Sandrine CHEMLA

26 years old
INCM - CNRS, 31 chemin Joseph Aiguier, 13402 Marseille Cedex.
Tel : +33 6 17 81 96 90, Email : Sandrine.Chemla@sophia.inria.fr
http ://www-sop.inria.fr/members/Sandrine.Chemla/

Education

2006–present **Ph.D. candidate in Computer Science and Neuroscience**
NeuroMathComp project, INRIA, Sophia-Antipolis/DyVA team, INCM, CNRS Marseille.

2005–2006 **M.S. in Applied Mathematics, Image and Signal Processing**
University of Nice Sophia-Antipolis.
ranked 4nd/20

2002–2005 **Engineering school in Microelectronics and Telecommunications**
Polytech'Marseille, Marseille.
M.Sc. in Microelectronics , Polytech'Marseille, Marseille.
ranked 4rd/52

2000–2002 **Preparatory classes in Mathematics and Physics** , Lycée Notre Dame de Sion, Marseille.

Research Experience

2006–present **Ph.D. in Computer Science and Neuroscience**
«Biophysical cortical column model for optical signal analysis», advised by T. Vieville and F. Chavane.

Abstract : What does the voltage-sensitive dye imaging signal (VSD signal) measures ? This question is difficult to resolve at the physiological level as the signal is multi-component : The dye reflects the dynamics of the membrane potential of all membranes in the neuronal tissue, including all layers of the circuitry, all cell types (excitatory, inhibitory, glial) and all neuronal compartments (somas, axons, dendrites).To answer this question, we propose to use a biophysical cortical column model, at a mesoscopic scale, taking into account biological and electrical neural parameters of the laminar cortical layers. The model is based on a cortical microcircuit, whose synaptic connections are made between six specific populations of neurons, excitatory and inhibitory neurons in three main layers. Each neuron is represented by a reduced compartmental description with conductance-based Hodgkin-Huxley neuron model. The model is fed by a thalamic input with increasing activity, background activity and lateral connections, and offers the possibility to compute the VSD signal with a linear formula. We validated the model by comparing the simulated and the measured VSD signal.

2006 **M.S. in Computer Science (7 months)**
«Biologically plausible computation mechanisms in cortical areas», advised by T. Vieville and P. Kornprobst.

Abstract : In computer or biological vision, computation of vectorial maps of parametric quantities (e.g. features parameters, 3D or motion cues) are of common use in perceptual processes. Defining them using continuous partial differential equations yields highly parallelizable regularization processes allowing to obtain well-defined estimations of these quantities. However, these equations have to be sampled on real data. Thus, an integral approximation of the diffusion operator used in regularization mechanisms have been introduced : it leads to a so-called particles methods. A step further, it appears that this method is also a biologically plausible approach when modelling networks of neural units.

2005 **Research Internship in Microelectronics (6 months)**
SoC Lab, University of British Columbia, Vancouver (Canada)
«BIST circuit design and fault modeling for deep-submicron interconnections», advised by A. Ivanov.

2004 **Research Internship in Microelectronics (2 months)**
L2MP laboratory, Marseille
«Analog design of a fully differential 5V Buffer for output RF mixer with current and linearity control», advised by W. Rahajandraibe and L. Zaid.

Teaching and Engineering Experience

Electronics	Teaching Assistant in Numerical & Analogical Electronics University of Nice Sophia-Antipolis
fMRI Project	Centre IRMf, La Timone, Marseille. *«Contrast response function in human visual cortex»*, fMRI experimental design, data acquisition and analysis.

Languages

French	Mother tongue
English	Written, spoken and read fluently
German	Elementary notions

Computer skills

Operating Systems	Linux, Windows
Programming languages	C, C++, Java, Python, VHDL, OpenGL, Maple, Matlab, Assembleur
Simulation tools	Cadence, PSpice, HSpice, ModelSim, ADS, ICCAP, NEURON, NEUROCONSTRUCT
Softwares	LaTeX, Excel, PowerPoint, OpenOffice

Scientific Publications and Communications

S. Chemla, T. Vieville, F. Chavane, "A biophysical cortical column model to study the multi-component origin of the optical signal", NeuroImage, In preparation, 2009.

S. Chemla, T. Vieville, F. Chavane, "Voltage-Sensitive Dye Imaging : Technique review and Models", Journal of Physiology, Accepted, 2009.

S. Chemla, T. Vieville, F. Chavane, "Biophysical cortical column model for optical signal analysis", Neurocomp'08, Oral Presentation, 2008.

S. Chemla, T. Vieville, F. Chavane, "Biophysical cortical column model for optical signal analysis", AREADNE'08, Poster, 2008.

S. Chemla, T. Vieville, F. Chavane, "Biophysical cortical column model for optical signal analysis", CNS'07, Poster, 2007.

T. Vieville, S. Chemla, P. Kornprobst, "How do high-level specifications of the brain relate to variational apparoches ?", Journal of Physiology, 2007.

P. Kornprobst, F. Chavane, S. Chemla, A. Reynaud, T. Vieville, "Reverse-engeneering of the visual brain cortical maps computation using optical imaging", ECVP'06, 54, 2006.

P. Kornprobst, S. Chemla, O. Rochel, T. Vieville, "A 1st step towards an abstract view of computation in spiking neural-networks", Neurocomp'06, 2006.

P. Kornprobst, T. Vieville, S. Chemla, O. Rochel, "Modeling cortical maps with feed-backs", ECVP'06, 53, 2006.

S. Chemla, "Biologically plausible computation mechanisms in cortical areas", Master's thesis, Master STIC, University of Nice-Sophia Antipolis, 2006.

Interests and Activities

Piano, Salsa, Tennis, Reading and Cinema.