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Nonlinear dynamics of Kuramoto oscillators coupled through higher-order interactions

For decades, consideration of the pairwise interactions between dynamical units has been at the forefront to capture dynamical processes in various complex systems. However, various complex systems such as brains, society and financial systems have the underlying topology of higher-order interactions. We investigate the dynamics of coupled Kuramoto oscillators on simplicial complexes having higher-order interactions. An inclusion of higher-order interactions have already been shown to lead to the emerging phenomenon of abrupt first-order transition to synchronization, which was not possible in the same system having only pair-wise interactions. In the talk, first, we will review the recent advances in the coupled Kuramoto oscillator on simplicial complexes, and then discuss our latest results on the existence of multiple transitions to first-order synchronization in such systems.

1. First-order route to antiphase clustering in adaptive simplicial complexes, A D Kachhvah, S. Jalan*, Phys. Rev. E (Letter) 105, L062203 (2022)
2. Hebbian plasticity rules abrupt desynchronization in pure simplicial complexes, A. D. Kachhvah, and S. Jalan*, New Journal of Physics (Fast Track) 24, 052002 (2022)
3. Multiple synchronization transitions in simplicial complexes on multilayer networks, S Jalan, A Suman, arXiv e-prints, arXiv: 2206.10852

The event is part of the group seminar of AG Mandel-Zakharova at TU Berlin.
For information on how to access the event, please contact: henning.reinken@itp.tu-berlin.de

Tuesday, 19.07.2022 · 16:15h · ER 164 / via Zoom

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