VLZ 10 prof. James Damon

4. "Towers of Solvable Groups, Free Divisors, and the Topology of Nonisolated Matrix Singularities"

This talk would recent joint results obtained with Brian Pike on a method for computing the vanishing topology of nonisolated matrix singularities. Goryunov and Mond provided in the case of an isolated matrix singularities defined for n X n symmetric, skew-symmetric, or general matrices a formula relating the Milnor number \mu in terms of \tau = K_H, e-codimension of the matrix mapping with a correction term which is a two term Euler characteristic for a Tor sequence.
For nonisolated matrix singularities, the vanishing topology is captured by replacing the Milnor fiber of the isolated matrix singularity by the singular Milnor fiber obtained from a stabilization of the corresponding matrix map viewed as a nonlinear section of the determinantal variety (where the determinant vanishes). We compute the corresponding "singular Milnor number" using a geometric method which uses a "tower of free divisors" to complete the determinantal variety to a free divisor and use results for nonlinear sections of free divisors and free complete intersections to compute it in terms of invariants expressed as lengths of determinantal modules.
The existence of the tower of free divisors results from a new result for representations of solvable linear algebraic groups (this is distinct from the results for reductive groups and quivers due to Buchweitz-Mond). We use the Lie-Kolchin theorem to introduce a "block decomposition" for a representation which yields that the variety of exceptional orbits is a free divisor. This is related to the classical Cholesky-type factorizations and can be simultaneously applied to a tower of solvable Lie groups and representations.

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