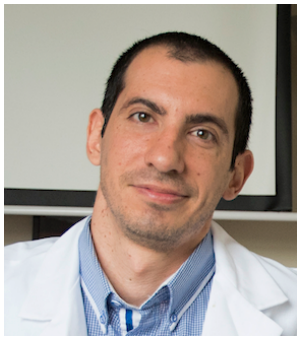
University of Houston - Biomedical Engineering Seminar

Friday, September 18, 2020, 12 noon

Via Zoom: https://uofh.zoom.us/j/92470065206

Deciphering the Brain's Neural Code Through Large-scale Simulation of Cortical Circuits



Salvador Dura-Bernal, Ph.D.

Abstract

Understanding the brain's neural code would allow us to develop treatments for brain disorders affecting 1 out of 2 people, develop technology to read and write information from the brain, and advance artificial intelligence. Despite the large amount of experimental data, understanding the brain is challenging due to its complex interactions across scales: from molecules to cells to circuits to behavior. Large-scale biophysically-detailed brain simulations provide an unrivaled method to integrate these data and bridge the scales. We have developed a model of mouse primary motor cortex (M1) with over 10,000 realistic neurons and 30 million synapses, that can reproduce cell-type and layer-specific *in vivo* activity associated with behavior. An earlier version of the model was trained to control a virtual and robotic arm using reinforcement learning. We have also developed a software tool (www.netpyne.org) that makes multiscale modeling of brain circuits accessible to the wider community.

Biosketch

Salvador Dura-Bernal is an Assistant Professor in the Physiology and Pharmacology department at SUNY Downstate. He completed his PhD and first postdoc at the University of Plymouth, UK; followed by postdocs at Johns Hopkins and SUNY Downstate. His research focuses on understanding cortical circuits through large-scale biophysically-detailed simulations. Dr. Dura-Bernal has developed detailed models of motor and auditory cortical circuits, and a software tool (www.netpyne.org) for modeling of brain circuits, which has been used in over 40 labs. He received the 2019 Robert Furchgott Scholar Award, an early career investigator prize; and the 2017 Best Use of AI Award from HPCwire, a leading supercomputing publication. Dr. Dura-Bernal is currently the PI in 3 grants funded by the National Institutes of Health (NIH), the National Science Foundation (NSF) and the NY State Spinal Cord Injury Board.