PDE/Analysis Seminar

Tuesday, October 27, 2026

3:00 PM – 4:00 PM Room 2 - 151



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"Correlations and relaxation to equilibrium in kinetic theory"

Abstract

The passage from interacting particles to PDEs is a central problem in statistical mechanics. For a dilute gas, the Boltzmann equation describes the evolution of the one-particle distribution, while the Boltzmann hierarchy keeps track of joint particle statistics and their correlations. I will explain how these descriptions are related and discuss the approach to equilibrium for correlated gases. The main analytic challenge is to control an infinite system in which each equation depends on the next. I will present an energy method that combines the dissipation produced by transport and collisions with estimates that remain uniform across the hierarchy. For a class of solutions near equilibrium satisfying suitable constraints on conserved quantities, these estimates give exponential relaxation toward an equilibrium of independent particles with Maxwellian velocities, together with quantitative decay of pair correlations. The talk will emphasize the statistical meaning of the equations and the ideas behind the estimates. [https://arxiv.org/abs/2610.24089]

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