

A tutorial on neuroConstruct

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This workshop will be a hands on tutorial for those interested in creating biophysically detailed single cell and network models with neuroConstruct (<http://www.neuroConstruct.org>). It will provide a broad overview of the range of features available to facilitate development and analysis of complex 3D models on the NEURON, GENESIS (and currently in development, MOOSE) simulation platforms.

It will cover the core features of the application including: importation and validation of detailed neuronal morphologies (e.g., from Neuromorpho.org); creation and use of ion channel and synaptic mechanisms, both in native simulator script and specified in ChannelML (the latest version of all of the NeuroML specifications is available at <http://www.morphml.org:8080/NeuroMLValidator>); generation of complex 3D network connectivity; inbuilt tools for single cell and population activity analysis. A number of cell and network models which have recently been converted to neuroConstruct/NeuroML format will be shown including cell models from the hippocampus (Migliore et al., 2005) and cerebellum (De Schutter and Bower, 1994), and a thalamocortical network model (Traub et al., 2005).

A number of new and under development features will also be presented, including support for the compact HDF5 file format (for storing network structure or cellular activity) and automatic generation of network simulations for parallel computing environments. The initial implementation of the Python based interface for controlling neuroConstruct via script files (e.g. to generate and analyze large numbers of simulations) will also be demonstrated.

Some basic knowledge of simulators such as NEURON and GENESIS prior to the tutorial would be a big advantage for participants, who are encouraged to confirm attendance to p.gleeson@ucl.ac.uk before the meeting.

De Schutter, E., and Bower, J.M. (1994). An active membrane model of the cerebellar Purkinje cell. I. Simulation of current clamps in slice. *J Neurophysiol* 71, 375-400.

Migliore, M., Ferrante, M., and Ascoli, G.A. (2005). Signal propagation in oblique dendrites of CA1 pyramidal cells. *J Neurophysiol* 94, 4145-4155.

Traub, R.D., Contreras, D., Cunningham, M.O., Murray, H., LeBeau, F.E., Roopun, A., Bibbig, A., Wilent, W.B., Higley, M.J., and Whittington, M.A. (2005). Single-column thalamocortical network model exhibiting gamma oscillations, sleep spindles, and epileptogenic bursts. *J Neurophysiol* 93, 2194-2232.