

Topological-numerical analysis of a two-dimensional dynamical model of a neuron

Justyna Signerska-Rynkowska^{1,2},
Joint work with Paweł Pilarczyk¹, and Grzegorz Graff¹

¹*Faculty of Applied Physics and Mathematics, Gdańsk University of Technology*

²*Dioscuri Centre in Topological Data Analysis*

We conduct computer-assisted analysis of the two-dimensional model of a neuron introduced by Chialvo in 1995 (*Chaos, Solitons & Fractals* 5, 461–479). We apply the method for rigorous analysis of global dynamics based on a set-oriented topological approach, introduced by Arai et al. in 2009 (*SIAM J. Appl. Dyn. Syst.* 8, 757–789). Additionally, we introduce a new algorithm to analyze the return times inside a chain recurrent set, and together with the information on the size of the chain recurrent set, we develop a new method that allows one to determine ranges of parameters for which chaotic dynamics may appear.