Sage/Oscar Days for Combinatorial Algebraic Geometry

Lightning Talks Session 1
February 17, 2021

Hyperelliptic Hodge Integrals

Adam Afandi, Colorado State University

I'll describe a combinatorial formula used to compute some intersection numbers on the moduli space of hyperelliptic curves.

Identities of prime rings solved by curves

Jose Brox, Centre for Mathematics of the University of Coimbra

In a prime ring, if an element a satisfies, for all x, an identity which is a linear combination of terms of the form a^ixa^j, then a is algebraic; but given such an identity it is not trivial to find the possible minimal polynomials for a. We show how to get them in terms of the curve generated by an associated polynomial in two variables.

Computing Syzygies

Juliette Bruce, University of California, Berkeley

I will discuss recent large-scale computations, which utilize numerical linear algebra and highly distributed, high-performance computing to generate data about the syzygies of various algebraic surfaces.

Multistationarity in Chemical Reaction Networks

Laura Brustenga i Moncusí, UCPH
Multistationarity in chemical reaction networks has many applications; for example, it builds switch-like behaviour in biological circuits. We will present an ongoing project to implement in Julia (using Oscar) well-known algorithms to determine regions for multistationarity.

Numerical algebraic geometry

Taylor Brysiewicz, The Max Planck Institute for Mathematics in the Sciences

Numerical algebraic geometry refers to a collection of computational tools for studying algebraic varieties by computing numerical approximations of points on them. Numerical methods are particularly well suited for finding examples of varieties displaying certain desirable properties. To showcase this, I will discuss a recent project which uses these tools to provably classify all 65 combinatorial types of quintic spectrahedra.

Combinatorial Aspects of Convex Algebraic Geometry

Papri Dey, University of Missouri, Columbia

I shall talk about some combinatorial features appearing in convex algebraic geometry.

A generalization of Springer's representations in type A, and Sage

Sean Griffin, Brown University

In the 70s, Springer geometrically constructed the irreducible representations of the symmetric group as the top cohomology groups of the Springer fibers. In this lightning talk, I present a generalization of this construction to

induced irreducible representations. I then briefly discuss how I used Sage to connect these representations to Macdonald theory. This is partially joint work with Jake Levinson and Alexander Woo.

On the deformation rigidity of smooth projective symmetric varieties with Picard number one
Shinyoung Kim, Institute for Basic Science, Center for Geomerty and Physics

Symmetric varieties are normal equivariant open embeddings of symmetric homogeneous spaces. The main goal is to study the deformation rigidity of smooth projective symmetric varieties with Picard number one.