Data-driven computational modeling of CA1 hippocampal principal cells and interneurons

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This is an abstract of a paper presented at the *26th Annual Computational Neuroscience Meeting (CNS*2017),* Antwerp, Belgium, 15 to 20 Jul 2017. It is available from the publisher at:

https://doi.org/10.1186/s12868-017-0372-1

P177 Data-driven computational modeling of CA1 hippocampal principal cells and interneurons

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BMC Neuroscience 2017, **18** (**Suppl 1**):P177

We present and discuss data-driven models of biophysically detailed hippocampal CA1 pyramidal cells and interneurons of a rat. The results have been obtained by using the Brain Simulation Platform (BSP) of the Human Brain Project and two open-source packages, the Electrophys Feature Extraction Library (eFEL, https://github.com/BlueBrain/eFEL) and the Blue Brain Python Optimization Library (BluePyOpt) [1]. They have been integrated into the BSP in an intuitive graphical user interface guiding the user through all steps, from selecting experimental data to constrain the model, to run the optimization generating a model template and, finally, to explore the model with in silico experiments. Electrophysiological features were extracted from somatic traces obtained from intracellular paired recordings performed using sharp electrodes on CA1 principal cells and interneurons with classical accommodating (cAC), bursting accommodating (bAC) and classical non-accommodating (cNAC) firing patterns. The extracted features, together with user selections for realistic morphological reconstructions and ion channel kinetics, were then used to automatically configure and run the BluePyOpt on the Neuroscience Gateway and/or on one of the HPC systems supporting the BSP operations, such as CINECA (Bologna, Italy) and JSC (Jülich, Germany) in this case. The resulting optimized ensembles of peak conductances for the ionic currents, were used to explore and validate the model behavior during interactive in silico experiments carried out within the HBP Collaboratory. Such a modelling effort has been undertaken in the context of the Human Brain Project and constitutes one of the major steps in the workflow that is being used to build a cellular level model of a rodent hippocampus.

Acknowledgements

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 720270

Reference

1. Van Geit W, Gevaert M, Chindemi G, Rössert C, Courcol J-D, Muller EB, Schürmann F, Segev I and Markram H (2016) BluePyOpt: Leveraging Open Source Software and Cloud Infrastructure to Optimise Model Parameters in Neuroscience. *Front. Neuroinform*. **10:**17. doi: 10.3389/fninf.2016.00017

https://bmcneurosci.biomedcentral.com/articles/10.1186/s12868-017-0372-1