

ACMS Grad & Postdoc Seminar



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Wednesday, Feb. 11, 2025
154 Hurley Hall
3:30 PM – 4:30 PM

Elimination Without Eliminating

Many hypersurfaces in algebraic geometry, such as discriminants, arise as the projection of another variety. The real complement of such a hypersurface partitions its ambient space into open regions. Existing methods for computing these regions require the explicit equation of the hypersurface as input. However, these methods are not applicable when the hypersurface is obtained after projection, as computing that equation by elimination can be computationally demanding or even infeasible. We propose a novel method for computing these regions. The idea underlying our approach is to compute the intersection of the hypersurface with a line. This can be done using numerical homotopy continuation and so-called pseudo-witness sets without computing a defining equation for the hypersurface – we perform elimination without actually eliminating variables. We implement our approach in a forthcoming Julia package and demonstrate, on several examples, that the resulting algorithm accurately recovers all regions of a hypersurface. This is joint work with Breiding, Cobb, Englander, Farnsworth, Hauenstein, Henriksson, Johnson, and Mundayur.

The Department of Applied and Computational
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