

ANATOLY BUCHIN, PhD

Computational neuroscientist | Research scientist

Seattle – Paris – St Petersburg



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EDUCATION

PhD in Computational Neuroscience, École Normale Supérieure, Paris
2012–2015

Master of Physics, Peter the Great Polytechnic University, St Petersburg
2010–2011

Master of Research, Descartes University, Paris
2009–2010

Bachelor of Physics, Peter the Great Polytechnic University, St Petersburg,
2005–2009

EXPERTISE

Machine learning methods

Computational neuroscience

Biophysics of neurons

Mathematical modeling

Scientific writing

Research and development

SKILLS

Machine learning

deep learning: CNN, DNN, RNN
dim. reduction: PCA, tSNE, UMAP
recommender systems
optimization: genetic algorithms
clustering: k-means, dbscan
non-negative matrix factorization
gaussian mixture models
linear regression

Python libraries

numpy, scipy, sklearn, pandas,
keras, tensorflow, imbalance
learn, matplotlib, seaborn

High performance computing

supercomputer simulations
parallel computations
AWS cloud

Code development

github, jupyter, pycharm, spyder

PROFILE

Neuro- and computational scientist passionate about data, analysis and the nervous system with 10+ years of experience in computational research. Leader and team-player working in a collaborative environment. Working on analyzing large complex datasets utilizing machine learning, dynamical systems and quantitative statistical methods. Designed and implemented large-scale simulations and data analysis pipelines using high performance computing and cloud computations at Allen Institute. Currently working on mechanisms of neurological disorders, properties of human neurons and analysis of multimodal neuronal data.

EXPERIENCE

INDUSTRIES: Biotechnology, Academic research

RESEARCH SCIENTIST

Allen Institute for Brain Science | Seattle | Apr 2017 - Present

Development of novel mathematical models of human neurons based on multimodal neuronal data. Implementation of large-scale simulations to clarify human epilepsy pathology. Defining data science problem based on biological data. Practicing open science by sharing code and engaging with the scientific community.

- Created data analysis pipelines for morpho- and electrophysiological data
- Implemented and performed parameter optimizations on supercomputers
- Developed human epilepsy biomarkers based on electrophysiological data
- Presented results at international conferences: SfN, OCNS

POST-DOCTORAL RESEARCHER

University of Washington, | Seattle | February 2016 - April 2017

Participated in multi-laboratory collaboration studying the neural network of *Hydra vulgaris*. Developed novel neural network model to explain animal behavior. Analyzed calcium imaging data using machine learning tools.

- Developed data analysis pipeline for the analysis of calcium imaging data
- Applied motion tracking algorithms to the behavioral data of *Hydra vulgaris*
- Implemented simulations of biological neural networks
- Created and maintained the knowledge base in wikipedia format

DOCTORAL RESEARCHER

École Normale Supérieure, | Paris | January 2012 - November 2015

Analyzed the data from two experimental labs and developed computational models for single neurons and neural networks. Applied dynamical system theory towards explaining brain dynamics in human epilepsy and the rodent motor system.

- Implemented neural network models of the human hippocampus
- Developed a stochastic dynamical system describing rat neurons
- Performed numerical simulations and analyzed terabytes of data
- Linked the multimodal neural data with computational models

AWARDS

2017 Assistant professor qualification

2016 NSF Travel grant

2016 The Swartz Foundation fellowship

2014 The Foundation of Medical Research grant

2011 Labex doctorate fellowship

2009 Foundation Bettencour Shueller fellowship

LANGUAGES

ENGLISH – Full professional proficiency

FRENCH – Proficient (speak, read & write)

GERMAN – Intermediate

RUSSIAN – Native speaker

MENTORSHIP

Shao-An Yin
Allen Institute for Brain Science

Soumita Bose
Allen Institute for Brain Science

Dawn Liang
University of Washington

Marta Gajowa
École Normale Supérieure

REFERENCES

Contacts available upon request

Costas Anastassiou
Allen Institute for Brain Science
Assistant Investigator

Adrienne Fairhall
University of Washington
Director of Swartz Center
Professor

Boris Gutkin
École Normale Supérieure
Research Director
Professor

EXPERIENCE continued

RESEARCH COLLABORATOR

University College London | London | May 2015 , July 2014

Applied information theory towards single neuron computation in rat motor system. Discovered the novel phenomenon of inverse stochastic resonance in cerebellar neurons.

- Performed high-performance simulations for mutual information calculation
- Statistical analysis of electrophysiological data

RESEARCH ASSISTANT

Ioffe Institute of Physics, | St Petersburg | September 2011 - January 2012

Developed novel computational models of neural populations using statistical Physics. Applied mean-field theory to explain the properties of neurons in the visual cortex.

- Developed novel computational models explaining the neural data
- Presented research results on national conferences

RESEARCH INTERN

Descartes University | Paris | October 2009 - March 2010

Worked in a team performing electrophysiological experiments *in vitro* on rat olfactory bulb and cat visual cortex *in vivo*. Analyzed the acquired experimental data.

- Performed the brain surgery, craniotomy and brain slice preparations
- Acquired the electrophysiological data in *in vivo* and *in vitro* experiments

SELECTED PUBLICATIONS

Buchin A. et al. Adaptation and inhibition control pathological synchronization in a model of focal epileptic seizure. (2018), eNeuro.0019–18.2018

Kalmbach, K .E., **Buchin A.** et al. (2018). H-channels contribute to divergent electrophysiological properties of supragranular pyramidal neurons in human versus mouse cerebral cortex. *Neuron*.

Buchin A. et al. (2016). Reduced Efficacy of the KCC2 Cotransporter Promotes Epileptic Oscillations in a Subiculum Network Model. *Journal of Neuroscience*, 36(46), 11619–11633. *Journal of Neuroscience*

Buchin A. et al. (2016). Inverse stochastic resonance in cerebellar Purkinje cells. *PLOS Computational Biology*, 12(8), e1005000

Buchin A. et al. (2015). Effects of reduced efficacy of KCC2 co-transporter in single neuron model: implications for epilepsy. *St. Petersburg State Polytechnical University Journal. Humanities and Social Sciences*. 15, 13–24

Buchin A., Chizhov A. V. (2010). Firing-rate model of a population of adaptive neurons. *Biophysics*, 55(4), 592–599

Buchin A. , Chizhov, A. V. (2010). Modified firing-rate model reproduces synchronization of a neuronal population receiving complex input. *Optical Memory and Neural Networks*, 19(2), 166–171

TEACHING

Dynamic Brain Workshop, Teaching Assistant, Allen Institute for Brain Science, 2019
Modeling in neuroscience, Teaching assistant, École Normale Supérieure, 2015 – 2013

CERTIFICATIONS

Convolutional Neural Networks
Sequence Models
Neural Networks and Deep Learning
Structuring Machine Learning Projects
Improving Deep Neural Networks
Deeplearning.ai | 2019

Machine learning
Stanford | 2019

Machine Learning Foundations
University of Washington | 2016

ACADEMIC SERVICE

Neurocomputing, Reviewer

PLOS ONE, Reviewer

PLOS Computational Biology, Reviewer

Society for Neurosciences, Member

Organization for Computational Neuroscience, Member