

# Ilya Prokin

Russian national with French work permit.

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**EXPERTISE** Machine Learning, Statistics, Computer Science, Probability Theory, Computational Neuroscience

## EDUCATION

**Ph.D. Computational Neuroscience**, INRIA Rhône-Alpes 2013 Oct.-2016 Dec., Villeurbanne, France

**M.Sc. Physics**, University of Nizhny Novgorod 2011-2013, Nizhny Novgorod, Russia

**B.Sc. Physics**, University of Nizhny Novgorod 2007-2011, Nizhny Novgorod, Russia

- Courses included: Computational Methods, Dynamical Systems, Probability Theory, Calculus, and Linear Algebra.

## EXPERIENCE

**Data Scientist**, Dataswati 2018 Jan.-present, Massy, France

- Predictive models for unevenly sampled time-series with uncertainty quantification (Python).
- Built automated data pipeline: from raw data to automated cross-validation based feature selection to predictions.
- Set up collaborations with academic researchers at INRIA.

**Independent Researcher**, Self-Employed 2017 Jan.-2017 Dec., Paris, France

- Researched synaptic plasticity exposed to randomized input patterns using Monte-Carlo numerical simulations. Collaboration with researchers at Collège de France and INRIA.

**Ph.D. Research**, INRIA Rhône-Alpes 2013 Oct.-2016 Dec., Villeurbanne, France

- Developed a Data-Driven Mathematical Model which explained the dependence of synaptic learning on the activity of neurons and experimental conditions. See <https://github.com/iprokin/Cx-Str-STDP>.
- Worked with various experimental and synthetic datasets: Data Cleaning, Parsing, Transformation and Modeling.
- Numerical Stochastic Simulations of Differential Equations, Parameter Optimization, Sensitivity Analysis.
- Python for Data Analysis (NumPy, SciPy, PANDAS, sklearn, and matplotlib) and Numerical Optimization (PyGMO); Numerical Integration in FORTRAN95 interfaced with Python using f2py (x100 faster than Python+SciPy+NumPy).
- 2 scientific publications (one in *eLife*, top 10% journal in biology/neuroscience), 2 submitted.

**Research Internship**, RIKEN Brain Science Institute 2013 July-Aug., Saitama, Japan

- 3-D reconstruction of neuronal spines from a stack of two-photon microscopy images in MATLAB.

**Graduate Research**, Institute of Applied Physics 2011-2013, Nizhny Novgorod, Russia

- Processing 64-dimensional time-series data recorded from neuronal cultures grown on multi-electrode arrays.
- Developed a method for graph reconstruction from the time-series data generated by graph's nodes.
- Time-series correlation and its statistical significance in C++; data manipulation/visualization in MATLAB.

**Undergraduate Research**, University of Nizhny Novgorod 2009-2013, Nizhny Novgorod, Russia

- Solved numerically Differential Equations based model of a Neural Network with a customized Runge-Kutta in C++.
- 2 international scientific publications describing the model of interacting neurons and an adaptive synapse.

## INDEPENDENT PROJECTS (see github)

- Halite II AI Programming Challenge (top 3%).
- Machine Learning powered RSS reader, using Naive Bayes, Python, web-UI.
- Bitcoin price prediction & betting bot; including uncertainty quantification (Python/sklearn/scipy/selenium).
- Py\_XPPCALL: Python interface to XPPAUT.
- PokerC, Poker Odds Calculator, Haskell.
- Haskell parser of Kospi market data from UDP packets in pcap file.

## SKILLS

- OS: GNU/Linux and OS X (4 years), FreeBSD (3 months), and Windows (14 years).
- Technologies: Python (including SciPy, NumPy, PANDAS, and sklearn) (>40000 SLOC<sup>1</sup>), Fortran 90/95 (>3000 SLOC), bash (>2500 SLOC), C/C++ (>15000 SLOC), MATLAB/Octave (>25000 SLOC), Haskell (>5000 SLOC), HTML, CSS, ~~LaTeX~~ LaTeX, SQL; familiar with InfluxQL.
- Languages: Russian (native), English (fluent), French (working proficiency).

## AWARDS

- INRIA PhD Fellowship, INRIA, Oct. 2013 - Dec. 2016.
- Best Graduate Research, University of Nizhny Novgorod, Apr. 2013.
- The Dynasty Foundation scholarship, Jan.-June 2013. One of 40 winners out of 149 applicants.
- Research Achievements scholarship, University of Nizhny Novgorod, Jan.-Dec. 2012. 12 out of about 250 students.
- Best Talk award, 16th Radiophysics Conference, University of Nizhny Novgorod, 15 May 2012. 1 out of 14.

## PUBLICATIONS

- **Prokin**, Ilya, Yihui Cui (*shared first co-authorship*), Alexandre Mendes, Hugues Berry, and Laurent Venance, “Robustness of STDP to spike-timing jitter.”, *Scientific Reports* (2018).
- Gangarossa, Giuseppe, Sylvie Perez, Yulia Dembitskaya, Ilya **Prokin**, Hugues Berry, and Laurent Venance, “BDNF controls endocannabinoid-mediated plasticity in striatum.” (2018, in preparation).
- Xu, Hao, Sylvie Perez, Bérangère Detraux, Amandine Cornil, Ilya **Prokin**, Yihui Cui, Bertrand Degos, Hugues Berry, Albande de Kerchove d’Exaerde, and Laurent Venance. “Endocannabinoid-Dopamine Interactions Mediate Spike-Timing Dependent Potentiation in the Striatum.” *Nature Communications* (2018, on review).
- Cui, Yihui, Ilya **Prokin**, Hao Xu, Bruno Delord, Stéphane Genet, Laurent Venance, and Hugues Berry. “Endocannabinoid Dynamics Gate Spike-Timing Dependent Depression and Potentiation.” *ELife* 5 (2016).
- **Prokin**, Ilya, Ivan Tyukin, and Victor Kazantsev. “Phase Selective Oscillations in Two Noise Driven Synaptically Coupled Spiking Neurons.” *International Journal of Bifurcation and Chaos* 25, no. 07 (2015).
- **Prokin**, IS, and VB Kazantsev. “Synchronization in the System of Synaptically Coupled Neural Oscillators with Frequency-Dependent Coupling.” *Radiophysics and Quantum Electronics* 57, no. 10 (2015).
- **Prokin**, IS, and VB Kazantsev. “Analysis of Pulsed-Signal Transmission in a System of Interacting Neural Oscillators with Frequency-Dependent Connections.” *Radiophysics and Quantum Electronics* 54, no. 11 (2012).

## COMMUNICATIONS

- **Prokin**, I. “Mechanistic Modeling of Spike-Timing Dependent Plasticity of Basal Ganglia Neurons.” 2015 University of Chicago, Chicago, United States of America. (**Talk**).
- **Prokin**, Ilya, Yihui Cui, Silvana Valtcheva, Laurent Venance, and Hugues Berry. “Modeling Spike-Timing Dependent Plasticity of Basal Ganglia Neurons and Its Bidirectional Control by Endocannabinoid Signaling.” *Advanced Lecture Course on Computational Systems Biology*. Aussois, France, 2015 (**Poster**).
- **Prokin**, Ilya, Silvana Valtcheva, Laurent Venance, and Hugues Berry. “Mechanistic Modeling of Spike-Timing Dependent Plasticity of Basal Ganglia Neurons.” *Neuroscience 2015*. Chicago, United States of America: Society for Neuroscience, 2015 (**Poster**).
- **Prokin**, I. “Detection of Multiple Spike Transmission Pathways in Neuronal Networks Based on Multichannel Recordings.” 2012 Institute for Theoretical Biology, Humboldt-Universität zu Berlin, Berlin, Germany. (**Talk**).
- **Prokin**, I. “Introductory Lecture to Lyle Graham Lecture at the Summer School in Computational Neuroscience ‘White Nights of Computational Neuroscience: Neurotheory from Cell to Cognition 2012’.” 2012 Saint-Petersburg State University, Saint-Petersburg, Russian Federation. (**Talk**).
- **Prokin**, I, and V Kazantsev. “Identifying Functional Connectivity Multigraph in the Time Maps Networks by the Sample of Multidimensional Point Process.” *Proceedings of the 16th Scientific Conference on Radiophysics*. Nizhny Novgorod, Russia: University of Nizhny Novgorod, 2012.
- **Prokin**, I, A Gladkov, I Mukhina, and V Kazantsev. “Detection of Multiple Spike Transmission Pathways in Neuronal Networks Based on Multichannel Recordings.” *8th Int. Meeting on Substrate-Integrated Microelectrodes*, 226–27. Reutlingen, Germany: NMI Natural; Medical Sciences Institute at the University of Tübingen, 2012.

## ADDITIONAL CLASSES AND SCHOOLS

- Data Science Summer School. École Polytechnique, Palaiseau, France. 25 June - 29 June, 2018.
- Data Science Summer School. École Polytechnique, Palaiseau, France. 28 Aug. - 1 Sept., 2017.
- Advanced Lecture Course on Computational Systems Biology. INRIA, Aussois, France. 6-11 Apr. 2015.
- Summer school in Computational Neuroscience: “White Nights of Computational Neuroscience: Neurotheory from cell to cognition”. Saint-Petersburg State University, Saint-Petersburg, Russian Federation. 4-15 June 2012.
- XVI Scientific school “Nonlinear Waves”, Fundamental and applied problems of nonlinear physics. Institute of Applied Physics, Nizhny Novgorod, Russian Federation. 29 Feb.-6 Mar. 2012.
- International school “Towards neuromorphic intelligence: experiments, models and technologies”. University of Nizhny Novgorod, Nizhny Novgorod, Russian Federation. 3-7 Oct. 2011.
- Modular course “Background techniques for Neurophysics: dynamical system theory, statistical physics, wavelet analysis”. Saint-Petersburg State University, Saint-Petersburg, Russian Federation. 14-17 Sept. 2011.
- Modular course “Cellular mechanisms of information transfer: neuronal and synaptic plasticity”. Saint-Petersburg State University, Saint-Petersburg, Russian Federation. 7-9 Apr. 2011.

## REFERENCES

Hugues Berry, Ph.D.  
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