Guillaume Bellec
Chemin de Chantemerle 6, 1024 Ecublens (VD), Switzerland
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Computational neuroscience and Artificial Intelligence

Career :

2020 - now **Postdoc** researcher in the Computational Neuroscience laboratory of **EPFL**, with **Wulfram Gerstner**
- network reconstruction from multi-electrode array recordings (Bellec et al. NeurIPS 2021)
- modeling brain plasticity with self-supervised learning theories (Illing et al. NeurIPS 2021)

2019 - now Creating and launching **Chord AI**, a mobile application
- on device deep learning for musical chord recognition (more than 1,000,000 users in 2022)

2015 - 2019 **PhD** in Theoretical Computer Science at **TU Graz** in Austria with **Wolfgang Maass**:
- deep learning with recurrent networks (see Bellec et al. NeurIPS 2018, ICLR 2018)
- theories of synaptic plasticity (see Bellec et al. Nature Comm. 2020)
- **teaching** machine learning and reinforcement learning

2014 Master thesis in computational neuroscience with **R. Brette** and **P. Yger** at the Vision institute, Paris

2012-2013 One year internship in sound and music computing with **Anders Friberg** at KTH, Stockholm

2012 Research internship in machine learning with **Tillmann Weyde** at the City University, London

Teaching :

2016 - 2019 **Lectures** Introduction to Machine Learning (third year of Bachelor), at TU Graz

2019 **Practical classes** of advanced machine learning (master level) with Thomas Pock at TU Graz

2016 **Practical classes** of reinforcement learning (master level) with Wolfgang Maass at TU Graz

Education :

2013-2014 Master of **Mathematics, Vision and Learning** (MVA) at **ENS Paris-Saclay**, Paris

2010-2014 Master of **Optimization and Operational Research** at **ENSTA ParisTech**, Paris

2012-2013 Erasmus program at **KTH** in audio techonology, Stockholm

2008-2010 Classes préparatoires aux grandes écoles, Paris

Grants :

Intel Research Grant (Approx. 110,000 euros, for the period 2020 - 2021)

Awards and honors :

Summer school on Brains, Minds and Machines at Woods hole with **MIT**, 2018. (travel grant, approx. 4000 euros)
C3N Summer school at the **Princeton Neuroscience Institute, 2018** (travel grant, approx. 4000 euros)
Inge St, Austrian travel grant for the NeurIPS 2019 conference (1240 euros)
Entrance at ENSTA Paristech via national exams corresponds to the top 5% with a Math or Physics major

Scientific achievements and skills :

Reviewer for NeurIPS, ICLR and ICML and journals like Science Magazine
Analysis of **neural recordings** (calcium imaging, large scale electro-physiology)
Expert knowledge of **TensorFlow and PyTorch**, also working with **JAX**
Programming neural networks on **mobiles, GPU and custom hardware**

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Invited talks :

November 2022	Ottawa, Universtiy of Ottawa
November 2022	MILA in Montreal - Talk: AI for Neuroscience
September 2022	Berlin, Berstein conference
November 2021	ACML workshop on Energy efficient AI – virtual conference
November 2021	Donders Institute for Brain, Cognition and Behaviour, Nijmegen, the Netherlands – virtual seminar
May 2021	Pints of science Austria – popular science festival, recording at https://youtu.be/SF4rqIcXPA4
March 2021	CNRS Thales – virtual seminar
February 2021	MILA in Montreal – virtual seminar
January 2020	European Institute for Theoretical Neuroscience in Paris – workshop on synaptic plasticity
September 2019	Bernstein conference in Berlin – workshop entitled 'Brain against the machine'
September 2019	ENS Paris and INRIA
June 2019	Blue brain project, Geneva
April 2019	Laboratoire des sciences cognitives, Paris
April 2019	Facebook AI, Paris

Contributed talks :

February 2021	INTEL INRC virtual workshop on Neuromorphic computing
December 2019	NeurIPS 2019, Vancouver: workshop on "Future directions at the intersection of neuroscience and AI" (top 10% of accepted submission)
September 2019	Bernstein conference in Berlin, conference main track (top 5% of accepted submission)

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List of selected publications : **Bold title** = most relevant publications, * = similar contribution and team work

NeurIPS 2022	Mesoscopic modeling of hidden spiking neurons Advances in Neural Information Processing Systems, 2022 *Wang*, Schmutz*, Bellec, Gerstner.*
NeurIPS 2021	**Fitting summary statistics of neural data with a differentiable spiking network simulator** Advances in Neural Information Processing Systems, 2021 *Bellec*, Wang*, Modirshanechi, Brea, Gerstner.*
NeurIPS 2021	**Local plasticity rules can learn deep representations using self-supervised contrastive predictions** Advances in Neural Information Processing Systems, 2021 *Illing, Ventura, Bellec*, Gerstner*.*
eLife 2021	Spike frequency adaptation supports network computations on temporally dispersed information ELife, 2021 *Salaj, Subramoney, Kraisnikovic, Bellec, Legenstein, Maass.*
Nature Communications 2020	**A solution to the learning dilemma for recurrent networks of spiking neurons** Nature Communications, 2020 *Bellec*, Scherr*, Subramoney, Hajek, Salaj, Legenstein and Maass.*
NeurIPS 2019 (workshop)	Eligibility traces provide a data-inspired alternative to backpropagation through time NeurIPS workshop on 'Real Neurons & Hidden Units' in 2019 *Bellec*, Scherr*, Hajek, Salaj, Subramoney, Legenstein and Maass.*
NeurIPS 2019 (workshop)	Slow processes of neurons enable a biologically plausible approximation to policy gradient NeurIPS workshop on 'Biological and artificial reinforcement learning' in 2019 *Subramoney*, Bellec*, Scherr*, Hajek, Salaj, Legenstein and Maass.*
arxiv 2019	Biologically inspired alternatives to backpropagation through time for learning in recurrent neural nets *Bellec*, Scherr*, Hajek, Salaj, Legenstein and Maass.*
NeurIPS 2018	**Long short-term memory and learning-to-learn in networks of spiking neurons** Advances in Neural Information Processing Systems, 2018 *Bellec*, Salaj*, Subramoney*, Legenstein and Maass.*
ICLR 2018	**Deep Rewiring: Training very sparse deep networks** International Conference on Learning Representation, 2018 *Bellec, Kappel, Maass and Legenstein.*
Frontiers 2018	Memory-Efficient Deep Learning on a SpiNNaker 2 Prototype Frontiers in Neuroscience, 2018 *Liu*, Bellec* … Furber, Maass, Legenstein and Mayr.*
IJCNN 2017	Neuromorphic hardware in the loop: Training a deep spiking network on the brainscales wafer-scale system International Joint Conference on Neural Networks, 2017 *Schmitt, Bellec, … Legenstein, Maass, Mayr, Schueffny, Schemmel, Meier*

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ISCAS 2017	Pattern representation and recognition with accelerated analog neuromorphic systems International Symposium on Circuits and Systems, 2017 *Petrovici, Bellec, … Maass, Schueffny, Mayr, Schemmel, Meier.*
JCNS 2016	Slow Feature Analysis with spiking neurons and its application to audio stimuli Journal of Computational Neuroscience, 2016 *Bellec, Galtier, Brette and Yger*
SMC 2013	A social network integrated game experiment to relate tapping to speed International Sound & Music Computing Conference, 2013 *Bellec, Friberg, Elowsson, Wolff, Weyde*
AES 2013	Creating Audio Based Experiments as Social Web Games with the CASimIR perception and explore rhythm reproduction International Conference of the Audio Engineering Society, 2013 *Wolff, Bellec, Friberg, MacFarlane, Weyde*