Title: Central patterns generation with heteroclinic orbits

Abstract:
Heteroclinic orbits have been suggested [1] as a dynamical systems construct underlying the generation of stable yet flexible motor patterns by central pattern generators (CPGs) in the nervous system. In this talk I will review the original models underlying these ideas, the mathematical formulation in the form of modified Lotka-Volterra models and how heteroclinic dynamics relates to the trade-off between stability to perturbations against sensitivity to meaningful inputs.
In the second part of the talk I will present results on extensions of the heteroclinic ideas to Hodgkin-Huxley type conductance based models [2] and discuss our recent paper [3] on the structural stability of heteroclinic orbits in this model class.

[1] Valentin S. Afraimovich, Mikhail I. Rabinovich, P. Varona. Heteroclinic Contours in Neural Ensembles and the Winnerless Competition Principle. Intern. J. Bifurcat. Chaos 14(4): 1195-1208 (2004).

[2] Thomas Nowotny, Mikhail I. Rabinovich. Dynamical origin of independent spiking and bursting activity in neural microcircuits, Phys Rev Lett 98: 128106 (2007).
[3] Peter Ashwin, Ozkan Karabacak, Thomas Nowotny. Criteria for robustness of heteroclinic cycles in neural microcircuits, J. Math. Neurosci. 1: 13 (2011).