

# ANATOLY BUCHIN, PhD

Computational Biology | Data Science | Bioinformatics



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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

## MACHINE LEARNING

### Unsupervised

PCA, k-Means, Mixture models, Louvain clustering, Hierarchical clustering, t-SNE, UMAP

### Supervised

kNN, SVM, Logistic regression, Naive Bayes, Random forest, XGBoost

### Semi-supervised

Label propagation

### Deep learning

Autoencoders, Generative Models, ResNet, CellPose, Transformers, Large Language Models (Geneformer, Hyena)

## SOFTWARE SKILLS

### Open source contributions

AllenSDK

### Distributed and cloud computing

Amazon SageMaker, AWS Cloud, Google cloud, Code Ocean, HPC, GPU compute

### Programming languages

Python, R, Matlab, Bash

### Database management

sqlalchemy, pandas, PostgreSQL

## PROFILE

Research scientist with a PhD in Computational Neuroscience and 15+ years of experience in high-dimensional data analysis, machine learning, genomics, and computational neuroscience. Expertise in developing and implementing AI/ML models and bioinformatics platforms to accelerate life sciences research. Proven track record of collaborating with interdisciplinary teams and transforming research findings into practical applications. Strong background in analyzing genomic sequencing data, including CRISPR screens, single-cell and bulk RNA-seq.

## EXPERIENCE

INDUSTRIES: Biotechnology, Neuroscience Research

### SENIOR SCIENTIST

Cajal Neuroscience | Seattle | May 2021 - June 2024

- Developed and optimized machine learning classifiers achieving 81% precision in identifying cellular states from gene expression data.
- Led the group working with LLM Hyena DNA model to extract low-dimensional representation of genes.
- Led the integration of over 10 TB of data into internal compute infrastructure using AWS, S3, and Google Cloud.
- Applied manifold learning methods to extract low-dimensional structures from gene expression data.
- Prepared targets and analyzed data from CRISPRi experiments to optimize drug targets for neurological disorders (Alzheimer's, Parkinson's).

### SCIENTIST I

Allen Institute for Brain Science | Seattle | Apr 2017 - March 2021

- Developed mathematical models of human neurons based on multimodal neuronal data.
- Led the development of computational models and optimized parameters for over 9200 models on supercomputers using genetic algorithms.
- Conducted single cell transcriptomics analysis to characterize gene expression patterns in the brain.
- Presented results at international conferences (SfN, OCNS).

### POST-DOCTORAL RESEARCHER

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

- Analyzed extracellular electrical recordings from epileptic human brain slices using computational modeling.
- Developed neural network models to explain animal behavior in Hydra vulgaris.
- Implemented data analysis pipelines for in vivo calcium imaging data and applied motion tracking algorithms for behavioral data.

## SOFTWARE SKILLS

### Data visualizations

Jupyter, Matplotlib, Seaborn

### Machine learning frameworks

TensorFlow, PyTorch, Keras, scikit-learn, scvi-tools

### Code development

Git, Github, Visual Studio, Anaconda

### Containers and workflow managers

Docker, Nextflow, Snakemake

## AWARDS

2017 Assistant professor in neuroscience (France)

2016 NSF Travel grant

2016 Swartz Foundation fellowship

2014 Foundation of Medical Research grant

2011 Labex doctorate fellowship

2009 Foundation Bettencour Shueller fellowship

## LANGUAGES

ENGLISH – Full proficiency

FRENCH – Proficient

GERMAN – Proficient

RUSSIAN – Native speaker

## MENTORSHIP

2022, Temitope Adeoye, University of Soth Florida, PhD student

2021, Sasha Batoukova, Tesla high school student

2018, Shao-An Yin, University of Washington, PhD student

## REFERENCES

### Ben Logsdon

Cajal Neuroscience

### Costas Anastassiou

Cedars-Sinai Hospital

### Adrienne Fairhall

University of Washington

### Boris Gutkin

Ecole Normalé Superieure

## EXPERIENCE continued

### DOCTORAL RESEARCHER

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

- Developed computational models for single neurons and neural networks based on time series data.
- Applied dynamical systems theory to explain brain dynamics in human epilepsy and rodent motor systems.
- Simulated biological neural network behavior based on neural dynamics and reaction-diffusion modeling.

### RESEARCH COLLABORATOR

University College London | London | May 2015 , July 2014

- Applied information theory towards single neuron computation in the rat motor system.
- Performed high-performance simulations for mutual information calculation.
- Conducted statistical analysis of time series electrophysiological data.

### RESEARCH ASSISTANT

loffe 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.
- Presented research results at national conferences: Neuroinformatics.

## SELECTED PUBLICATIONS

**Buchin A.**, et al. (2022). Multi-modal characterization and simulation of human epileptic circuitry. *Cell Reports*. (**Paper | Code | Web product**)

Wei Y., **Buchin A.**, et al (2023). Associations between in vitro, in vivo and in silico cell classes in mouse primary visual cortex. *Nature communications*. (**Paper | Code**)

Nandi A., **Buchin A.** et al (2022). Single-neuron models linking electrophysiology, morphology and transcriptomics across cortical cell types. *Cell Reports*. (**Paper | Code | Web Product**)

Berg, J., **Buchin A.** et al, (2021). Human cortical expansion involves diversification and specialization of supragranular intratelencephalic-projecting neurons. *Nature*. (**Paper | Code**)

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*. (**Paper | Code**)

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

**Buchin A.** et al. Reduced Efficacy of the KCC2 Cotransporter promotes epileptic oscillations in a subiculum network model. *Journal of Neuroscience*. (**Paper | Code**)

**Buchin A.** et al (2016). Inverse stochastic resonance in cerebellar Purkinje cells. *PLOS Computational Biology*. (**Paper | Code**)

## SELECTED CONFERENCE PROCEEDINGS

**Buchin A.**, et al Lineage tracing and differential expression analysis of single nuclei RNA-seq data from human neocortex identifies novel genes and pathways involved into progression of Alzheimer's disease. (2023). Alzheimer's and Parkinson's disease conference. Gothenburg, Sweden.

**Buchin A.**, et al. Lineage tracing and differential expression analysis of single cell RNA-sequencing data from human midbrain identifies novel genes affected by idiopathic Parkinson's disease. (2022). Alzheimer's and Parkinson's disease conference. Barcelona, Spain.

**Buchin A.**, et al (2019). Conserved and divergent electrophysiological and morphological properties of mouse and human transcriptomically-defined cell types. Chicago, United States.

**Buchin A.**, et al (2018). Morpho-electric properties and computational simulation of human dentate gyrus granule cells from the epileptogenic hippocampus. Society for Neuroscience. San Diego, United States.

## SCIENCE COMMUNICATION

### Medium – Anatoly Buchin

#### Articles

2023, Matching form and function of brain cell types, Cedars Sinai  
2022, An AI model of epilepsy, Cedars Sinai  
2022 Realistic computer models of brain cells, Brain tomorrow

#### Biomolecula journal

2019, What is special about the human brain?  
2017, Chaos in the brain.  
2016, Blue brain project: connections and chaos.  
2013, From living brain to artificial intelligence

## PUBLIC OUTREACH

2021, Neuroscience and machine intelligence, Neurotea podcast

2020, Computational neuroscience & AI, Engineering mind podcast

2019 People in science, Novatech journal

2017 Disfunction of proteins in epilepsy, Foundation of Medical Research

2017, Epilepsy from neuroscience point of view, XX2 century

2017 Science career in Russia, Europe and United states, Rabota.ru

2016, About squids, brain modeling and practical use of neuroscience, Theory & Practice

2015, Expatriates in Paris, Le Monde

2015, Public neuroscience lecture, Granum Sails, Saint Petersburg

## ADDITIONAL TRAINING

2023, Public speaking course

2020, Genomic data science, Coursera, John Hopkins

2018, Intelligent machinery course, University of Washington

2016, Dynamic brain workshop, Allen Institute for Brain Science

2013, Advanced course in computational neuroscience, FENS

## SELECTED CONFERENCE PROCEEDINGS

**Buchin A.** et al (2016). Reduced Efficacy of the KCC2 co-transporter promotes epileptic oscillations in a subiculum network model. Society for Neuroscience. San Diego, United States.

**Buchin, A.,** et al (2015). Inverse stochastic resonance in cerebellar Purkinje cells. Society for Neuroscience. Chicago, United States.

**Buchin A.** et al. Mapping of cortical cell types from Alzheimer's patients to the reference datasets. (2021). Online, United States.

**Buchin A.** et al. Adaptation and Inhibition Control Pathological Synchronization in a Model of Focal Epileptic Seizure. Organization for Computational Neurosciences. Antwerp, Belgium.

**Buchin A.** et al. (2015). Inverse stochastic resonance in cerebellar Purkinje cells. Society for Neuroscience, Chicago, United States.

**Buchin A.** et al. Effects of a reduced efficacy of the KCC2 co-transporter in Temporal Lobe Epilepsy: single neuron and network study. (2015). Organization for Computational Neurosciences. Prague, Czech Republic.

**Buchin A.** et al. Effects of a reduced efficacy of the KCC2 co-transporter in a neuron population model. (2014). Federation of European Neuroscience Societies. Milan, Italy.

**Buchin A.** et al. (2011). Model of bistability and Inhibition by noise of Purkinje cells, Neuroinformatics, Moscow, Russia.

**Buchin A.** et al (2009). Synchronization of a neural population by complex shape signal. Neuroinformatics. Moscow, Russia.

## INVITED TALKS

Life in Industry and Academia, University of South Florida, 2023.

Multi-modal characterization and simulation of human epileptic circuitry, Skoltech, Moscow, 2019.

Computational modeling of human epilepsy: from single neurons to pathology, 2018, Microsoft Research, Redmond, United States.

What is so special about human cortex?, Higher School of Economics, Center for Cognition and Decision Making, Moscow, Russia.

Drift-diffusion model of decision-making, 2015, Jagiellonian University, Faculty of Psychology, Krakow, Poland.

Mathematical models of the brain function, 2015, JetBrains, St Petersburg, Russia.

## TEACHING

Neuromatch Academy, Mentor, Online, 2020.

Dynamic Brain Workshop, Teaching assistant, Allen Institute and University of Washington, 2019, Friday Harbor, United States.

Computational neuroscience, Teaching Assistant, École Normale Supérieure, 2013 – 2015, Paris, France.

Physics and mathematics private lessons, Saint-Petersburg, Russia.

## CERTIFICATIONS

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

Machine learning  
Standford | 2019

Machine Learning Foundations:  
Case study approach  
University of Washington | 2016

## SERVICE AND MEMBERSHIPS

**Journal reviewer**  
Neurocomputing  
Journal of Computational Neuroscience  
PLOS ONE  
PLOS Computational Biology

**Member**  
Society for Neurosciences  
Organization for Computational Neurosciences