Georgios Is. Detorakis (GID), PhD

Contact Information

Data Science Architect
adNomus Inc.
75 EW Santa Clara St.,
95113, CA, USA

+1 (949) 241 0844
george.detorakis@adnomus.com
gdetor@protonmail.com
https://github.com/gdetor
cogsci.uci.edu/~gdetorak

Summary of Qualification

- Ten years of **research experience** in scientific laboratories of various disciplines such as **computational neuroscience**, **machine learning**, **neuromorphic computing**, **control theory**, and **robotics**.
- Strong **abilities** in combining and bridging different fields such as **machine learning**, **neuroscience**, **computer science** and **mathematics**.
- **Advanced mathematical skills**, especially in linear algebra, dynamical systems, signal processing and control theory.
- **Long experience in programming** in computational scripting and system languages.

Professional Experience

Data Science Architect with adNomus Inc.
adNomus | San Jose (CA), USA — August 2019–Now

- Developing NLP algorithms with applications on context analysis.
- Deep learning for time-series forecasting.

Research Experience

Postdoc Researcher in Neuromorphic Computing and Machine Learning
UCI | Irvine (CA), USA — January 2016–July 2019
Neuromorphic Machine Intelligence Lab

- Binary stochastic deep neural networks.
- Developed a neuromorphic framework and its simulator (https://github.com/nmi-lab/NSAT).
- Developed machine learning algorithms.
- Co-developed algorithms for Brain-Machine Interface using machine learning and neuromorphic devices.
- Integrated neuromorphic sensors (DVS camera) with the NSAT neuromorphic framework.

Postdoc Researcher in Neuroscience and Control Theory
CentraleSupélec | Gif-sur-Yvette, France — December 2013–December 2015
Laboratoire des signaux et systèmes

- Developed a neural model (nonlinear, delayed, neural field) and a closed-loop simulation for Parkinson's disease treatment.
- Conducted theoretical work on non-linear retarded dynamical systems in a closed-loop setup.
- Co-developed software for spike-sorting (https://github.com/gdetor/SPySort).
- Developed Matlab software for on-line data processing using a Plexon recording device.

Python Instructor | CentraleSupélec | Gif-sur-Yvette, France — March 2014–April 2014

- Instructed the Python Programming Language and the Numpy, Scipy, and Matplotlib packages.

Research Assistant in Computational Neuroscience
INRIA-Nancy Grand Est | Nancy, France — October 2010–October 2013
CORTEX Team

- Developed a computational model for self-organizing maps.
- Developed a mathematical model for the development of the somatosensory cortex.
- Developed an attention mechanism for the self-organizing map.
- Reproduced an *in vivo* experiment *in silico* to study self-organization in the brain.

Research Intern in Robotics
FORTH | Heraklion, Greece — May 2008–October 2008
Computational Vision and Robotics Laboratory

- Configured and calibrated a humanoid robot (HOAP3).
- Applied biped locomotion algorithms on the robotic platform HOAP3.
- Developed demo simulations for the aforementioned robotic platform.

Research Intern in Systems Neuroscience
University of Crete | Heraklion, Greece October 2007–April 2008
Laboratory of Systems Physiology and Computational Neuroscience
- Conducting EMG and EEG experiments for studying human tremor.
- Developed software on Matlab for EMG signal processing and analysis.
- Analyzing EMG and EEG data.
- Developed simulations of motor units.

Education

INRIA Nancy Grand-Est/The University of Lorraine, Lorraine, France

Ph.D. in Computer Science, October 2010–October 2013
- Thesis Topic: *Cortical plasticity, dynamic neural fields, and self-organization*.
- Area of Study: Computational Neuroscience.

The University of Crete, Heraklion, Greece

M.Sc. in "Brain & Mind Sciences" January 2007–January 2009

B.Sc. in Applied Mathematics September 2002–September 2006
- Mathematical methods and software development track.

Communication Skills

Languages:
- Greek-native language,
- English-full professional proficiency,
- French-intermediate working proficiency,
- German-elementary proficiency (dead).

Software Skills

Programming:
- C, C++, Python, Fortran, Java, Pascal, UNIX shell scripting, GNU make, SQL, Matlab/Octave, Maple, HTML, CSS, Bootstrap.
- Scikit-learn, LAPACK/BLAS, Sundials, OpenMP, Nvidia CUDA, MPI.

Deep Learning Frameworks:
- PyTorch, TensorFlow.

Simulators:
- Brian, Neuron (Python).

Version Control and Software Configuration Management:
- Git and SVN.

Devops:
- Gitlab CI/CD configuration.

Desktop Editing and Productivity Software:
- Vim, TEX (LATEX, BibTEX, Tikz), Microsoft Office, Graphviz, GIMP, Inkscape, Scribus.

Operating Systems:
- Linux and BSD, Microsoft Windows family, Apple OS X.

Expertise

Mathematics:
- Linear and Nonlinear Dynamical Systems, Control Theory, Numerical Analysis, Linear Algebra, Probabilities Theory, Theory of Systems and Signals, Information Theory, Optimization, and Empirical Dynamic Modeling.

Computer Science:
- Deep Learning, Machine Learning, Neural Networks, Neuromorphic Computing, Software Development, Evolutionary Computing, Theory of Algorithms.

Computational Neuroscience:
- Spiking Neural Networks, Neural Population Models, Mathematical Modeling of Neural Systems.

Software

Major contributor in open source projects in Neuroscience/Machine Learning

- **NSAT** Is a simulator written in C/Python for the Neural and Synaptic Array Transceiver (NSAT) neuromorphic framework.
  Github link: https://github.com/nmi-lab/NSAT
- **NSATcarl** Is a C++ interface of CARLsim (http://www.socsci.uci.edu/~jkrichma/CARLsim/) for the NSAT neuromorphic framework.
  Github link: https://github.com/gdetor/CarlNsat
- **SPySort** Is a Python package for spike sorting.
  Github link: https://github.com/gdetor/spysort.

Recording Techniques

Noninvasive:

- Electroencephalography (EEG) – Operation of portable EEG device consisting in 18 electrodes.

Invasive:

- Extracellular recordings – Set up, calibration and development of software for extracellular recordings using a Plexon Recording Device.
- Electromyography (EMG) – Conducting muscle force and motor units (MUs) activity recordings.

Talks

- **Biologically plausible contrastive divergence: Towards an abstract complementary learning system**, Hughes Research Laboratory (HRL), Malibu CA (USA), 2017.
- **Closed-loop deep brain stimulation for Parkinson's disease: A computational study**, University of California Irvine, Irvine CA (USA), 2016.
- **Neural Fields 101**, CenraleSupélec, Gif-sur-Yvette (France), 2015.
- **The perception of touch: A computational approach**, Aix Marseille University, Marseille (France), 2014.

Publications

[1] **G. Detorakis**, S. Dutta, A. Khanna, B. Grisafe, S. Datta, and E. Neftci, *Inherent Weight Normalization in Stochastic Neural Networks*, accepted for Poster Presentation in NeurIPS (NIPS) Conference, Vancouver, (Canada), 2019.

[2] B. U. Pedroni, S. Joshi, S. Deiss, S. Sheik, **G. Detorakis**, S. Paul, C. Augustine, E. Neftci, and G. Cauwenberghs, *Memory-efficient Synaptic Connectivity for Spike-Timing-Dependent Plasticity* accepted for publication in Frontiers in Neuroscience (Neuromorphic Section).

[3] **G. Detorakis**, T. Bartley, E. Neftci, *Contrastive Hebbian Learning with Random Feedback Weights*, Neural Networks, 114, 2019.

[4] **G. Detorakis**, S. Sheik, C. Augustine, S. Paul, B.U. Pedroni, N. Dutt, J. Krichmar, G. Cauwenberghs, E. Neftci, *Neural and Synaptic Array Transceiver: A Brain-Inspired Computing Framework for Embedded Learning*, Frontiers in Neuroscience (Neuromorphic section) 12, 2018.

[5] H. Kashyap, **G. Detorakis**, N. Dutt, J. Krichmar,and E. Neftci, *A Recurrent Neural Network Based Model of Predictive Smooth Pursuit Eye Movement in Primates*, IJCNN, Rio de Janeiro (Brazil), 2018.

[6] N.P. Rougier, K. Hinsen, [et al., including **Georgios Detorakis**] *Sustainable computational science: the ReScience initiative*, PeerJ Computer Science 3, 2017.

[7] E. Neftci, S. Paul, C. Augustine, **G. Detorakis** *Event-Driven Random Back-Propagation: Enabling Neuromorphic Deep Learning Machines*, Frontiers in Neuroscience 11, 2017.

[8] **G. Detorakis** and A. Chaillet, *Incremental stability of spatiotemporal delayed dynamics and application to neural fields*, CDC, Melbourne (Australia), 2017.

[9] E. Neftci, C. Augustine, S. Paul, **G. Detorakis**, *Event-Driven Random Backpropagation: Enabling Neuromorphic Deep Learning Machines*, IEEE ISCAS, Baltimore (MD, USA), 2017.

[10] **G. Detorakis**, *[Re] A generalized linear Integrate-and-Fire neural model produces diverse spiking behaviors*, The ReScience Journal, 3:1, 2017.

[11] A. Chaillet, **G. Is. Detorakis**, S. Palfi and S. Senova *Robust stabilization of delayed neural fields with partial measurement and actuation*, Automatica 83, 2017.

[12] **G.Is. Detorakis**, *[Re] Multiple dynamical modes of thalamic relay neurons: rhythmic bursting and intermittent phase-locking*, The ReScience Journal, 2:1, 2016.

[13] B. U. Pedroni, S. Sheik, S. Joshi, **G. Detorakis**, S. Paul, C. Augustine, E. Neftci, G. Cauwenberghs, *Forward Table-Based Presynaptic Event-Triggered Spike-Timing-Dependent Plasticity*, IEEE BioCAS 2016, Shanghai (China), 2016.

[14] **G.Is. Detorakis**, A. Chaillet, S. Palfi, and S. Senova, *Closed-loop stimulation of a delayed neural fields model of parkinsonian STN-GPe network: a theoretical and computational study*, Frontiers in Neuroscience, 9:237, 2015.

[15] C. Pouzat and **G.Is. Detorakis**, *SPySort: Neural spike sorting with Python*, Proc. of the 7th Eur. Conf. on Python in Science (Euroscipy 2014), Cambridge (UK), 2014.

[16] **G.Is. Detorakis** and N.P. Rougier, *Structure of Receptive Fields in a Computational Model of Area 3b of Primary Sensory Cortex*, Frontiers in Computational Neuroscience, 8(76), 2014.

[17] **G. Is. Detorakis** *Cortical plasticity, dynamic neural fields, and self-organization*, University of Lorraine, 2013.

[18] **G.Is. Detorakis** and N.P. Rougier, *A Neural Field Model of the Somatosensory Cortex: Formation, Maintenance and Reorganization of Ordered Topographic Maps*, PLoS ONE 7(7): e40257, 2012.

[19] N.P. Rougier and **G.Is. Detorakis**, *Self-Organizing Dynamic Neural Fields*, Advances in Cognitive Neurodynamics III, Hokaido (Japan), 2012.

Book Chapters

[20] A. Chaillet, **G. Is. Detorakis**, S. Palfi, and S. Senova, *ISS-stabilization of delayed neural fields by small-gain arguments*, to be published in Advances on Delays and Dynamics at Springer.