



THE DEPARTMENT OF MATHEMATICAL SCIENCES PROUDLY PRESENTS

COLLOQUIUM

Spring 2023

Primary decompositions

Dr. Irena Swanson
Purdue University



Feb-23-2023

10:30 am

Abstract

Primary decompositions are a basic tool in commutative algebra, but they also arise in other contexts. In this talk I will discuss some connections with algebraic geometry, partial differential equations, algebraic statistics, and computational complexity. Determinants of $n \times n$ matrices can be computed in polynomial time, whereas the computation of permanents is $\#P$ -complete. On the algebra side, in polynomial rings the ideals generated by determinants have a simpler and nicer structure than those generated by permanents, and in particular, the determinantal ideals are prime ideals whereas the permanent ideals have many primary components. This is one instance in which primary decompositions capture a computational difficulty. Other instances have to do with the Castelnuovo--Mumford regularity and numbers of associated prime of powers of ideals. I will touch on the 2016 work of Jason McCullough and Irena Peeva producing a family of counterexamples to the Eisenbud--Goto conjecture and simultaneously to the Stillman question and a Bayer--Huneke--Stillman question. I will finish the talk with my work with Jesse Kim on the complexity of primary decompositions of second powers of prime ideals and more recent work with Rosie Rissner on fluctuations of numbers of associated primes of powers of ideals.

GRIC, Biblioteca RUM

Refrigerios, 15 minutos antes.

Join Zoom Meeting

<https://us02web.zoom.us/j/81148054497?pwd=Qmt6bIR1UURGdi9yM3E2YmM0UkxmZz09>

Meeting ID: 811 4805 4497

Passcode: 052906

