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Genealogy of Catalytic Populations

For neutral branching models of two types of populations there are three universality classes of behavior: independent branching, (one-sided) catalytic branching and mutually catalytic branching. Loss of independence in the two latter models generates many new features in the way that the populations evolve.

In this talk I will focus on describing the genealogy of a catalytic branching diffusion. This is the many individual fast branching limit of an interacting branching particle model involving two populations, in which one population, the "catalyst", evolves autonomously according to a Galton–Watson process while the other population, the "reactant", evolves according to a branching dynamics that is dependent on the number of catalyst particles.

We show that the sequence of suitably rescaled family forests for the catalyst and reactant populations converge in Gromov–Hausdorff topology to limiting real forests. We characterize their distribution via a reflecting diffusion and a collection of point-processes. We compare geometric properties and statistics of the catalytic branching forests with those of the "classical" (independent branching) forest.

This is joint work with Andreas Greven and Anita Winter.