

Coarse combinatorial models of global dynamics capturing cycling motion

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It is notoriously difficult to characterize the dynamics of a system which evolves on a high-dimensional complicated invariant set – one of the most prominent examples of such a system being a turbulent fluid flow. One attempt in this direction is to construct a coarse finite-state model of the system which captures the essential dynamics up to a certain scale. In this talk, we describe how to construct such a model which, in contrast to existing approaches, incorporates information about cycling behaviour. The basic idea of our construction is to combine degree 1 cohomological information about the invariant set with dynamical information (possibly from time series data only) in order to extract subsets on which the system performs an approximately periodic motion.

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