

Indicators and precursors of transitions in complex systems

Henrik Jeldtoft Jensen

Imperial College London
Email: h.jensen@imperial.ac.uk

Abstract

We use the Tangled Nature model of co-evolving agents in a high dimensional abstract type space to develop mathematical methods that allow us to monitor and to some extent see warnings of approaching systems level transitions. The fundamentally stochastic dynamics is approximated by deterministic mean field equations. Because of the big dimensionality fixed points cannot be identified by analytic means, but an eigenvalue stability analysis can be performed numerically about the quasi stable configurations generated by the stochastic dynamics. The appearance of positive eigenvalues associated with directions with an overlap with instantaneous state vector of the system is found to be a good indicator/precursor of transitions or tipping points.