KUMUNU 2021 (held in May 2022)
Titles and Abstracts

Speaker: Dale Cutkosky

Title: Analytic spread of filtration

Abstract: Let $\mathcal{I} = \{I_n\}$ be a filtration of a (Noetherian) local ring R with maximal ideal m_R. The Rees algebra of $\mathcal{I}$ is $R[\mathcal{I}] = \oplus_{n\geq 0} I_n$. We define the analytic spread of $\mathcal{I}$ to be $\ell(\mathcal{I}) = \dim R[\mathcal{I}]/m_R R[\mathcal{I}]$, generalizing the classical definition for I-adic filtrations $\{I^n\}$, where I is an ideal of R. We explore this concept for arbitrary (not necessarily Noetherian) filtrations, and for divisorial filtrations, which are the natural (but not necessarily Noetherian) extension of the filtrations $\{\overline{I^n}\}$ of integral closures of the power of an ideal I.

Many of the classical theorems for I-adic filtrations generalize to arbitrary or divisorial filtrations, but there are some interesting differences.

Speaker: Eloísa Gifo

Title: Cohomological support varieties

Abstract: Given a ring R, we can associate a variety to each R-module, or more generally each complex of R-modules, which encodes homological information. We will discuss what these varieties are, how they can detect ring theoretic properties of R, and other applications. This is joint work with Ben Briggs and Josh Pollitz.

Speaker: Srikanth Iyengar

Title: Rigidity properties of the cotangent complex

Abstract: This talk is about the cotangent complex of a homomorphism of commutative noetherian rings. I will present results recent work, some due to Benjamin Briggs and others obtained in collaboration with him, that highlight various rigidity properties of the cotangent complex. These are reported in the following article: https://arxiv.org/abs/2010.13314

Speaker: Kyle Maddox

Title: Nilpotent singularity types in prime characteristic

Abstract: In prime characteristic local rings, properties of the Frobenius map and the Frobenius action on local cohomology which it induces are often used to define properties of the ring. Many classical F-singularity types (e.g. F-injective, F-rational) are defined in terms of how well-behaved this action is. Asking instead how much of the local cohomology can be nilpotent under Frobenius leads to the study of F-nilpotent rings, which were introduced by Srinivas and Takagi in 2017. Recent work in exploring depth-like theories related to nilpotent cohomology have demonstrated robust analogies with Cohen-Macaulay singularities. In this talk, we aim to survey some of these results to demonstrate that F-nilpotent and related singularity types are natural to consider and demonstrate a variety of interesting behaviors.

Speaker: Julia Pevtsova

Title: Noncommutative support theories

Abstract: I'll discuss the construction and properties of the hypersurface support for the class of *smoothly integrable* finite dimensional Hopf algebras with an eye towards getting some information for the Balmer spectrum of a small quantum group. In this both non commutative and non cocommutative setting the techniques developed in commutative algebra by Eisenbud, Avramov-Buchweitz and Avramov-Iyengar turn out to be more applicable then the ones coming from finite group schemes which can be viewed as the cocommutative counterpart. This is joint work with Cris Negron.

Speaker: Thomas Polstra

Title: Inversion of Adjunction of F-purity

Abstract: Critical to the inductive treatment of the complex minimal model program are theorems which compare the singularities of a complex variety with the singularities of a codimension 1 subvariety. Such theorems, when viewed through the lens of reduction to prime characteristic, produce conjectures on the behavior of Noetherian rings of prime characteristic. In particular, Kawakita's Inversion of Adjunction of Log Canonical Singularities Theorem inspires the similarly named Inversion of Adjunction of F-purity conjecture in commutative algebra. We will discuss historical developments around this conjecture, recent progress, and relations with the problem of deforming F-purity,. This talk is based on collaborative efforts with Austyn Simpson and Kevin Tucker.