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Driven Synchronization in Random Networks of Oscillators JASON HINDES, CHRISTOPHER R. MYERS, Cornell University — Synchronization is a universal phenomenon found in many non-equilibrium systems. Much recent interest in this area has overlapped with the study of complex networks, where a major focus is determining how a system's connectivity patterns affect the types of emergent behavior that it can produce. Thus far, modeling efforts have focused on the tendency of networks of oscillators to mutually synchronize themselves, and largely neglected the effects of external driving, even though both effects are present, and often compete, in many naturally occurring systems. In this work we discuss the interplay between mutual and forced synchronization in networks of phase oscillators, and in particular resolve how the structure and emergence of these states depends on the underlying network topology for simple random networks with a given contact distribution. We provide a bifurcation analysis, centering on the unfolding of a Takens-Bogdanov-Cusp singularity, which naturally separates homogeneous and heterogeneous network behavior, and determines the number, stability, and appearance of entrained and mutually synchronized states as a function of a few system parameters.

Jason Hindes
Cornell University

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