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Caring for the environment: the blooming "Python in Neuroscience" ecosystem

Eilif Muller*[1] and Andrew P Davison[2]

Address: [1]Laboratory for Computational Neuroscience, Ecole Polytechnique Fédérale de Lausanne, Switzerland and [2]Unité de Neurosciences Intégratives et Computationnelles, CNRS, Gif-sur-Yvette, France

Email: Eilif Muller* - eilif.mueller@epfl.ch

* Corresponding author

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Recent years have seen a bloom in adoption of the Python environment in Neuroscience [1]. Widely used simulators, such as NEURON and NEST, have recently deprecated legacy programming interfaces in favor of modern yet mature Python equivalents [2,3] as complex work-flows flourish in the modern, expressive and intuitive Python language with its thriving ecosystem of both Neuroscience specific and general-purpose modules.

This shift to a standard general-purpose interpretive language, widely used outside of Neuroscience, has engulfed the simulator development community relatively rapidly and without central coordination. A plausible explanation is that the field was in critical need of the solutions Python offers. Python allows simulation developers to outsource interpreter development to the computer science community, while unifying simulation with analysis work-flows traditionally performed in MATLAB. Python has powerful parallel computing features without restrictive licensing costs and opens new possibilities to implement the on-going interoperability needs of the field [4]. Specifically, it has made PyNN possible, a shared API between NEURON, NEST, PCSIM and Brian with support for MOOSE/Genesis 3 and NeuroML export in development [5].

PyNN facilitates the development of conceptually satisfying and productivity boosting higher level modeling concepts in a simulator-agnostic way while still allowing simulator-specific optimization, with an elegant side effect: The software investments required for making use of exotic neuron solvers such as the FACETS VLSI neuromorphic hardware http://www.facets-project.org are minimized, as all state-of-the-art work-flow infrastructure is available once basic API compliance is implemented. Porting existing models implemented using the PyNN API to such platforms becomes trivial and verification is straightforward in comparison to results obtained using NEURON or NEST.

For students, Python is an attractive alternative to the traditionally domain-specific languages of the field, as competence thereof represents a widely recognized practical and employable skill. As such, long running courses like the Advanced Course in Computational Neuroscience http://www.neuroinf.org/courses/EUCOURSE/F09 have started to feature Python as an important part of their curriculum.

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