

Seminar/Talk

Real-rootedness and log-concavity from moduli of curves to matroids: an AI-assisted workflow

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We report on a story that began in January with my AlphaEvolve experiments on a conjecture of Aluffi, Chen and Marcolli: the Poincar polynomials of the moduli of genus-zero curves are real-rooted. These experiments uncovered the asymptotic behaviour of the roots, but no proof.In April a bivariate deformation, discovered by an internal DeepMind model, led in joint work with Young-Hoon Kiem to a proof of the conjecture. Reinterpreting the deformation as a stratified motivic invariant, we generalised real-rootedness to that setting and formulated a conjecture on the branches of the real roots of the deformation which implies the real-rootedness of the Chow, chain and coarse flag polynomials of an arbitrary loopless matroid. We proved this branch conjecture for broad classes of matroids, among them the paving matroids.The same machinery then found the limits: in recent joint work with Basile Coron, Chris Eur and Shiyue Li, our agents constructed matroids from finite geometries whose Chow and chain polynomials are not log-concave, disproving conjectures of Huh-Stevens, Ferroni-Schroter and Athanasiadis-Kalampogia-Evangelinou. Interestingly, for genus one curves log-concavity survives but real-rootedness does not.

Thursday, December 3, 2026 01:00pm - 04:00pm
Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

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