

# Johannes Friedrich

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## EMPLOYMENT

- since Mar 15 **PostDoc**, *Department of Statistics*, Columbia University in the City of New York, USA.  
May 13 – Jan 15 **PostDoc**, *Computational and Biological Learning Lab, Department of Engineering*, University of Cambridge, UK.  
Sep 08 – Apr 13 **(Post-)Doctoral Researcher**, *Department of Physiology*, University of Bern, Switzerland.  
Jun – Jul 08 **Research Assistant**, *Institute of Theoretical Physics and Astrophysics*, Julius-Maximilians-University of Würzburg, Germany.

## EDUCATION

### Advanced courses/Summer schools.

- May 10 *Cognitive Science and Machine Learning Summer School*, Pula, Sardinia, Italy  
Jun 10 *Okinawa Computational Neuroscience Course*, Onna Village, Okinawa, Japan  
Sep 08 – Feb 12 **PhD in Natural Sciences**, *Department of Physiology*, University of Bern, Switzerland.  
Final grade: Insigni cum laude  
PHD THESIS: *Reinforcement Learning in Populations of Spiking Neurons*  
Oct 06 – Mar 08 **MSc in Physics (Diplom)**, *Institute of Theoretical Physics and Astrophysics*, Julius-Maximilians-University of Würzburg, Germany.  
Final grade: First class honours  
MASTER THESIS: *Leaky Integrate-and-Fire Networks with Unreliable Synapses*  
Sep 05 – May 06 **Exchange Program**, *Department of Physics*, University of Toronto, Canada.  
Oct 02 – Aug 05 **Undergraduate studies in Physics**, *Institute of Theoretical Physics and Astrophysics*, Julius-Maximilians-University of Würzburg, Germany.

## SCHOLARSHIPS & AWARDS

- Dec 15 – May 17 Advanced Postdoc.Mobility fellowship of the Swiss National Science Foundation.  
Mar 15 Hojjat Adeli Award for Outstanding Contribution in Neural Systems (best paper 2014).  
May 13 – Oct 14 Scholarship of the Swiss National Science Foundation for prospective researchers.  
Nov & Dec 10 Two poster prizes: Clinical Neuroscience Meeting Bern & All-SystemsX.ch-Day Geneva.  
Nov 09 Endeavour International Postgraduate Research Scholarship (EIPRS) to commence my PhD-studies at the University of Sydney (I declined).  
Sep 05 – Jan 06 Scholarship of the German Academic Exchange Service (DAAD).  
Oct 02 – Mar 08 Scholarship by the Bavarian state according to the “Bavarian law for the support of talented students”(BayBFG).  
1999 & 2000 Reaching twice the final round of the German nationwide mathematics competition by winning first prizes in the first two rounds.

## LANGUAGES

- German Mother tongue  
English Fluent. I have lived more than four years in English speaking countries.

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## SCIENTIFIC ACTIVITIES

since Jan 10 Member of the *Swiss Society for Neuroscience*  
since Jan 08 Member of the *German Physical Society*  
Reviewing: NIPS, PLoS Comp Bio, PLoS One, Neural Comput, Biol Cybern

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## SCIENTIFIC INTERESTS

○ Machine Learning                      ○ Statistical Neuroscience                      ○ Probabilistic Inference  
○ Reinforcement Learning                      ○ Neural Networks                      ○ Stochastic Processes

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## COMPUTER SKILLS

### Programming Languages

Object-Oriented C++, Java  
Scientific Python, Mathematica, MatLab, R  
Big Data Apache Spark

### Operating Systems

Linux, MacOS, Windows

### Tools

LaTeX, Libre Office, Microsoft Office

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## TEACHING EXPERIENCE

2009 – 12 Practical course for medical students (80h) on the visual system, University Bern  
Mar 14 Supervisions for engineering students (7h), University of Cambridge

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## PUBLICATIONS

submitted **Friedrich J., et al.** Multi-scale approaches for high-speed imaging and analysis of large neural populations. *bioRxiv*, 091132, 2016.

published **Friedrich J., Zhou P. and Paninski L.** Fast online deconvolution of calcium imaging data. *PLoS Comput Biol*, 13(3):e1005423, 2017.

**Friedrich J. and Paninski L.** Fast active set methods for online spike inference from calcium imaging. *Adv Neural Inf Process Syst*, 29:1984-1992, 2016.

**Friedrich J. and Lengyel M.** Goal-directed decision making with spiking neurons. *J Neurosci*, 36(5):1529-1546, 2016.

**Clarke A., Friedrich J., Senn W., Tartaglia E., Marchesotti S. and Herzog M.** Human and machine learning in non-Markovian decision making. *PLoS ONE*, 10(4):e0123105, 2015.

**Friedrich J., Urbanczik R. and Senn W.** Code-specific learning rules improve action selection by populations of spiking neurons. *Int J Neur Syst*, 24(5):1450002, 2014.

**Friedrich J. and Senn W.** Spike-based decision learning of Nash equilibria in two player games. *PLoS Comput Biol*, 8(9):e1002691, 2012.

**Friedrich J., Urbanczik R. and Senn W.** Spatio-temporal credit assignment in neuronal population learning. *PLoS Comput Biol*, 7(6):e1002092, 2011.

**Friedrich J., Urbanczik R. and Senn W.** Learning spike-based population codes by reward and population feedback. *Neural Comput*, 22(7):1698-1717, 2010.

**Friedrich J. and Kinzel W.** Dynamics of recurrent neural networks with delayed unreliable synapses: metastable clustering. *J Comput Neurosci*, 27:65-80, 2009.

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## CONFERENCE ABSTRACTS / WORKSHOP PAPERS

Feb 17 **Friedrich J., Zhou P. and Paninski L.** Fast active set methods for online deconvolution of calcium imaging data. *Computational and Systems Neuroscience*, Salt Lake City, UT, USA.

- Feb 17 **Giovannucci A., Friedrich J., Deverett B., Staneva V., Chklovskii D. and Pnevmatikakis E.** CalmAn: An open source toolbox for large scale calcium imaging data analysis on standalone machines. *Computational and Systems Neuroscience*, Salt Lake City, UT, USA.
- Dec 15 **Friedrich J., Soudry D., Mu Y., Freeman J., Ahrens M. and Paninski L.** Fast constrained non-negative matrix factorization for whole-brain calcium imaging data. *NIPS Workshop*, Montreal, Canada.
- Mar 15 **Friedrich J. and Lengyel M.** Goal-directed decision making with spiking neurons. *Computational and Systems Neuroscience*, Salt Lake City, UT, USA.
- Sep 14 **Friedrich J. and Lengyel M.** Model-based reinforcement learning with spiking neurons. *Bernstein Conference*, Göttingen, Germany.
- Oct 13 **Clarke A., Friedrich J., Senn W., Tartaglia E., Marchesotti S. and Herzog M.** Non-markovian human learning. *1st Multidisciplinary Conference on Reinforcement Learning and Decision Making*, Princeton, NJ, USA.
- Jul 12 **Friedrich J. and Senn W.** Spike-Based Decision Learning In Socio-Economic Interactions. *8th Forum of European Neuroscience*, Barcelona, Spain.
- May 12 **Friedrich J. and Senn W.** Spike-based decision learning in two player games. *International Conference on Brain Dynamics and Decision Making*, Ascona, Switzerland.
- Jul 11 **Friedrich J., Urbanczik R. and Senn W.** Policy gradient rules for populations of spiking neurons. *20th Computational Neuroscience meeting*, Stockholm, Sweden.
- Jul 10 **Friedrich J., Urbanczik R. and Senn W.** Spatio-temporal credit assignment in population learning. *7th Forum of European Neuroscience*, Amsterdam, Netherlands.
- Feb 10 **Friedrich J., Urbanczik R. and Senn W.** Spatio-temporal credit assignment in population learning. *Computational and Systems Neuroscience*, Salt Lake City, UT, USA.
- Feb 08 **Friedrich J. and Kinzel W.** Synfire Chains in Integrate-and-Fire Networks with Unreliable Synapses. *Annual Meeting of the German Physical Society*, Berlin, Germany.

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## CONFERENCE TALKS / INVITED TALKS

- June 16 *Online multi-scale methods for fast large-scale calcium imaging.* University College London, UK.
- Jan 15 *Goal-directed decision making with spiking neurons.* University of Cambridge, UK.
- Aug 13 *Spike-based neuronal population learning in games.* University of Sheffield, UK.
- Nov 12 *Neuronal population learning in non-Markovian tasks and 2-player games.* Frankfurt Institute of Advanced Studies, Germany.
- Jan 12 *Spatio-temporal credit assignment in neuronal population learning.* University of Cambridge, UK.
- Dec 10 *Activity dependent modulation of plasticity in population learning.* NIPS Workshop, Whistler, Canada.
- Nov 10 *Policy gradient rules for populations of spiking neurons.* EPFL Lausanne, Switzerland.
- Jan 10 *Spatio-temporal credit assignment in population learning.* University of Würzburg, Germany.

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## OTHER ACTIVITIES

- Civilian Service Prior to university education I was caring for twelve mentally and physically disabled persons living in a shared home for Lebenshilfe e.V.
- Scouting I was part of the leadership team of a scout group for about six years.
- Outdoors I enjoy endurance sport: Cycling, hiking, climbing, ski touring, swimming.