MAR16-2015-001357

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Infering Networks From Collective Dynamics[1]

MARC TIMME, Network Dynamics, Max Planck Society

How can we infer direct physical interactions between pairs of units from only knowing the units' time series? Here we present a dynamical systems' view on collective network dynamics, and propose the concept of a *dynamics' space* to reveal interaction networks from time series. We present two examples: one, where the time series stem from standard ordinary differential equations, and a second, more abstract, where the time series exhibits only partial information about the units' states. We apply the latter to neural circuit dynamics where the observables are spike timing data, i.e. only a discrete, state-dependent outputs of the neurons. These results may help revealing network structure for systems where direct access to dynamics is simpler than to connectivity, cf. [1,2,3].

This is work with Jose Casadiego, Srinivas Gorur Shandilya, Mor Nitzan, Hauke Haehne and Dimitra Maoutsa.

[1] M. Timme, Phys. Rev. Lett. 98:224101 (2007). http://dx.doi.org/10.1103/PhysRevLett.98.224101

[2] S.G. Shandilya M. Timme, New J. Phys. 13, 013004 (2011). http://dx.doi.org/10.1088/1367-2630/13/1/013004

[3] M. Timme J. Casadiego, Phys. Rev. A 47:343001 (2014) - Invited Review. http://dx.doi.org/10.1088/1751-8113/47/34/343001

[1]Supported by grants of the BMBF (Future Compliant Power Grids - CoNDyNet) and by the Max Planck Society to MT.