# Nicholas A. Steinmetz

Assistant Professor, University of Washington
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## *Education*

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| 2007 – 2014 | Ph.D., Neurosciences<br>Stanford University, Stanford, CA, USA<br>Supervisors: Prof. Tirin Moore and Prof. Kwabena Boahen |
| 2003 – 2007 | Bachelor of Science and Engineering, Bioengineering, *summa cum laude*<br>University of Pennsylvania, Philadelphia, PA, USA |

## *Employment*

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|---|---|
| 2019 – present | Assistant Professor, Department of Biological Structure, University of Washington |
| 2017 – 2018 | Senior Research Associate, University College London, London, UK |
| 2014 – 2017 | Research Associate, University College London, London, UK<br>Supervisors: Prof. Matteo Carandini and Prof. Kenneth D. Harris |

## *Large-scale Collaborations*

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| 2019 – present | International Brain Laboratory member |
| 2017 – 2022 | Program Coordinator, Neuropixels Consortium |

## *Fellowships and Awards*

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| 2022 | NSF CAREER award |
| 2020 | Pew Biomedical Scholar |
| 2020 | Klingenstein-Simons Neuroscience Fellow |
| 2019 – present | Simons Foundation Investigator |
| 2019 – 2022 | Next Generation Leader, Allen Institute for Brain Science |
| 2015 – 2018 | Postdoctoral Fellowship from the Human Frontier Sciences Program |
| 2016 – 2018 | Postdoctoral Fellowship from the Marie Curie Action of the EU |
| 2015 | Newton Postdoctoral Fellowship from the Royal Society (awarded) |
| 2011 – 2014 | Graduate Research Fellowship from National Science Foundation (NSF GRFP) |
| 2009 – 2011 | Graduate Research Fellowship from the Stanford Center for Mind, Brain, and Computation, National Science Foundation, Integrative Graduate Education Research Traineeship (NSF IGERT) |
| 2006 – 2007 | Blair Fellowship for Undergraduate Research in Bioengineering/Biomedical Sciences from the University of Pennsylvania |
| 2005 – 2007 | University Scholars Fellowship for Undergraduate Research from the University of Pennsylvania |

## *Publications* *(Peer-reviewed except where noted. **Red**: first or senior author)*

2023 Ye, Bull, Li, Birman, Daigle, Tasic, Zeng, **Steinmetz** *bioRxiv*
Brain-wide Topographic Coordination of Traveling Spiral Waves | *preprint*

Ye*, Shelton*, Shaker, Boussard, Colonell, …, Koch, Olsen, Harris, **Steinmetz** *bioRxiv*
Ultra-high Density Electrodes Improve Detection, Yield, and Cell Type Specificity of Brain Recordings | *preprint*

Birman, Yang, West, Karsh, Browning, IBL, Siegle, **Steinmetz** *eLife*
Pinpoint: Trajectory Planning for Multi-probe Electrophysiology and Injections in an Interactive Web-based 3D Environment | *reviewed preprint*

Ottenheimer, Hjort, Bowen, **Steinmetz***, Stuber* — *eLife*
A Stable, Distributed Code for Cue Value in Mouse Cortex During Reward Learning

The International Brain Laboratory, …, **Steinmetz**, et al. — *bioRxiv*
A Brain-Wide Map of Neural Activity during Complex Behaviour | *preprint*

Findling, Hubert, The International Brain Laboratory, … **Steinmetz**, …, Dayan, Pouget — *bioRxiv*
Brain-wide Representations of Prior Information in Mouse Decision-making | *preprint*

Zeraati, Shi, **Steinmetz**, Gieselmann, Thiele, Moore, Levina, Engel — *Nature Comm*
Intrinsic Timescales in the Visual Cortex Change With Selective Attention and Reflect Spatial Connectivity

Zhang, …, **Steinmetz**, …, Paninski — *bioRxiv*
Bypassing spike sorting: Density-based Decoding Using Spike Localization from Dense Multielectrode Probes | *preprint*

Windolf, …, **Steinmetz**, …, Paninski — *bioRxiv*
DREDge: Robust Motion Correction for High-density Extracellular Recordings Across Species | *preprint*

Song, Shin, Seo, Soltani, **Steinmetz**, Lee, Jung, Paik — *bioRxiv*
Hierarchical Gradient of Timescales in the Mammalian Forebrain | *preprint*

2022 Recanatesi, Bradde, Balasubramanian*, **Steinmetz***, Shea-Brown* — *Patterns*
A Scale-dependent Measure of System Dimensionality

The International Brain Laboratory, …, **Steinmetz**, et al. — *bioRxiv*
Reproducibility of In-vivo Electrophysiological Measurements in Mice | *preprint*

The International Brain Laboratory, …, **Steinmetz**, et al. — *Nature Methods*
Data Architecture for a Large-scale Neuroscience Collaboration

Zagha, Erlich, Lee, Lur, O'Connor, **Steinmetz**, Stringer, Yang — *J Neurosci*
The Importance of Accounting for Movement When Relating Neuronal Activity to Sensory and Cognitive Processes | *review*

Shi, **Steinmetz**, Moore, Boahen, Engel — *Nature Comm*
Cortical State Dynamics and Selective Attention Define the Spatial Pattern of Correlated Variability in Neocortex

't Hart, …, **Steinmetz**, et al. — *J Open Science Education*
Neuromatch Academy: a 3-week, Online Summer School in Computational Neuroscience

2021 **Steinmetz***, Aydin*, Lebedeva*, Okun*, Pachitariu*, et al. — *Science*
Neuropixels 2.0: A Miniaturized High-density Probe for Stable, Long-term Brain Recordings

Zatka-Haas*, **Steinmetz***, Carandini, Harris — *eLife*
Sensory Coding and the Causal Impact of Mouse Cortex in a Visual Decision

Peters, Fabre, **Steinmetz**, Harris, Carandini — *Nature*
Striatal Activity Topographically Reflects Cortical Activity

Van Kempen, Gieselmann, Boyd, **Steinmetz**, Moore, Engel, Thiele — *Neuron*
Top-down Coordination of Local Cortical State During Selective Attention

Petersen, Siegle, **Steinmetz**, Mahallati, Buzsáki — *Neuron*
CellExplorer: A Framework for Visualizing and Characterizing Single Neurons

Benjamin, **Steinmetz**, Oza, Aguayo, Boahen — *Neuromorphic Comp and Eng*
Neurogrid Simulates Cortical Cell-types, Active Dendrites, and Top-down Attention

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| | Linden, Tabuena, **Steinmetz**, Moody, Brunton S, Brunton B<br>Go with the FLOW: Visualizing Spatiotemporal Dynamics in Optical Widefield Calcium Imaging | *J Royal Society Interface* |
| 2020 | Schröder, **Steinmetz**, Krumin, Pachitariu, Rizzi, Lagnado, Harris, Carandini<br>Arousal Modulates Retinal Output | *Neuron* |
| | Jacobs, **Steinmetz**, Carandini, Harris<br>Cortical State Fluctuations During Sensory Decision Making | *Current Biology* |
| | Dimitriadis, Neto, …, **Steinmetz**, et al.<br>Why Not Record from Every Electrode with a CMOS Scanning Probe? | *preprint* | *bioRxiv* |
| 2019 | **Steinmetz**, Zatka-Haas, Carandini, Harris<br>Distributed Coding of Choice, Action, and Engagement Across the Mouse Brain | *Nature* |
| | Engel, **Steinmetz**<br>New Perspectives on Dimensionality and Variability from Large-scale Cortical Dynamics | *review* | *Curr Op in Neurobio* |
| | Stringer*, Pachitariu*, **Steinmetz**, Carandini, Harris<br>High-Dimensional Geometry of Population Responses in Visual Cortex | *Nature* |
| | Stringer*, Pachitariu*, **Steinmetz**, Reddy, Carandini, Harris<br>Spontaneous Behaviors Drive Multidimensional, Brain-Wide Population Activity | *Science* |
| | Shimaoka, **Steinmetz**, Harris, Carandini<br>The Impact of Bilateral Ongoing Activity on Evoked Responses in Mouse Cortex | *eLife* |
| | Okun, **Steinmetz**, Lak, Dervinis, Harris<br>Distinct Structure of Cortical Population Activity on Fast and Infraslow Timescales | *Cerebral Cortex* |
| | Pettine, **Steinmetz**, Moore<br>Laminar Segregation of Sensory Coding and Behavioral Readout in Macaque V4 | *PNAS* |
| 2018 | **Steinmetz**, Koch, Harris, Carandini<br>Challenges and Opportunities for Large-Scale Electrophysiology with Neuropixels Probes | *review* | *Curr Op in Neurobio* |
| | Shamash, Harris, Carandini, **Steinmetz**<br>A Tool for Analyzing Electrode Tracks From Slice Histology | *preprint* | *bioRxiv* |
| 2017 | Jun*, **Steinmetz***, Siegle*, Denman*, Bauza*, Barbarits*, Lee*, et al.<br>Fully Integrated Silicon Probes for High-Density Recording of Neural Activity | *Nature* |
| | Burgess*, Lak*, **Steinmetz***, Zatka-Haas*, et al.<br>High-Yield Methods for Accurate Two-Alternative Visual Psychophysics in Head-Fixed Mice | *Cell Reports* |
| | **Steinmetz**, Buetfering, Lecoq, Lee, et al.<br>Aberrant Cortical Activity in Multiple GCaMP6-Expressing Transgenic Mouse Lines | *eNeuro* |
| | Sridharan, **Steinmetz**, Moore, Knudsen<br>Does the Superior Colliculus Control Perceptual Sensitivity or Choice Bias during Attention? Evidence from a Multialternative Decision Framework | *J Neurosci* |
| 2016 | Engel*, **Steinmetz***, Gieselmann, Thiele, Moore, Boahen<br>Selective Modulation of Cortical State During Spatial Attention | *Science* |
| | Stringer, Pachitariu, **Steinmetz**, Okun, Bartho, Harris, Sahani, Lesica<br>Inhibitory Control of Correlated Intrinsic Variability in Cortical Networks | *eLife* |
| | Pachitariu, **Steinmetz**, Kadir, Carandini, Harris<br>Fast and Accurate Spike Sorting of High-Channel Count Probes with Kilosort | *NeurIPS* |

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| 2015 | Okun, **Steinmetz**, … Carandini, Harris<br>Diverse Coupling of Neurons to Populations in Sensory Cortex | *Nature* |
| 2014 | Steinmetz, Moore<br>Eye Movement Preparation Modulates Neuronal Responses in Area V4 When Dissociated from Attentional Demands | *Neuron* |
| | Zirnsak, **Steinmetz**, Noudoost, Xu, Moore<br>Visual Space is Compressed in Prefrontal Cortex Before Eye Movements | *Nature* |
| | Sridharan, **Steinmetz**, Moore, Knudsen<br>Distinguishing Bias from Sensitivity Effects in Multialternative Detection Tasks | *J Vision* |
| | Steinmetz<br>Circuits Underlying Visual Attention in Primate Neocortex | *Ph.D. Thesis, Stanford Univ.* |
| 2012 | Squire*, Steinmetz*, Moore<br>Frontal Eye Field \| *review* | *Scholarpedia* |
| | Steinmetz, Moore<br>Lumping and Splitting the Neural Circuitry of Visual Attention \| *commentary* | *Neuron* |
| 2010 | Steinmetz, Moore<br>Changes in the Response Rate and Response Variability of Area V4 Neurons During the Preparation of Saccadic Eye Movements | *J Neurophys* |
| | Noudoost, Chang, **Steinmetz**, Moore<br>Top-Down Control of Visual Attention \| *review* | *Curr Op in Neurobio* |
| 2009 | Aton, Seibt, Dumoulin, Jha, **Steinmetz**, Coleman, Naidoo, Frank<br>Mechanisms of Sleep-Dependent Consolidation of Cortical Plasticity | *Neuron* |
| 2008 | Liu, **Steinmetz**, Farley, Smith, Joseph<br>Mid-fusiform Activation During Object Discrimination Reflects the Process of Differentiating Structural Descriptions | *J Cog Neuro* |
| 2006 | Joseph, Cerullo, Farley, **Steinmetz**, Mier<br>fMRI Correlates of Cortical Specialization and Generalization for Letter Processing | *Neuroimage* |
| | Joseph, Powell, Andersen, …, **Steinmetz**, Zhang<br>fMRI in Alert, Behaving Monkeys: An Adaptation of the Human Infant Familiarization Novelty Preference Procedure | *J Neurosci Methods* |
| 2005 | Jha, Jones, Coleman, **Steinmetz**, …, Frank<br>Sleep-Dependent Plasticity Requires Cortical Activity | *J Neurosci* |

## *Professional Service*

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| 2019 – pres. | Editorial Board, *Scientific Data* |
| 2014 – pres. | Peer reviewer for journals including *Nature, Science, eLife*, *Neuron*, *Current Biology*, *J. of Neuroscience*, *J. of Neurophysiology*, and *Cerebral Cortex* |

## *Invited Talks*

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| 2023 Dec | *Keynote:* Statistical Analysis of Neural Data, Pittsburgh, PA, USA |
| 2023 Oct | University of Utah, Salt Lake City, UT, USA |
| 2023 Jun | Champalimaud Centre for the Unknown, Lisbon, Portugal (*virtual*) |
| 2023 May | Klingenstein-Simons Fellowship Meeting, New York, NY, USA |
| 2023 Apr | NeuroTEC Symposium, UW, Seattle, WA, USA |
| 2023 Feb | DFG Research Unit 5159, Hamburg, Germany *(virtual)* |

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| 2023 Feb | Johns Hopkins University, Baltimore, MD, USA |
| 2022 Nov | International Network for Bio-Inspired Computing Workshop, UW, Seattle, WA, USA |
| 2022 Oct | A3D3: Accelerated Artificial Intelligence Algorithms for Data-Driven Discovery (*virtual*) |
| 2022 Sept | NeuroAI, Seattle, WA, USA |
| 2022 June | Champalimaud Centre for the Unknown, Lisbon, Portugal (*virtual*) |
| 2022 Mar | University of Texas, Austin, TX, USA (*virtual*) |
| 2022 Mar | Columbia University, New York, NY, USA |
| 2022 Mar | Princeton University, Princeton, NJ, USA |
| 2022 Feb | University of California, San Diego, CA, USA (*virtual*) |
| 2021 Oct | University of Sussex, England, UK (*virtual*) |
| 2021 Sept | Karolinska Institute, Sweden (*virtual*) |
| 2021 Mar | University of Geneva, Geneva, Switzerland (*virtual*) |
| 2021 Mar | Medical University of South Carolina, Charleston, SC, USA (*virtual*) |
| 2020 Dec | University of Texas Health Science Center, Houston, TX, USA (*virtual*) |
| 2020 Nov | Hebrew University, Jerusalem, Israel (*virtual*) |
| 2020 Sept | Simons Foundation Workshop on Spike Sorting, New York, NY, USA (*virtual*) |
| 2020 July | FENS Workshop "Measuring activity at brain-wide scale", Glasgow, UK (*virtual*) |
| 2020 May | Netherlands Institute for Neuroscience, Amsterdam, NL (*virtual*) |
| 2020 Mar | Cosyne Workshop on "Modules in the Brain", Breckenridge, CO, USA |
| 2020 Jan | Albert Einstein College of Medicine, New York, NY, USA |
| 2020 Jan | University of Oslo, Oslo, Norway |
| 2019 Nov | Allen Institute for Brain Science, Seattle, WA, USA |
| 2019 Oct | Society for Neuroscience, Minisymposium, Chicago, IL, USA |
| 2019 Sept | Next-generation Neurotech Symposium, IBRO 2019, Daegu, South Korea |
| 2019 Sept | Allen Institute Workshop on the Dynamic Brain, Friday Harbor, WA, USA |
| 2019 July | Champalimaud Centre for the Unknown, Lisbon, Portugal |
| 2019 July | Neural Data Science course, Cold Spring Harbor Labs, New York, NY, USA |
| 2019 May | *Keynote:* Statistical Analysis of Neural Data, Pittsburgh, PA, USA |
| 2019 Apr | University of Washington, Seattle, WA, USA |
| 2019 Mar | University of Oregon, Eugene, OR, USA |
| 2019 Jan | Neural Computation and Engineering Connection, University of Washington, Seattle, WA, USA |
| 2018 Nov | Society for Neuroscience, Nanosymposium, San Diego, CA, USA |
| 2018 Oct | 'Neureka' Symposium, Kings College London, London, UK |
| 2018 Sept | Cardiff University, Cardiff, Wales, UK |
| 2018 May | International Brain Laboratory, First Science Meeting, Paris, France |
| 2018 May | International Conference for Advanced Neurotechnology, Ann Arbor, MI, USA |
| 2018 Mar | Cosyne Workshop on "Brain-wide neuronal dynamics", Breckenridge, CO, USA |
| 2018 Feb | Neuralink, San Francisco, CA, USA |
| 2017 Nov | SfN Neuropixels Satellite Session, Washington, DC, USA |
| 2017 Oct | Kavli Futures Symposium: Neurotechnology, Santa Monica, CA, USA |
| 2017 Sept | NIH Neurotechnology Seminar, Bethesda, MD, USA |
| 2017 July | Computational Neuroscience Society, Antwerp, Belgium |
| 2017 July | Champalimaud Centre for the Unknown, Lisbon, Portugal |
| 2017 June | International Conference for Advanced Neurotechnology, Freiburg, Germany |
| 2016 Nov | Institute of Opthalmology, University College London, London, UK |
| 2015 Nov | Neuroseeker Data Workshop, Nijmegen, Netherlands |

*Other Training*

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| 2012 | FENS-IBRO-Hertie Winter School on "Neural Coding in Sensory Systems", Obergurgl, Austria |

2009 "Methods in Computational Neuroscience", Woods Hole, MA, USA

*Teaching Activities*

2023-2024 Lecturer, Neurobiology (NEURO502), UW
2020-2023 Course organizer and lecturer, "Seminar in Computational Neuroscience" (NEUSCI490), UW
2019-2023 Lecturer, "Current Topics in Neurobiology and Behavior" (NEURO527), UW
2020, 2022 Lecturer, "Computational Neuroscience" (CSE/NEUBEH 528), UW
2019-2023 Course organizer and lecturer for Neuropixels Workshop, Allen Institute for Brain Science
2018 Course organizer and instructor for International Brain Laboratory "Neuropixels mini-course"
2018 Course instructor for Cajal Course "Linking Neural Circuits and Behavior", Bordeaux, France
2018 Course instructor for Paris Neuro, Paris, France
2017 Teaching Assistant for Cajal Course "Interacting with Neural Circuits", Champalimaud Centre, Lisbon, Portugal
2017-2023 Course organizer and/or lecturer for Neuropixels Training Course, University College London
2012 Teaching Assistant, *Large-scale neural models*, with Dr. Kwabena Boahen, Stanford University
2011 Teaching Assistant, *Computational Neuroscience*, with Dr. John Huguenard, Stanford University
2009 Teaching Assistant, *Information and Signaling in Neurons and Networks*, with Dr. Richard Tsien and Dr. Stephen Baccus, Stanford University
2008 Teaching Assistant, "Stanford Intensive Neuroscience" graduate program boot camp