Interoperability of software for computational and experimental neuroscience

Organizers: Padraig Gleeson, Sharon Crook

Abstract:

Biophysically detailed computational models are increasingly accepted as important tools for the investigation of brain function by the wider neuroscience community. However, there are still a number of issues to address before a clear and practical framework can be created for exchange of ideas and data both between theoreticians working in different areas and between modelers and experimentalists. At present, multiple simulation platforms are used to model cellular and network activity, each of which has its own scripting language and data structures. This can make reuse of model code developed for one environment difficult for users of another platform, despite the fact that the physiological concepts underlying software design are the same in both. Also, software applications for analysis and management of data produced by electrophysiological experiments, and tools and utilities for the analysis of simulation results are normally developed independently, although the same analysis techniques can be carried out on both datasets.

This workshop includes presentations from researchers who are actively involved in the construction of software solutions for various stages of the computational modeling cycle: from obtaining experimental results, to model creation, simulation and analysis, to prediction of experimental results, and back again. The aim is to present an overview of initiatives in the field to allow greater interaction between these elements and increased usability of results from each stage.

After the main talks, an open discussion session will a) identify "gaps" in the tool chain and b) identify desired extensions/updates to existing standards that allow for greater biophysical detail in models.

Agenda:

Sharon Crook Arizona State University	Introduction to model interoperability and usability
Pierre Yger Centre National de la Recherche Scientifique	PyNN: a common Python interface for network simulators
Padraig Gleeson University College London	Enabling interoperability and transparency of models of biophysical neurons and networks with NeuroML
Hugo Cornelis University of Texas Health Science Center at San Antonio	A technical overview of the CBI simulation framework: examples of instances and applications
Cengiz Gunay Emory University	Standardizing acquired electrophysiological data: A Matlab-loadable HDF5 file format annotated with recording conditions, units and scaling factor attributes

Darren Myatt University of Reading	Neuromantic: A freeware tool for semi-automatic reconstruction of neuronal morphologies
Subhasis Ray/Upinder Bhalla National Centre for Biological Sciences, Bangalore	MOOSE, the Multiscale Object-oriented Simulation Environment
Ivan Raikov Okinawa Institute of Science and Technology	Neuroscience modeling languages: practice and theory
Dan Goodman École Normale Supérieure, Paris	Brian: a simulator for spiking neural networks in Python
Phillip Lord Newcastle University	The CARMEN Project: Towards a common data format for electrophysiological data exchange and analysis
Open Discussion	A number of topics related to interoperability and standardization will be discussed including: Identification of gaps in the toolchain Integration with SBML Incorporation of Kinetic scheme/Markov model descriptions of channels/synapses