LadHyX Seminar – April 13, 10:45 – LadHyX library

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Minimum action method for nonequilibrium phase transitions and bistable dynamical systems

First-order nonequilibrium phase transitions observed in active matter, fluid dynamics, biology, climate science, and other systems with time-irreversible dynamics are challenging to analyze because they cannot be inferred from a simple free energy minimization principle. In this seminar, I will present a numerical tool that can be used to pinpoint the change of relative stability between the different attractors of a stochastic dynamical system, hence predicting the phase transitions in parameter space. As an illustration of the method, I will show how our algorithm finds the transition paths in an experimental system made of a trapped active particle. I will also study the phase transitions of two spatially-extended nonequilibrium systems: the one of a reaction-diffusion network based on the Schlögl model, and the one of the Active Model B, the natural nonequilibrium extension of the Cahn-Hilliard dynamics. Notably, the paths of the transitions, including their critical nuclei, are identified.