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Nilpotent Hopf Bifurcations in Coupled Cell Systems

A coupled cell system is a collection of interacting dynamical systems. Coupled cell models assume that the output from each cell is important and that signals from two or more cells can be compared so that patterns of synchrony can emerge. We ask: How much of the qualitative dynamics observed in coupled cells is the product of network architecture and how much depends on the specific equations?

For example, network architecture can lead to codimension one bifurcations from a synchronous equilibrium whose linearization has a pair of purely imaginary eigenvalues with algebraic multiplicity two and geometric multiplicity one. In addition, network architecture can change the nonlinear terms in the normal forms of such bifurcations and lead to multiple branches of periodic solutions and amplitude growth rates that differ from that of standard Hopf bifurcation. This is joint research with Toby Elmhirst.