Examining the Performance of a Method that Extracts Network Connectivity from Dynamics

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The understanding of neural systems as complex networks has brought about important discoveries in neuroscience. In the study of network of neurons, it is essential to understand the relationship between the functionality and connectivity of the network. As it is challenging to directly observe the connectivity among neurons, methods that extract the connectivity of networks from measurements are important. We have recently developed a method that extracts network connectivity using only measurements of the dynamics of the nodes. Our method is based on a noise-induced relation between the connectivity and the dynamical correlation [Ren et al., Phys. Rev. Lett. 104, 058701 (2010)]. Yet it does not require prior knowledge of the noise strength σ nor the coupling strength g, and can even give the ratio σ^2/g. To examine the performance of this method, we have applied it to a number of different networks and types of dynamics. We study the quality of extraction using local measures of sensitivity and specificity as well as global measures of degree distribution and eigenvalue spectrum of the adjacency matrix. In this talk, we shall discuss our results and show that our method is applicable to a range of networks and dynamics.