CURRICULUM VITAE

PERSONAL INFORMATION

Name Pedro Romero Fragoso de Carvalho

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RESEARCH INTEREST

Theoretical Physics: Biological Physics, Stochastic Process, Nonlinear Dynamics, Neuroscience, Statistical Mechanics, Complex Physics, Critical Phenomena.

WORK EXPERIENCE

04/2021- Research as a Ph.D student, Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society

(TBD)

10/2019- Research as a Ph.D student, Institute of Physics, Polish Academy of Sciences (IF-PAN)

I developed and studied models of intrinsically disordered proteins. In a framework of computational simulations, mostly using LAMMPS, the goal was to establish a criteria that determines the coexistence phases, and consequently how to build phase diagrams for intrinsically disordered proteins.

08/2016-10/2018 Research as a M.S student, Federal University of Pernambuco, Physics Department (DF-UFPE)

I developed a theoretical model that simulate a random network of neurons, modelled by two cellular automatas, that exhibit intrinsic adaptation. The work was made theoreticaly by using statistical mechanics tools and computational methods to simulate such networks.

02/2012–06/2016 Research as a B.S student, DF-UFPE

First I studied the principles of Neuroscience, together with stochastic process, and how to merge both subjects. After, I have Developed my computational skills (C/C++, Gnuplot, LaTeX) learning how to make computational simulations. The Department of Physics at Universidade Federal de Pernambuco has no undegraduate thesis.

08/2015-12/2015 Teaching Assistant, DF-UFPE

I had extra classes and helped students in assignments in the discipline of Instrumentation for teaching, which were based on a Arduino course. The focus of this course is to introduce electronic instrumentation for senior students of the bachelor program. (5 hours per week)

EDUCATION

08/2016-10/2018 Master of Physics - Federal University of Pernambuco (UFPE), Recife-Brazil

02/2011-06/2016 Bachelor of Physics - Federal University of Pernambuco (UFPE), Recife-Brazil

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SUMMARY OF THE MASTER'S THESIS

My master's thesis investigates the collective effects of the intrinsic adaptation in excitable neurons. This phenomenon of self-regulation of the cell has the function of counterbalance mechanisms that control the excitability of the neuron. This work is an extension of the model proposed by Kinouchi and Copelli[1], where neurons are modeled by a probabilistic cellular automata that represent the spiking activity of the cell. My thesis proposes an extension of the above-mentioned model through the addition of a new variable of the cellular automata, which models the adaptive dynamics of the neuron, decreasing the probability that the neuron can fire. Among the obtained results, we could verify that, although in general, it does not occur alteration on the critical point of the model, the addition of this new adaptive variable, in a regime of strong and persistent adaptation, provides an increase in the dynamic range of the network and in a gain of the robustness of the system.
Reference:[1]https://www.nature.com/articles/nphys289

PRESENTATIONS

2013 · Poster presentation of my undergraduate project at the *Programa Institucional de Bolsas de Iniciação Científica*.

2014 · Poster presentation of my undergraduate project at the *Programa Institucional de Bolsas de Iniciação Científica*.

PROGRAMMING SKILLS

C/C++ · Python · LaTeX · Gnuplot · Arduino · Bash

LANGUAGES

Portuguese · Mothertongue

English · Fluent

October 11, 2021