Seattle Noncommutative Algebra Day

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ABSTRACT

Toward Balmer Spectra for Derived Categories of Operadic Modules

Jonathan Beardsley

University of Washington, USA

This talk is a preliminary report on joint work with James Zhang. If A is an O-algebra for an operad O which admits an operad map from the commutative operad, then we may think of A as a commutative algebra with some additional structure. We may then investigate the category of chain complexes of operadic A-modules, which contains the usual category of chain complexes of A-modules, but is typically larger. This category admits a tensor triangulated derived category whose Balmer spectrum can be defined. Our goal is to investigate the relationship of this space to Spec(A), which is the Balmer spectrum of the usual derived category of A-modules. We are particularly interested in the case that O is the operad whose algebras are commutative k-algebras with a derivation.

Isolated noncommutative cyclic singularities

Kenneth Chan

University of Washington, USA

Unlike most noncommutative rings, the ring of (-1)-skew polynomials admits an action of the symmetric group on its set of generators. Taking invariant subrings by subgroups of the symmetric group give examples of noncommutative quotient singularities. In this talk, we consider subrings invariant under cyclic permutation of the generators.

This gives a family of noncommutative cyclic singularities indexed by their dimension. Using the idea of pertinency, we prove (part of) a dichotomy theorem which gives conditions for whether or not such singularities are isolated.

Zariski cancellation problem for non-commutative algebras

Yanhua Wang

Shanghai University of Finance and Economics, China

I will give some recent developments on the Zariski cancellation problem of non-commutative algebras.

Cohen-Montgomery Duality and the Grothendieck Correspondence

Liang Ze Wong

University of Washington, USA

Cohen-Montgomery Duality gives an equivalence between group-graded rings and rings with a group action. I will review this result, then show how it is a special case of the Grothendieck correspondence between indexed and fibered categories.

Additive maps determined by rank-s matrices

Xiaowei Xu

Jilin University, China

Let $M_n(\mathbb{K})$ be the ring of all $n \times n$ matrices over a field $\mathbb{K}$, where $n \geq 2$ is a fixed integer. We proved that a map $f : M_n(\mathbb{K}) \to M_n(\mathbb{K})$ is additive if and only if $f(A + B) = f(A) + f(B)$ for all rank-s matrices $A, B \in M_n(\mathbb{K})$, where s is a fixed positive integer such that $\frac{n}{2} \leq s \leq n$. For the case $1 \leq s < \frac{n}{2}$, we also proved that if $g : M_n(\mathbb{K}) \to M_n(\mathbb{K})$

is a map such that $g\left(\sum_{i=1}^{[\frac{n}{s}]} A_i\right) = \sum_{i=1}^{[\frac{n}{s}]} g(A_i)$ holds for any $[\frac{n}{s}]$ rank-s matrices $A_1, \ldots, A_{[\frac{n}{s}]} \in M_n(\mathbb{K})$, then $g(x) = f(x) + g(0)$, $x \in M_n(\mathbb{K})$, for some additive map $f : M_n(\mathbb{K}) \to M_n(\mathbb{K})$, where $[\frac{n}{s}]$ denotes the least integer m with $m \geq \frac{n}{s}$. Particularly, g is additive if $char\mathbb{K} \nmid \left([\frac{n}{s}] - 1\right)$.

Some homological invariant properties under Frobenius extensions

Zhibing Zhao

Anhui University, China

Frobenius extensions were firstly introduced by Kasch as a generalization of Frobenius algebra. In this talk, we will show that, for a Frobenius extension, a module over the extension ring is Gorenstein projective if and only if so is its underlying module over the base ring. For a separable Frobenius extension between Artin algebras, we obtain that some homological properties are invariant, including CM-finiteness, CM-freeness and the representation dimension of Artin alebra.