

ANATOLY BUCHIN, PhD

Computational Biology | Data Science | Machine Learning



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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 Biomedical Research, Descartes University, Paris
2009–2010

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

MACHINE LEARNING

Unsupervised learning

PCA, k-Means, Mixture models, Louvain clustering, Hierarchical clustering, tSNE, UMAP

Supervised learning

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

Model development

MLOps, CI/CD, data pipelines

Deep learning

Variational Autoencoders, Generative Models, ResNet, CellPose, Transformers, LLM

SOFTWARE SKILLS

Open source contributions

AllenSDK

Distributed and cloud computing

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

Programming languages

Python, R, Matlab, Bash

Database management

sqlalchemy, pandas, PostgreSQL

PROFILE

Accomplished research scientist with a PhD in Computational Neuroscience and over 15 years of experience in computational research, high-dimensional data analysis, and AI/ML algorithm development. Expert in developing and applying machine learning models for large-scale biological data analysis, including cellular imaging, single-cell omics, digital pathology and multi-omics. Strong proficiency in creating and implementing AI/ML algorithms for genomic data, complex data manipulation, computational biology and neuroscience. Experienced in collaborative, cross-disciplinary team environments and large-scale projects.

EXPERIENCE

INDUSTRIES: Drug discovery, Biotechnology, GenAI

SENIOR COMPUTATIONAL BIOLOGIST

Synthesize Bio | Seattle | August 2024

- Development of a foundational model for transcriptomics, simulating and generating artificial single-cell and bulk RNA-seq data for human tissues.
- Built scalable data pipelines for multi-modal datasets, leveraging cloud infrastructure (AWS, GCP) and machine learning frameworks (PyTorch).
- Collaborated with cross-functional teams to design experiments, interpret results, and implement predictive models for tissue-specific gene expression patterns.
- Presented findings to stakeholders, driving product development and aligning research outcomes with strategic goals.

SENIOR SCIENTIST

Cajal Neuroscience | Seattle | May 2021 - June 2024

- Analyzed high-dimensional biological data: dimensionality reduction, feature selection, clustering, classification.
- Performed computational experiments with foundational LLMs (Hyena DNA, Geneformer) to identify low-dimensional representations of genes.
- Applied manifold learning algorithms to extract low-dimensional structure from high dimensional gene expression data.
- Developed ensemble learning classifier achieving 81% precision in identifying cellular states from high dimensional data.
- Co-developed key experiments and analyzed data for drug discovery programs.

SCIENTIST I

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

- Developed neural network and random forest classifiers to identify cellular types from high dimensional gene expression data.
- Developed computational models of human neurons based on multimodal biological data.
- Led the development of computational models and optimized parameters for over 9200 models in cloud environment using genetic algorithms.
- Applied feature extraction to time series electrophysiological data to extract biological signals from noisy data.

SOFTWARE SKILLS

Data visualizations

Jupyter, Matplotlib, Seaborn

Machine learning frameworks

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

Code development

Git, Github, Visual Studio, Anaconda

Containers and workflow managers

Docker, Singularity, Snakemake, Nextflow

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 Medical Center

Adrienne Fairhall

University of Washington

Boris Gutkin

Ecole Normalé Superieure

EXPERIENCE continued

POST-DOCTORAL RESEARCHER

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

- Analyzed time series electrical recordings from epileptic human brain slices using computational modeling and non-linear dynamics.
- Developed novel 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 video behavioral data.

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 network dynamics and reaction-diffusion modeling.

RESEARCH ASSISTANT

Ioffe Institute of Physics, | St Petersburg | September 2009 - 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.