

GRADUATE STUDENT SEMINAR

Guest Speaker: Michael Perlman

University of Notre Dame

Date: Monday, November 5, 2018

Time: 4:00 PM

Location: 231 Hayes-Healy Hall



Lecture Title:

Local cohomology and D -modules

Abstract

An affine algebraic variety over a field k is a subset of k^n defined by the simultaneous vanishing of polynomial equations. Given an affine algebraic variety Z in k^n , it is natural to ask the following question: What is the minimal number of polynomial equations required to define Z ? This number, written $\text{ara}(Z)$, is known as the arithmetic rank of Z . Stated more geometrically, $\text{ara}(Z)$ is the smallest natural number d such that Z is the intersection of d hypersurfaces in k^n . One way to get lower bounds on arithmetic rank is via cohomological obstructions, such as non-vanishing of local cohomology with support in Z . Computing local cohomology modules is hard, complicated by the fact that, in general, they are not finitely-generated modules over the polynomial ring. However, if we instead view local cohomology as a module over a larger ring, the Weyl algebra D of differential operators on k^n , local cohomology modules have a much more rigid structure (called "holonomic") which has been employed to do new computations in recent past. In this talk, I will introduce local cohomology and explain what it can tell us about arithmetic rank, as well as the geometry and topology of Z . This will lead to discussing the structure of local cohomology as a D -module. If there is time, I will state new results on the D -module structure of local cohomology with support in Pfaffian varieties.