

Seattle Noncommutative Algebra Day

Dec. 19, 2020

ABSTRACT

Degree bounds for Hopf actions on Artin-Schelter regular algebras

Ellen Kirkman

Wake Forest University

In 1915 E. Noether proved that for a field \mathbb{k} of characteristic zero and a finite group G acting naturally on a polynomial ring $\mathbb{k}[x_1; \cdots; x_n]$, the degrees of minimal generators of the subring of invariants are bounded above by the order of the group. In 2011, using Castelnuovo-Mumford regularity, P. Symonds proved that for a general field \mathbb{k} , an upper bound is $n(|G| - 1)$ when $n \geq 2$ and $|G| > 1$. Replacing $\mathbb{k}[x_1; \cdots; x_n]$ by an Artin-Schelter regular algebra A and G by a semisimple Hopf algebra H , we prove analogues of results of Noether, Fogarty, Fleischmann, Derksen, Sidman, Chardin and Symonds on bounds on the degrees of generators of the subring of invariants and on the degrees of syzygies of modules over the invariant subring. We further explore Castelnuovo-Mumford regularity and related weighted sums of homological and internal degrees in complexes of graded A -modules for noncommutative algebras. This is joint work with Robert Won and James J. Zhang.

Noncommutative hypersurface algebras

Cris Negron

University of North Carolina at Chapel Hill

In recent work with J. Pevtsova we use noncommutative hypersurface algebras to study support theories for finite-dimensional Hopf algebras. I will discuss a number of questions about hypersurface algebras,

and their associated stable categories/matrix factorization categories, which play a fundamental role in our work.

Constructing non-semisimple modular categories

Chelsea Walton

Rice University

In joint work with Robert Laugwitz (<https://arxiv.org/abs/2010.11872>), we construct non-semisimple modular tensor categories with the relative monoidal center construction. Most of the talk will be dedicated to defining and providing context for these terms, and if time permits, I'll suggest some follow-up research directions in case anyone is curious.

Invariant theory of twisted generalized Weyl algebras

Jason Gaddis

Miami University

One generalization of the Shephard-Todd-Chevalley (STC) theorem is to determine when the fixed ring of a (twisted) Calabi-Yau algebra is (twisted) Calabi-Yau. While significant work has been done on this problem in the \mathbb{N} -graded connected case, less is known in other settings. Amongst \mathbb{Z} -graded algebras, the Weyl algebra and its generalizations play a central role. In this talk I will survey several recent projects on the invariant theory of twisted generalized algebras (TGWAs). This is a class of algebras which includes generalized Weyl algebras (GWAs), multiparameter quantized Weyl algebras, and primitive quotients of enveloping algebras of semisimple Lie algebras. In particular, I will discuss an STC-like theorem for TGWAs and results on Hopf actions on GWAs.

New approaches to finite generation of cohomology rings

Xingting Wang

Howard University

In this talk, we introduce various approaches to study the finite generation condition. First, we show that the finite generation condition on modules can be replaced by a condition on any affine commutative Hopf module algebra under the integral assumption. Next, we use a spectral sequence argument to show that the finite generation condition holds for certain filtered, smash and crossed product algebras in positive characteristic if the related spectral sequence collapses at some page. Finally, for any finite dimensional (Hopf) algebra that is defined over a number field over the rationals, we construct another finite dimensional (Hopf) algebra over a finite field and prove that the finite generation condition can be lifted up from a finite field to any number field. This is joint work with Nguyen and Witherspoon.

Algebraic properties of face algebras

Fabio Alejandro Calderon

Rice University and Universidad Nacional de Colombia

In joint work with Chelsea Walton, we study some ring-theoretic and homological properties of Hayashi's face algebra attached to a quiver. In this talk I will provide the motivation behind this study, the results already obtained and the following steps of our research.