbit of simple objects under tensoring by invertible objects. Such categories first drew attention due to their prominent appearance in the classification of small-index subfactors, and many small examples have now been painfully constructed by brute force. A major open question is whether generic infinite families of these categories exist (and if so, is there some natural construction of them?). In a series of remarkable conjectures, Evans and Gannon predicted the existence of many quadratic categories on the basis of conjectural formulas for associated modular data. In this talk we will describe the Evans-Gannon conjectures and then discuss some generalizations and examples. This is joint work with Masaki Izumi (parts still in progress).

Lance Gurney

Title: *de Rham and prismatic cohomology*

Abstract: Recently Bhatt - Lurie, and independently Drinfeld, introduced the "stacky approach" to prismatic cohomology for p-adic schemes. I'll explain this general approach and how it can be used to construct a cohomology theory for schemes over $\mathbb{Z}$ whose p-adic completions recover prismatic cohomology and whose generic fibre recovers de Rham cohomology.

Christian Haesemeyer

Title: *Fourier - Mukai transforms and local t-structures on derived categories*

Abstract: The notion of a local t-structure (or sheaf of t-structures) on derived categories of varieties was introduced by Abramovich and Polishchuk. Recent work by G. Sahoo and U. Dubey generalising Alonso Tarrio et al's classification of compactly generated t-structures on derived categories of commutative rings allows to classify such local t-structures. In this talk, I will discuss joint work with David Gepner using this classification and recent results of A. Neeman to give a new proof of Bondal and Orlov's theorem regarding Fourier - Mukai transforms between varieties with (anti-)ample canonical bundle.

Nate Harman

Title: *Pre-Tannakian Categories and Oligomorphic Groups*

Abstract: Oligomorphic groups arise in model theory as automorphism groups of certain highly homogeneous structures. I will discuss a new construction of

rigid symmetric tensor categories using these groups. Applying this to the infinite symmetric group gives a new concrete realization of the Deligne category $\mathrm{Rep}(S_t)$, and applying it to other groups gives new and interesting examples of tensor categories.

Katrina Honigs

Title: *Derived categories of coherent sheaves and 4-folds of Kummer type*

Abstract: If two smooth, projective varieties have equivalent bounded derived categories of coherent sheaves, they have a strong geometric relationship and must share several invariants, including for instance dimension and Kodaira dimension. However, there are many open questions about precisely which invariants are preserved under derived equivalence. In this talk I will present work joint with Sarah Frei showing that over number fields, a Kummer 4-fold associated to an abelian surface is not in general derived equivalent to the Kummer 4-fold associated to the dual abelian surface.

Bruno Kahn

Title: *Universal rigid abelian tensor categories and Schur finiteness*

Abstract: I will talk about a universal construction made in collaboration with Luca Barbieri-Viale, and then give some structural results on rigid additive tensor categories. Those are most striking in the case of Schur-finite ones, thanks to the work of Peter O'Sullivan. If time permits, the case of the free rigid category on one generator will be studied as an example.

Masoud Kamgarpour

Title: *Airy sheaves for reductive groups via geometric Langlands*

Abstract: The Airy differential equation is a second order ODE which arose in the investigation of the British astronomer Airy in optics. Following Riemann, one can associate a rank 2 local system to this differential equations. Properties of this local system, as well as its generalisations to rank n and to the ℓ-adic setting, have been studied extensively by Nick Katz. In this talk, I will discuss generalisations of Airy sheaves from GL_n to arbitrary reductive groups. The key method for constructing such local systems is the geometric Langlands program.

Based on joint work with Konstantin Jakob and Lingfei Yi
https://arxiv.org/abs/2111.02256

Amnon Neeman

Title: *Vanishing negative K-theory and bounded t-structures*

Abstract: We will begin with a quick reminder of algebraic K-theory, and a few classical, vanishing results for negative K-theory. The talk will then focus on a striking 2019 article by Antieau, Gepner and Heller - it turns out that there are K-theoretic obstructions to the existence of bounded t-structures.

The result suggests many questions. A few have already been answered, but many remain open. We will concentrate on the many possible directions for future research.

Peter O'Sullivan

Title: *Super Tannakian hulls*

Abstract: Recently there have been a number of investigations of how to render abelian a given linear rigid symmetric monoidal category. We consider the particular case where the category has a faithful linear symmetric monoidal functor to a category of super vector spaces over a field of characteristic 0. In this case a geometric approach is possible, analogous to passing from vector bundles over a scheme to their generic fibres. The main result is that each category of the type considered has a super Tannakian hull, which is the target of a universal faithful functor to a super Tannakian category. We give a sketch of the proof, and describe some of the applications, mainly to motives and algebraic cycles.

Bregje Pauwels

Title: *Approximation in triangulated categories with partial Serre functors*

Abstract: Approximation, Serre duality and recollements are three major tools, theories really, used to study triangulated categories in algebraic geometry and representation theory. However, the existence of Serre duality is a very strong condition; the bounded derived category of a finite dimensional algebra satisfies Serre duality if and only if it has finite global dimension. Replacing Serre duality by the weaker notion of a partial Serre functor, we get a new tool which applies to any approximable category, and in particular to any ring.

In this talk, I will explain how these tools interact and lead to new theorems. I will introduce Neeman's theory of approximation for triangulated categories and describe how it induces a theory of (co-)approximation by objects in the image of a (partial) Serre functor, leading to a new representability theorem. Finally, I will explain how approximability and Serre functors behave under recollements. Throughout, I will give special attention to tensor triangulated categories.

Sophie Raynor

Title: *Circuit algebras, modular operads and Brauer diagrams*

Abstract: Circuit algebras (Bar-Natan and Dancso '17) are a symmetric version of Jones's planar algebras. I will sketch three descriptions of circuit algebras: as algebras over operads of wiring diagrams, as modular operads with an extra operation, and as symmetric lax monoidal functors from certain categories of Brauer diagrams (and hence generalised representations of Brauer categories).

Audience insights about algebraic structures described by these lax monoidal functors and possible applications of the modular operad perspective are very welcome!

Marcy Robertson

Title: *A topological characterization of the Kashiwara-Vergne groups*

Abstract: Solutions to the Kashiwara–Vergne equations in noncommutative geometry are a "higher dimensional" version of Drinfeld associators. In this talk we build on work of Bar-Natan and Dancso and identify solutions of the Kashiwara–Vergne equations with isomorphisms of (completed, rigid) tensor category of "welded tangled foams" – a class of knotted surfaces in $\mathbb{R}^4$. As a consequence, we identify the symmetry groups of the Kashiwara-Vergne equations with automorphisms of our (completed, rigid) tensor categories.

This talk will be aimed at a general audience and I will not assume familiarity with the Kashiwara-Vergne equations or Drinfeld associators. Includes joint work with Zs. Dancso, I. Halacheva and T. Hogan.

Alexander Sherman

Title: *On support varieties for Lie superalgebras*

Abstract: Two approaches to support theory for Lie superalgebras were introduced in the 2000s. One is through cohomological support varieties, defined via the Ext algebra, which were introduced and studied by Boe, Kujawa, and Nakano. On the other hand Duflo and Serganova introduced associated varieties, which mimic the rank variety construction given for finite groups. Both types of support have been studied over the years, and have their own strengths and difficulties. We discuss an ongoing project to understand the connection between these two approaches. We will begin by recalling support theory for finite groups, and explore the similarities and differences with the super case. In the end, we will explain how in the case when our Lie superalgebra is finite-dimensional, symmetrizable Kac-Moody there is a very beautiful relationship between the two types of support, using the recently developed notion of splitting subgroups.

Part of joint works with I. Entova-Aizenbud, J. Petsova, V. Serganova, and D. Vaintrob.

Ross Street

Title: *Representations of a category can be those of a groupoid*

Abstract: I am interested in categories F for which there is a groupoid G such that the categories [F,Vect] and [G,Vect] of linear representations are equivalent. The spurring example is due to Dan Kuhn where F is the category of finite vector spaces over a fixed finite field with all linear functions and G has the same objects but with only the bijective linear functions. I plan to discuss a categorical setting for a class of such results. There are important monoidal (tensor) structures on some of the [G,Vect] so arising and these transport to [F,Vect], however that is not the point of the present talk.

Daniel Tubbenhauer

Title: *Minimal representations of monoids*

Abstract: There is a MathOverflow question with title "Why aren't representations of monoids studied so much?". Well, I do not know, but it can't be because the theory is bad. In fact, there is a well-developed theory that is about 80 years old: representations of monoids form a non-rigid monoidal category, and

the study of monoid representations is indeed a nice mixture between tensor-category-type arguments and cell theory.

This talk is a friendly overview of the representation theory of monoids with the focus on minimal monoid representations.

This is based on joint ongoing work with M. Khovanov and finish joint work with M. Sitaraman.