Michael Beyeler

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EDUCATION

- **PhD in Computer Science** · Specialization in Computational Neuroscience 2012 – 2016
  University of California, Irvine (UCI)
  Dissertation: Cortical neural network models of visual motion perception for decision-making and reactive navigation, May 2016. Advisors: JL Krichmar, N Dutt
- **MS in Biomedical Engineering** · Focus on Bioelectronics 2009 – 2011
  ETH Zurich, Switzerland
- **BS in Electrical Engineering** · Major in Micro- and Optoelectronics 2005 – 2009
  ETH Zurich, Switzerland

ACADEMIC APPOINTMENTS

- **Postdoctoral Fellow** · Psychology · Institute for Neuroengineering · eScience Institute 2016 – present
  University of Washington (UW)
- **Research Assistant** · Brain-Inspired Computing Group 2015
  IBM Research–Almaden
- **Research Assistant** · Robots & Assistive Systems 2013
  Fraunhofer Institute IPA, Stuttgart, Germany
- **Graduate Student Researcher** · Computer Science 2012 – 2016
  University of California, Irvine (UCI)
- **Junior Specialist** · Cognitive Sciences 2011 – 2012
  University of California, Irvine (UCI)
- **Research Assistant** · Institute for Biomedical Engineering 2010
  ETH Zurich, Switzerland

HONORS & AWARDS

Major Honors & Awards

- NIH K99 Pathway to Independence Award: *National Eye Institute (NEI)* 2018

Best Paper Award Nominations

- Best Student Paper Nominee: *IEEE International Joint Conference on Neural Networks (IJCNN)* 2018
- Best Student Paper Nominee: *IEEE Biomedical Circuits and Systems Conference (BioCAS)* 2010

Fellowships & Selected Travel Awards

- CSHL Computational Neuroscience–Vision summer course, *Helmsley Charitable Trust* 2018
- Presenter's Travel Award: *Computational & Systems Neuroscience (COSYNE)* 2017
- Innovation in Neuroengineering & Data Science Postdoctoral Fellowship: *Gordon & Betty Moore Foundation, Alfred P. Sloan Foundation, Washington Research Foundation (WRF)* 2016
- Chair's Fellowship for Outstanding PhD Applicants: *UCI* 2012

Other Academic Awards

- Finalist: Postdoc Mentoring Award, *UW* 2019

MENTEE HONORS & AWARDS

Graduate Students

· Ezgi I. Yücel: Innovation in Neuroengineering Graduate Fellowship, *WRF* 2017

Undergraduate Students

· Jon Luntzel: Innovation in Neuroengineering Undergraduate Fellowship, *WRF* 2019

RESEARCH FUNDING *Total: $257,282*

· NIH K99 EY-029329: Virtual prototyping for retinal prosthesis patients. 2018 – present
M Beyeler, PI. *National Eye Institute (NEI)*. ($244,882)

· Cloud Credits for Research, *Amazon Web Services (AWS)*. ($10,000) 2017

· GPU Seed Grant, *NVIDIA Corporation*. (2 × $1,200) 2016, 2018

ACADEMIC MENTORING

Graduate Students

· Ezgi I. Yücel, PhD Student, Psychology, *UW* 2017 – present

Undergraduate Students

· Jon Luntzel, Research Assistant, Computer Science, *UW* 2019

· Saideep Gupta, Research Assistant, Cognitive Sciences, *UCI* 2015 – 2016

· Stanislav Listopad, Research Assistant, Cognitive Sciences, *UCI* 2014 – 2016

ACADEMIC SERVICE

University Committees

· Postdoctoral Representative: Research Advisory Board, *UW* 2017 – 2019

Conference Program Committees

· Session Chair: Neuroscience, *Scientific Computing with Python (SciPy)* 2017

Conference Workshops

· Co-organizer: Recent Computational Advances in Neuroengineering, *COSYNE* 2018

Editorial Boards

· Review Editor: *Frontiers in Neurorobotics* 2017 – present

Ad-Hoc Reviewing · Conferences

2017, 2018 Computational & Systems Neuroscience (COSYNE) · 2015 IEEE International Conference on Intelligent Robots and Systems (IROS) · 2014 IEEE International Conference on Robotics and Automation (ICRA) · 2014 IEEE International Symposium on Circuits and Systems (ISCAS) · 2019 Medical Image Computing and Computer Assisted Intervention (MICCAI) · 2017 Scientific Computing with Python (SciPy)

Ad-Hoc Reviewing · Journals *publons.com/researcher/1188259/michael-beyeler*

1x ACM Journal on Emerging Technologies in Computing Systems (JETC) · 5x Frontiers in Neurorobotics · 3x Frontiers in Neuroscience · 5x IEEE Transactions on Cybernetics · 8x IEEE Transactions on Neural Networks and Learning Systems (TNNLS) · 1x Journal of Computational Neuroscience (JCNS) · 4x Journal of Neural Engineering · 1x Journal of Neuroscience · 2x Journal of Vision · 5x Neural Networks · 1x Neurocomputing · 2x PLoS Computational Biology · 3x PLoS ONE · 1x Sensors · 1x Vision Research

Ad-Hoc Reviewing · Books

Bertham Science · Packt Publishing

PUBLICATIONS

scholar.google.com/citations?user=1CDDZSIAAAAJ

Note that in many areas of computer science, *conferences* are the primary venue for peer-reviewed publications.
Legend: ◐ equal contribution, $^{(i)}$ invited publication

Conference Publications

C7 **M Beyeler** (2019). Biophysical model of axonal stimulation in epiretinal visual prostheses. *IEEE EMBS Conference on Neural Engineering (NER)*, San Francisco, CA.

C6 T-S Chou◐, HJ Kashyap◐, J Xing, S Listopad, EL Rounds, **M Beyeler**, N Dutt, JL Krichmar (2018). CARLsim 4: An open source library for large scale, biologically detailed spiking neural network simulations using heterogeneous clusters. *IEEE International Joint Conference on Neural Networks (IJCNN)*, Rio de Janeiro, Brazil. **Best Student Paper Nominee.** [Code]

C5 **M Beyeler**, GM Boynton, I Fine, A Rokem (2017). pulse2percept: A Python-based simulation framework for bionic vision. *Scientific Computing with Python (SciPy)*, p.81–88. [Code]

C4 **M Beyeler**◐, KD Carlson◐, T-S Chou◐, N Dutt, JL Krichmar (2015). CARLsim 3: A user-friendly and highly optimized library for the creation of neurobiologically detailed spiking neural networks. *IEEE International Joint Conference on Neural Networks (IJCNN)*, Killarney, Ireland. [Code]

C3 KD Carlson, **M Beyeler**, N Dutt, JL Krichmar (2014). GPGPU accelerated simulation and parameter tuning for neuromorphic applications$^{(i)}$. *Asia and South Pacific Design Automation Conference (ASP-DAC)*, Suntec, Singapore.

C2 **M Beyeler**, F Mirus, A Verl (2014). Vision-based robust road lane detection in urban environments. *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, China.

C1 **M Beyeler**◐, F Stefanini◐, H Proske, CG Galizia, E Chicca (2010). Exploring olfactory sensory networks: simulations and hardware emulation. *IEEE Biomedical Circuits and Systems Conference (BioCAS)*, Paphos, Cyprus. **Best Student Paper Nominee.**

Journal Articles

J5 **M Beyeler**, D Nanduri, JD Weiland, A Rokem, GM Boynton, I Fine (2019). A model of ganglion axon pathways accounts for percepts elicited by retinal implants. *Scientific Reports* 9(1):9199. [Code] [Data]

J4 **M Beyeler**, N Dutt, JL Krichmar (2016). 3D visual response properties of MSTd emerge from an efficient, sparse population code. *Journal of Neuroscience* 36(32): 8399–8415.

J3 **M Beyeler**, N Oros, N Dutt, JL Krichmar (2015). A GPU-accelerated cortical neural network model for visually guided robot navigation. *Neural Networks* 72: 75–87.

J2 **M Beyeler**, M Richert, ND Dutt, JL Krichmar (2014). Efficient spiking neural network model of pattern motion selectivity in visual cortex. *Neuroinformatics*, 1–20.

J1 **M Beyeler**, ND Dutt, JL Krichmar (2013). Categorization and decision-making in a neurobiologically plausible spiking network using a STDP-like learning rule. *Neural Networks* 48C: 109–124.

Reviews and Perspectives

R4 BW Brunton, **M Beyeler** (in press). Data-driven models in human neuroscience and neuroengineering$^{(i)}$. *Current Opinion in Neurobiology*.

R3 **M Beyeler** (2019). Commentary: Detailed visual cortical responses generated by retinal sheet transplants in rats with severe retinal degeneration. *Frontiers in Neuroscience* 13:471.

R2 **M Beyeler**◐, EL Rounds◐, KD Carlson, N Dutt, JL Krichmar (2019). Neural correlates of sparse coding and dimensionality reduction. *PLOS Computational Biology*.

R1 **M Beyeler**, A Rokem, GM Boynton, I Fine (2017). Learning to see again: Biological constraints on cortical plasticity and the implications for sight restoration technologies. *Journal of Neural Engineering* 14(5). **Featured cover article.**

US Patent Applications

P2 R Appuswamy, **M Beyeler**, P Datta, MD Flickner, DS Modha (2018). Long short-term memory (LSTM) on spiking neuromorphic hardware. US Patent App 15/434,672.

P1 **M Beyeler**, ND Dutt, JL Krichmar (2017). Sparse and efficient neuromorphic population coding. US Patent App 15/417,626.

Manuscripts Under Review

M2 **M Beyeler**, GM Boynton, I Fine, A Rokem (under review). Model-based recommendations for optimal surgical placement of epiretinal implants.

Contributed Presentations and Abstracts

A30 **M Beyeler**, A Rokem, GM Boynton, I Fine (2019). Interpretable machine-learning predictions of perceptual sensitivity in retinal implant users. *Northwest Data Science Summit*, Seattle, WA. (oral)

A29 **M Beyeler** (2019). Biophysical model of axonal stimulation in epiretinal visual prostheses. *NER'19*, San Francisco, CA. (poster)

A28 **M Beyeler**, EL Rounds, KD Carlson, N Dutt, JL Krichmar (2018). Sparse coding and dimensionality reduction in the brain. *OCNS'18*, Seattle, WA. (poster)

A27 T-S Chou, HJ Kashyap, J Xing, S Listopad, EL Rounds, **M Beyeler**, N Dutt, JL Krichmar (2018). CARLsim 4: An open source library for large scale, biologically detailed spiking neural network simulation using heterogeneous clusters. *OCNS'18*, Seattle, WA. (oral)

A26 **M Beyeler**, D Nanduri, JD Weiland, A Rokem, GM Boynton, I Fine (2018). Optimizing stimulation protocols for prosthetic vision based on retinal anatomy. *VSS'18*, St. Pete's Beach, FL. (poster)

A25 **M Beyeler**, EI Yucel, A Rokem, GM Boynton, I Fine (2018). Optimizing stimulation protocols for prosthetic vision based on retinal anatomy. *COSYNE'18*, Breckenridge, CO. (oral)

A24 **M Beyeler**, A Rokem, GM Boynton, I Fine (2018). Modeling the perceptual experience of retinal prosthesis patients. *UWIN NCEC'18*, Seattle, WA. (oral)

A23 EL Rounds, **M Beyeler**, KD Carlson, N Dutt, JL Krichmar (2017). Sparse coding and dimensionality reduction in cortex. *SfN'17*, Washington, DC. (poster)

A22 **M Beyeler**, A Rokem, GM Boynton, I Fine (2017). Improving retinal prostheses using the "virtual patient". *OSA Fall Vision '17*, Washington, DC. (oral).

A21 HJ Kashyap, T-S Chou, EL Rounds, S Listopad, **M Beyeler**, N Dutt, JL Krichmar (2017). CARLsim4: A C++ library for the design, simulation, and parameter tuning of biologically detailed spiking neural networks on high performance clusters. *SfN'17*, Washington, DC. (poster)

A20 **M Beyeler**, A Rokem, GM Boynton, I Fine (2017). Reverse-engineering optimized stimulation protocols in epiretinal prosthesis patients. *The Eye & the Chip '17*, Detroit, MI. (oral, **Platform Presentation**)

A19 GM Boynton, A Rokem, **M Beyeler**, J Dorn, NC Sinclair, MN Shivdasani, MA Petoe, R Hornig, I Fine (2017). Efficient and scalable measurements of sensitivity for high resolution electrode arrays. *The Eye & the Chip '17*, Detroit, MI. (poster, **Best Poster Award**)

A18 **M Beyeler**, N Dutt, JL Krichmar (2017). A sparse coding model of MST can account for human heading perception in the presence of eye movements. *ECVP'17*, Berlin, Germany. (poster)

A17 **M Beyeler**, GM Boynton, I Fine, A Rokem (2017). pulse2percept: A Python-based simulation framework for bionic vision. *SciPy'17*, Austin, TX. (oral, **youtube.com/watch?v=KxsNAa-P2X4**)

A16 **M Beyeler**, A Rokem, GM Boynton, I Fine (2017). Modeling the perceptual experience of retinal prosthesis patients. *VSS'17*, St. Pete's Beach, FL. (oral)

A15 **M Beyeler**, A Rokem, GM Boynton, I Fine (2017). Modeling the perceptual experience of retinal prosthesis patients. *COSYNE'17*, Salt Lake City, UT. (poster)

A14 **M Beyeler**, M Richert, N Oros, N Dutt, JL Krichmar (2016). GPU-accelerated real-time simulation of information processing in early visual cortex. *UWIN NCEC'16*, Seattle, WA. (poster)

A13 **M Beyeler**, N Dutt, JL Krichmar (2016). Efficient coding of optic flow can account for MSTd visual response properties. *SfN'16*, San Diego, CA. (poster)

A12 **M Beyeler**, M Richert, N Oros, N Dutt, JL Krichmar (2016). GPU-accelerated real-time simulation of information processing in early visual cortex. *The Eye & the Chip '16*, Dearborn, MI. (poster)

A11 **M Beyeler**, M Richert, N Oros, N Dutt, JL Krichmar (2016). A cortical neural network model of visual motion perception for decision-making and navigation. *JSNC'16*, Los Angeles, CA. (poster)

A10 **M Beyeler**, M Richert, N Oros, N Dutt, JL Krichmar (2016). A cortical neural network model of visual motion perception for decision-making and navigation. *COSYNE'16*, Salt Lake City, UT. (poster)

A9 **M Beyeler**, KD Carlson, T-S Chou, N Dutt, JL Krichmar (2015). An optimized library for the design, simulation, and parameter tuning of biologically detailed spiking neural networks. *SfN'15*, Chicago, IL. (poster)

A8 **M Beyeler**, KD Carlson, T-S Chou, N Dutt, JL Krichmar (2015). CARLsim 3: A user-friendly and highly optimized library for the creation of neurobiologically detailed spiking neural networks. *IJCNN'15*, Killarney, Ireland. (oral)

A7 **M Beyeler**, KD Carlson, T-S Chou, N Dutt, JL Krichmar (2015). CARLsim 3: A user-friendly and highly optimized library for the creation of neurobiologically detailed spiking neural networks. *JSNC'15*, Los Angeles, CA. (poster)

A6 **M Beyeler**, M Richert, N Oros, N Dutt, JL Krichmar (2014). A cortical spiking neural network model for visually guided robot navigation. Neurobiologically Inspired Robotics workshop, *ICRA'14*, Hong Kong, China. (oral, **Best Student Talk Award**).

A5 **M Beyeler**, F Mirus, A Verl (2014). Vision-based robust road lane detection in urban environments. *ICRA'14*, Hong Kong, China. (oral)

A4 **M Beyeler**, M Richert, JM Nageswaran, ND Dutt, JL Krichmar (2014). Large-scale spiking neural network model of visual motion processing. *JSNC'14*, Irvine, CA. (poster)

A3 **M Beyeler**, M Richert, JM Nageswaran, ND Dutt, JL Krichmar (2014). Large-scale spiking neural network model of visual motion processing. *Dynamics of Multifunction Brain Networks MURI Winter School*, San Diego, CA. (oral)

A2 **M Beyeler**, M Richert, JM Nageswaran, ND Dutt, JL Krichmar (2013). Large-scale spiking neural network model of visual motion processing. *SfN'13*, San Diego, CA. (poster)

A1 **M Beyeler**, ND Dutt, JL Krichmar (2013). Spiking neural network model of visual pattern recognition and decision-making using a stochastic STDP learning rule. *JSNC'13*, Pasadena, CA. (poster)

INVITED TALKS & SEMINARS

Scheduled

T14 14th Conference on Learning & Memory: Cellular and Systemic Views (plenary), *University of Magdeburg, Germany* — Mar 2020

Past

T13 Department of Cognitive Sciences, *University of California, Irvine, CA* — Apr 2019

T12 Department of Computer Science, *Duke University, Durham, NC* — Mar 2019

T11 Department of Computer Science, *University of California, Santa Barbara, CA* — Jan 2019

T10 COSYNE Workshop on Recent Advances in Neuroengineering, *Breckenridge, CO* — Mar 2018

T9 Center for Applied and Translational Sensory Science (CATSS), *University of Minnesota, Minneapolis, MN* — Feb 2018

T8 Eye & Chip World Congress on Artificial Vision (plenary), *Detroit Institute of Ophthalmology* — Sep 2017

T7 Cluster of Excellence in Cognitive Interaction Technology (CITEC), *Bielefeld University, Germany* — Aug 2017

T6 Center for Perceptual Systems, *University of Texas, Austin, TX* — Jul 2017

T5 UW Medicine Eye Institute, *University of Washington, Seattle, WA* — Feb 2017

T4 Second Sight Medical Products Inc., *Sylmar, CA* — Nov 2016

T3 Department of Psychology, *University of Washington, Seattle, WA* — Dec 2015

T2 IBM Research, *San Jose, CA* — Aug 2015

T1 Qualcomm Technologies Incorporated, *San Diego, CA* — Nov 2014

TEACHING ACTIVITIES

Tutorials at Conferences

TC1 Image processing and computer vision with scikit-image, *Neurohackademy* 2018

Software Carpentry

SC2 Instructor: Unix shell, version control with git, Python/R, *UW eScience Institute* 2017 – present
SC1 Attendee: Instructor training workshop, *UW eScience Institute* 2017

Selected Guest Lectures

GL6 PSYCH-508: Core Concepts in Perception, grad, *UW* SQ2019
GL5 BIOEN-460: Neural Engineering, undergrad, *UW* WQ2019
GL4 NRSC-490: Advanced Topics in Neuroscience, undergrad, *U Puget Sound* SQ2018
GL3 PSYCH-268R: Cognitive Robotics, undergrad, *UCI* SQ2016
GL2 CS-171: Introduction to Artificial Intelligence,undergrad, *UCI* WQ2015
GL1 PSYCH-268A: Computational Neuroscience, undergrad, *UCI* FQ2015

Teaching Assistant

TA3 CS-143A: Principles of Operating Systems, 186 students, undergrad, *UCI* SQ2015
TA2 CS-171: Introduction to Artificial Intelligence, 81 students, undergrad, *UCI* WQ2015
TA1 Networks & Circuits I & II, undergrad, *ETH Zurich, Switzerland* FS2009, SS2010

Programming Books

PB3 **M Beyeler** (2017). Machine Learning for OpenCV. *Packt Publishing Ltd.*, Birmingham, UK, 382 pages, ISBN 978-178398028-4. **Also available in Korean, Japanese, and as a video course.** [Code]
PB2 J Howse, P Joshi, **M Beyeler** (2016). OpenCV: Computer Vision Projects with Python. *Packt Publishing Ltd.*, Birmingham, UK, 558 pages, ISBN 978-178712549-0.
PB1 **M Beyeler** (2015). OpenCV with Python Blueprints. *Packt Publishing Ltd.*, Birmingham, UK, 230 pages, ISBN 978-178528269-0. [Code]

PUBLIC OUTREACH & SCIENCE COMMUNICATION

Panels

P1 An Evening with Neuroscience, *University of Washington, Seattle, WA* 2019

Documentary & Video Appearances

D1 Made with Android, *Google Developers* 2015

Volunteer Work

V2 Outreach & fundraising: Lighthouse Foundation for the Blind, *Seattle, WA* 2018
V1 Lab tour leader: Mathobotix "Bytes and Bots" K-12 Summer Camp, *UCI* 2013, 2014

PROFESSIONAL ASSOCIATIONS

· Member: *IEEE Engineering in Medicine & Biology Society (EMBS)* 2019 – present
· Member: *Association for Research in Vision and Ophthalmology (ARVO)* 2018 – present
· Member: *Vision Sciences Society (VSS)* 2017 – present
· Member: *IEEE Robotics and Automation Society (RAS)* 2014 – 2016
  - Student Volunteer, 2014 – 2016
· Member: *Society for Neuroscience (SfN)* 2013 – present
  - Neuronline Community Leader, 2016 – 2017

REJECTIONS & FAILURES

Inspired by: Melanie Stefan (2010), A CV of Failures. *Nature* 468(467).
Legend: TT tenure-track, PD postdoc, G grad

Academic & Professional *Success rate, TT: 3 % (n=31), PD: 100 % (n=2), G: 50 % (n=2)*

- Tenure-track positions (R1): 17 no answers, 12 explicit rejections, 1 rejection after interview 2019
- EPFL Neuroscience Graduate program: rejected 2013

Grants *Success rate, PD: 50 % (n=2)*

- Burroughs Wellcome Award at the Scientific Interface (CASI): invited for full proposal 2018

Fellowships & Travel Awards *Success rate, PD: 100 % (n=4), G: 44 % (n=9)*

- IJCNN Travel Award: not awarded 2015
- NVIDIA Graduate Fellowship: not awarded 2013, 2014, 2015
- Microsoft Research Fellowship: not awarded 2013

Workshops *Success rate, PD: 50 % (n=2)*

- VSS workshop proposal: rejected 2019

Scientific Peer Review

- J5, *Sci Rep*: desk-rejected from 5 journals 2018
- R3, *Front Neurosci*: desk-rejected from 1 journal 2018
- R2, *PLOS Comp Bio*: desk-rejected from 3 journals 2017
- COSYNE abstract: rejected 2015, 2018