Abstract:

We describe an ongoing program to resolve certain problems at the interface of Diophantine approximation and homogenous dynamics. Highlights include computing the Hausdorff and packing dimensions of the set of singular systems of linear forms and show they are equal, thereby resolving a conjecture of Kadyrov-Kleinbock-Lindenstrauss-Margulis (2014) as well as answering a question of Bugeaud-Cheung-Chevallier (2016). As a corollary of the Dani correspondence principle, this implies that the set of divergent trajectories of a one-parameter diagonal action on the space of unimodular lattices with exactly two Lyapunov exponents with opposite signs has equal Hausdorff and packing dimensions. Other applications include dimension formulas with respect to the uniform exponent of irrationality for simultaneous and dual approximation in two dimensions. This is joint work with David Simmons, Lior Fishman, and Mariusz Urbanski. The reduction of various problems to questions about certain combinatorial objects that we call templates along with a variant of Schmidt’s game allows us to answer some of these problems, while leaving plenty that remain open. The talk will be accessible to students and faculty interested in some convex combination of homogeneous dynamics, Diophantine approximation and geometric measure theory.

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