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Dynamical Phase Transitions In Periodically Driven Model Neurons JAN R. ENGELBRECHT[1], RENATO MIROLLO[2], Physics[1] and Mathematics[2] Departments, Boston College — Transitions between dynamical states in integrate-and-fire (IF) neuron models with periodic stimuli result from tangent or discontinuous bifurcations of a return map. We study their characteristic scaling laws and show that discontinuous bifurcations exhibit a new kind of phase transition intermediate between continuous and first order. We then consider a much more complicated Hodgkin-Huxley type of model and show that in the presence of periodic stimuli an attracting 2D invariant subspace develops in the 7D state space. A Poincare section on this subspace yields a 1D return map, remarkably similar to the IF case. This reduction to 1D map dynamics should extend to real neurons in a periodic current clamp setting.

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