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Title: Classical Many-Body Time Crystals

Abstract

Time crystals is the contemporary term used to describe a discrete time-translation symmetry breaking in a quantum many-body state of matter, where the system's dynamics are slower than the forces acting on it, leading to a subharmonic response. Such (time) symmetry breaking transitions occur in a wide plethora of systems, which are commonly described by collective classical order parameters that exhibit period-doubling bifurcations. In my talk, I will introduce the coarse-graining required to connect between the microscopic (quantum many-body) setting to the effective classical description, thus elucidating the role played by interactions and dissipation in such driven systems. This connection provides an eagle's view on the ubiquitous phenomenology of time crystals, while providing a tool to distinguish between single- and many-mode transitions, which we also show in experiments. I will, then, highlight potential technological applications of the latter, as simulators of Ising networks and analog neural networks.