SYNCHRONIZATION (AND ANTI-SYNCHRONIZATION) OF NOISY ARRAYS OF COUPLED OSCILLATORS: THE SIMPLEST MODELS

Synchronization is observed in many systems in nature, from microscopic to macroscopic, in biological systems (neurons in the brain, cells in the heart, the flocking of birds), in mechanical systems, in epidemiology: the list is endless. In these systems, a collection of coupled units, if coupled sufficiently strongly, can undergo a transition to synchronized behavior. Noise in these systems arises from a number of sources, for instance inherent fluctuations in each unit, fluctuations due to finite numbers of units, external fluctuating forces. The theoretical analysis of any such “real” system is often notoriously difficult, and numerical simulations notoriously resource intensive. And, at the end of the day, while a great deal of valuable information might be learned from analyzing a particular such system, the results may shed little light on the behavior of other systems.

My work focuses on work with the simplest arrays that exhibit synchronization behaviors seen in the far more complex “real” systems, but that are sufficiently simple to be analytically and numerically far more tractable. We work with coupled two-state (e.g., on-off) and three-state (e.g., functional-neutral-dysfunctional or on-neutral-off) units. I will present a number of examples that highlight our results and extend our understanding of synchronization phenomena in these simpler model noisy arrays.

Monday, October 16, 2017
4:00 P.M.
2033 Young Hall

Contact: Nancy Gutierrez at (310) 206-4956 or ngutierrez@chem.ucla.edu for more information.