Department of Computational Neuroscience, Institute of Physiology (Academy of Sciences of the Czech Republic, Prague) – State of the Art .

Brief Characterization

The last several decades have seen the rise of the new and fascinating field -- The computational Neuroscience (Sejnowski, Koch and Churchland 1988: "What is Computational Neuroscience", Science: 8, 1299-1306).

The well-established Prague Computational Neuroscience group applies theoretical methods to various aspects of information processing and transmission in neural systems, and to model these systems with biophysical insight. Broadly speaking, the ultimate goal of our effort is to contribute to understanding of the nervous system function in a quantitative way. .

Main topics

recently investigated are well documented by the list of publications available at the departmental web site **(http://comput.biomed.cas.cz/)**:

* Estimation of input signal in biologically relevant neuronal models
* Information-theoretic analysis of ultimate bounds on information transfer in model neurons
* Development and application of advanced statistical methods for neuronal spiking data
* Mechanosensory control of insect flight, axon growth, neural development .

Although the focus is on "basic research", there is no doubt that Computational Neuroscience helps in the development of new, more powerful, ''bio-inspired'' technical devices (for example, artificial sensors) and algorithms and coding schemes to operate these devices .

Personnel and Equipment

The group consists of four full-time researchers, a fluctuating number of foreign visitors, and several MSc and PhD students. The methodology of research is provided by the theory of stochastic processes, information theory, signal estimation theory and biophysics (among others).
Besides Mathematica and Matlab licenses, a 20-core cluster computer is used for computationally-intensive projects .

The lab has extensive and long-term international collaboration experience with colleagues in France, Italy, Germany, Denmark, Switzerland, Japan or Australia. The group is strictly theory-based, but experimental data are available thanks to collaborations.

Members of the lab are also active in organizing international meetings, supervising students of all levels and teaching at Czech universities.