Carsen Stringer

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POSITIONS

2020-	**HHMI Janelia Research Campus**, Group Leader
2026-	**Johns Hopkins University**, Adjunct Professor in Neuroscience

POSTDOCTORAL EXPERIENCE

2018-2020	**HHMI Janelia Research Campus** Visual processing and behavioral representations in cortex Advisors: Marius Pachitariu & Karel Svoboda

EDUCATION

2013-2018	**PhD in Computational Neuroscience** Gatsby Computational Neuroscience Unit, UCL, London Discovering structure in multi-neuron recordings through network modelling Advisors: Kenneth D. Harris & Matteo Carandini
2009-2013	**BS in Applied Mathematics and Physics** University of Pittsburgh – GPA: 3.93/4.00 Chancellor's Scholar (one of 12 per year, full scholarship) Advisor: Jonathan Rubin

PUBLICATIONS

Preprints

1. Paul K LaFosse, Daniel Flickinger, Georg Jaindl, Antonia Drinnenberg, Sverre Grødem, Kristian K Lensjø, Charu Ramakrishnan, La'Akea Siverts, Hongkui Zeng, Bosiljka Tasic, Tanya L Daigle, Marianne Fyhn, Karl Deisseroth, Carsen Stringer†, Marius Pachitariu†. Raster photostimulation of large-scale neural populations. *bioRxiv*, 2026.
2. Miguel Angel Nuñez-Ochoa, Fengtong Du, Lin Zhong, Scott Baptista, Michalis Michaelos, Alex Sohn, Liad Baruchin, Sylvia Schröder, Carsen Stringer†, Marius Pachitariu†. Linking neural representations to behavior using generalization. *bioRxiv*, 2026.
3. Atika Syeda, Miguel Angel Núñez-Ochoa, Lin Zhong, Marius Pachitariu†, Carsen Stringer†. Orofacial behaviors, not eye movements, govern neural activity in mouse visual cortex. *bioRxiv*, 2026.
4. Carsen Stringer, Chris Ki, Nicholas Del Grosso, Paul LaFosse, Qingqing Zhang, Marius Pachitariu. Extracting large-scale neural activity with Suite2p. *bioRxiv*, 2026.
5. Emmanuel Marquez Legorreta, Greg M Fleishman, Luuk W Hesselink, Mark Eddison, Kasper Smeets, Carsen Stringer, Philipp J Keller, Sujatha Narayan, Alex B Chen, Brett D Mensh, Scott M Sternson, Bernhard Englitz, Paul W Tillberg, Misha B Ahrens. Whole-Brain Co-Mapping of Gene Expression and Neuronal Activity at Cellular Resolution in Behaving Zebrafish. *bioRxiv*, 2026.
6. Leandro PL Jacob, Sydney M Bailes, Carsen Stringer, Jonathan R Polimeni, Laura D Lewis. Functional MRI signals as fast as 1Hz are coupled to brain states and predict spontaneous neural activity. *bioRxiv*, 2026.
7. Qingqing Zhang, Sverre Grødem, Alexa Gracias, Kristian K Lensjø, Marianne Fyhn, Carsen Stringer†, Marius Pachitariu†. Spatial predictive coding in visual cortical neurons. *bioRxiv*, 2025.
8. Marius Pachitariu, Michael Rariden, Carsen Stringer. Cellpose-SAM: superhuman generalization for cellular segmentation. *bioRxiv*, 2025.
9. Carsen Stringer, Marius Pachitariu. Benchmarking cellular segmentation tools against Cellpose. *bioRxiv*, 2024.
10. Marius Pachitariu, Carsen Stringer, Sylvia Schröder, Mario Dipoppa, L Federico Rossi, Matteo Carandini, Kenneth D Harris. Suite2p: Beyond 10,000 Neurons with Standard Two-Photon Microscopy. *bioRxiv*, 2016.

Peer-reviewed

1. Marius Pachitariu, Lin Zhong, Alexa Gracias, Amanda Minisi, Crystall Lopez, Carsen Stringer. A critical initialization for biological neural networks. **Nature**, 2026.

2. Leandro PL Jacob, Sydney M Bailes, Stephanie D Williams, Carsen Stringer, Laura D Lewis. Brainwide hemodynamics predict EEG neural rhythms across sleep and wakefulness in humans. **PLOS CB**, 2025.
3. Lin Zhong, Scott Baptista, Rachel Gattoni, Jon Arnold, Daniel Flickinger, Carsen Stringer†, Marius Pachitariu†. Distinct streams for supervised and unsupervised learning in the visual cortex **Nature**, 2025.
4. Fengtong Du, Miguel Angel Núñez-Ochoa, Marius Pachitariu†, Carsen Stringer†. A simplified minimodel of visual cortical neurons. **Nature Communications**, 2025.
5. Xuyu Qian, Kyle Coleman, Shunzhou Jiang, Andrea J Kriz, Jack H Marciano, Chunyu Luo, Chunhui Cai, Monica Devi Manam, Emre Caglayan, Aoi Otani, Urmi Ghosh, Diane D Shao, Rebecca E Andersen, Jennifer E Neil, Robert Johnson, Alexandra LeFevre, Jonathan L Hecht, Michael B Miller, Liang Sun, Carsen Stringer, Mingyao Li, Christopher A Walsh. Spatial transcriptomics reveals human cortical layer and area specification. **Nature**, 2025.
6. Carsen Stringer, Marius Pachitariu. Cellpose3: one-click image restoration for improved cellular segmentation. **Nature Methods**, 2025.
7. Valentina Gandin, Jun Kim, Liang-Zhong Yang, Yumin Lian, Takashi Kawase, Amy Hu, Konrad Rokicki, Greg Fleishman, Paul Tillberg, Alejandro Aguilera Castrejon, Carsen Stringer, Stephan Preibisch, Zhe J Liu. Deep-tissue transcriptomics and subcellular imaging at high spatial resolution. **Science**, 2025.
8. Weinan Sun, Johan Winnubst, Maanasa Natrajan, Chongxi Lai, Koichiro Kajikawa, Michalis Michaelos, Rachel Gattoni, Carsen Stringer, Daniel Flickinger, James E Fitzgerald, Nelson Spruston. Learning produces a hippocampal cognitive map in the form of an orthogonalized state machine. **Nature**, 2025.
9. Atika Syeda, Lin Zhong, Renee Tung, Will Long, Marius Pachitariu†, Carsen Stringer†. Facemap: A Framework for Modeling Neural Activity Based on Orofacial Tracking. **Nature Neuroscience**, 2024.
10. Marius Pachitariu, Shashwat Sridhar, Jacob Pennington, Carsen Stringer. Spike sorting with Kilosort4. **Nature Methods**, 2024.
11. Carsen Stringer, Lin Zhong, Atika Syeda, Fengtong Du, Maria Kesa, Marius Pachitariu. Rastermap: A Discovery Method for Neural Population Recordings. **Nature Neuroscience**, 2024.
12. Helen Farrants, Yichun Shuai, William C Lemon, Christian Monroy Hernandez, Shang Yang, Ronak Patel, Guanda Qiao, Michelle S Frei, Jonathan B Grimm, Timothy L Hanson, Filip Tomaska, Glenn C Turner, Carsen Stringer, Philipp J Keller, Abraham G Beyene, Yao Chen, Yajie Liang, Luke D Lavis, Eric R Schreiter. A modular chemigenetic calcium indicator for multiplexed in vivo functional imaging. **Nature Methods**, 2024.
13. Jonathan W. Lovelace, Jingrui Ma, Saurabh Yadav, Karishma Chhabria, Hanbing Shen, Zhengyuan Pang, Tianbo Qi, Ruchi Sehgal, Yunxiao Zhang, Tushar Bali, Thomas Vaissiere, Shawn Tan, Yuejia Liu, Gavin Rumbaugh, Li Ye, David Kleinfeld, Carsen Stringer, Vineet Augustine. Vagal sensory neurons mediate the Bezold–Jarisch reflex and induce syncope. **Nature**, 2023.
14. Marius Pachitariu, Carsen Stringer. Cellpose 2.0: How to Train Your Own Model. **Nature Methods** 19, no. 12 (2022): 1634–41. Research Briefing: A Cellular Segmentation Algorithm with Fast Customization.
15. Kevin J Cutler, Carsen Stringer, Teresa W Lo, Luca Rappez, Nicholas Stroustrup, S Brook Peterson, Paul A Wiggins, Joseph D Mougous. Omnipose: A High-Precision Morphology-Independent Solution for Bacterial Cell Segmentation. **Nature Methods** 19, no. 11 (2022): 1438–48.
16. Bernard t Hart, Titipat Achakulvisut, Ayoade Adeyemi, Athena Akrami, Bradly Alicea, Alicia Alonso-Andres, Diego Alzate-Correa, . . . Carsen Stringer, et al. Neuromatch Academy: A 3-Week, Online Summer School in Computational Neuroscience. **Journal of Open Source Education** 5, no. 49 (2022): 118.
17. Carsen Stringer, Michalis Michaelos, Dmitri Tsyboulski, Sarah E Lindo, Marius Pachitariu. High-Precision Coding in Visual Cortex. **Cell** 184, no. 10 (2021): 2767–78.
18. Carsen Stringer, Tim Wang, Michalis Michaelos, Marius Pachitariu. Cellpose: A Generalist Algorithm for Cellular Segmentation. **Nature Methods** 18, no. 1 (2021): 100–106.
19. Carsen Stringer*, Marius Pachitariu*, Nicholas Steinmetz, Matteo Carandini†, Kenneth D Harris†. High-Dimensional Geometry of Population Responses in Visual Cortex. **Nature**, 2019, 1.
20. Carsen Stringer*, Marius Pachitariu*, Nicholas Steinmetz, Charu Bai Reddy, Matteo Carandini†, Kenneth D Harris†. Spontaneous Behaviors Drive Multidimensional, Brainwide Activity. **Science** 364, no. 6437 (2019): 255.

21. Marius Pachitariu, Carsen Stringer, Kenneth D Harris. Robustness of Spike Deconvolution for Neuronal Calcium Imaging. **Journal of Neuroscience** 38, no. 37 (2018): 7976–85.
22. Carsen Stringer*, Marius Pachitariu*, Nicholas A Steinmetz, Michael Okun, Peter Bartho, Kenneth D Harris, Maneesh Sahani, Nicholas A Lesica. Inhibitory Control of Correlated Intrinsic Variability in Cortical Networks. **Elife** 5 (2016): e19695.
23. Ernesto Suárez, Steven Lettieri, Metthew C Zwier, Carsen Stringer, Sundar Raman Subramanian, Lillian T Chong, Daniel M Zuckerman. Simultaneous Computation of Dynamical and Equilibrium Information Using a Weighted Ensemble of Trajectories. **J. Chem. Theory Comput.** (2014), 10, 7, 2658–2667.

Review articles

1. Carsen Stringer, Marius Pachitariu. Analysis methods for large-scale neuronal recordings. **Science**, 2024.
2. Lilach Avitan, Carsen Stringer. Not so Spontaneous: Multi-Dimensional Representations of Behaviors and Context in Sensory Areas. **Neuron** 110, no. 19 (2022): 3064–75.
3. Edward Zagha, Jeffrey C Erlich, Soohyun Lee, Gyorgy Lur, Daniel H O'Connor, Nicholas A Steinmetz, Carsen Stringer, Hongdian Yang. The Importance of Accounting for Movement When Relating Neuronal Activity to Sensory and Cognitive Processes. **Journal of Neuroscience** 42, no. 8 (2022): 1375–82.
4. Tara van Viegen, Athena Akrami, Kathryn Bonnen, Eric DeWitt, Alexandre Hyafil, Helena Ledmyr, Grace W Lindsay, … Carsen Stringer, et al. Neuromatch Academy: Teaching Computational Neuroscience with Global Accessibility. **Trends in Cognitive Sciences** 25, no. 7 (2021): 535–38.
5. Carsen Stringer, Marius Pachitariu. Computational Processing of Neural Recordings from Calcium Imaging Data. **Current Opinion in Neurobiology** 55 (2019): 22–31.

Book chapters

1. Carsen Stringer, Marius Pachitariu. Architectures and Loss Functions. *AI in Microscopy: A Bioimaging Guide*, 2026. [Tutorial]

DATASETS

- Spontaneous neural activity in cortex and hippocampus (Pachitariu et al 2026): Recordings of 5,000-10,000 neurons at 22Hz across cortical areas and hippocampal CA1; analysis code
- Visual response dataset (Du et al 2025): recordings of 29,000 neurons in mouse primary visual cortex in response to up to 65,000 natural images; analysis code
- Visual learning dataset (Zhong et al 2025): recordings of 50,000+ neurons simultaneously in mouse visual cortex as mice undergo unsupervised and task learning in virtual reality; analysis code
- Facemap dataset (Syeda et al 2024): spontaneous neural activity from 50,000+ neurons in mouse visual cortex and sensorimotor cortex, simultaneous face camera recordings, and keypoint tracking training set
- Cellpose dataset (Stringer et al 2021): 70,000 labelled cells used to train Cellpose segmentation algorithm
- Neural responses to oriented stimuli (Stringer et al 2021): Responses of 20,000+ neurons in mouse primary visual cortex and higher order visual cortex; analysis code
- Spontaneous neural activity in V1 (Stringer, Pachitariu et al 2019): Recordings of 10,000 neurons in visual cortex during spontaneous behaviors; analysis code
- Eight-probe Neuropixels recordings during spontaneous behaviors by Nicholas Steinmetz, from Stringer, Pachitariu et al 2019
- Neural responses to natural images (Stringer, Pachitariu et al 2019): Recordings of 10,000 neurons in primary visual cortex in response to 2,800 natural images; analysis code
- V1 responses to drifting gratings (Pachitariu et al 2018): Responses of 10,000 neurons in mouse V1 during drifting gratings

SOFTWARE

Our lab develops machine learning tools for understanding large-scale neural, behavioral, and imaging data, which are used by thousands of labs.

cellpose	Cellular segmentation software	*2M+ downloads*
suite2p	Calcium imaging processing software	*450k+ downloads*
kilosort	Spike sorting software	*150k+ downloads (since 2024)*
rastermap	Non-linear embedding algorithm for high-dimensional data	*200k+ downloads*
facemap	Behavioral analysis software	*120k+ downloads*

TEACHING EXPERIENCE

2026	Deep Learning for Microscopy Image Analysis (course organizer + lecturer)	*Janelia*
	Computational Neuroscience: Vision (lecturer, upcoming)	*CSHL*
2022-25	Modern Optical Microscopy for the Modern Biologist, guest lecturer	*UC Berkeley*
2025	CAJAL Course on NeuroAI: Modeling visual circuits (tutorial lecturer)	*Champalimaud*
	JHU Grad Student Bootcamp: Calcium imaging segmentation (tutorial lecturer)	*Janelia*
	CAJAL Course on Interacting with Neural Circuits (lecturer)	*Champalimaud*
2024	Deep Learning for Microscopy Image Analysis (EMBO-DL4MIA)	*Human Technopole*
2023	JHU Grad Student Bootcamp: Neural-behavioral analysis (tutorial lecturer)	*Janelia*
	Deep Learning for Microscopy Image Analysis (lecturer)	*MBL Woodshole*
	Imaging Structure & Function in the Nervous System (lecturer)	*CSHL*
	CAJAL Course on Interacting with Neural Circuits (lecturer)	*Champalimaud*
	Summer Course on Computational & Cognitive Neuroscience (lecturer)	*CSHA, Suzhou*
2022	Probabilistic Machine Learning Reading Group (course organizer + lecturer)	*Janelia+JHU*
	Deep Learning for Microscopy Image Analysis (lecturer)	*MBL Woodshole*
	Imaging Structure & Function in the Nervous System (lecturer)	*CSHL*
	CAJAL Course on Interacting with Neural Circuits (lecturer)	*Champalimaud*
	Computational Neuroscience Winter School	*SJTU*
2020	Computational Neuroscience: Deep Learning Day (organizer + lecturer)	*Neuromatch Academy*
2019	Mathematical methods for neuroscience and ML (course organizer + lecturer)	*Janelia*
	Learning to use suite2p and kilosort2 (course organizer + lecturer)	*Janelia*
	Neural Data Science (co-instructor)	*CSHL*
	Imaging Structure & Function in the Nervous System (lecturer)	*CSHL*
2018	Imaging Structure & Function in the Nervous System (lecturer)	*CSHL*
	Machine Learning: Dimensionality reduction (lecturer)	*Janelia*
2014	Theoretical Neuroscience TA	*Gatsby, UCL*

SERVICE

Neuromatch Academy: TA Instruction co-Chair 2020, Board of Directors 2021-2023, Faculty mentor 2024, 2026

I helped to launch Neuromatch Academy in 2020, creating the Deep Learning Day, and teaching and organizing the 180 TAs who taught over 2,000 students. From 2021-2023, I was on the Board of Directors, and continued to volunteer for the TA management team until 2024. From 2020-2024, Neuromatch taught 11,625 students from 122 countries, and over half of these students came from low- and middle-income economies. In 2024 (and 2026 upcoming) as a mentor, I have provided professional development advice to several groups of students.

Reviewer, ad hoc: Nature, Science, Nature Communications, Nature Neuroscience, Neuron, eLife, Nature Methods, Journal of Neuroscience, Cell Reports, PLOS Biology, PLOS Computational Biology, Current Biology, Journal of Physiology, PNAS, Cell Systems, Science Advances, Cosyne (conference), NSF

Thesis committees: Jeremy Delahanty, Janelia/JHU, ongoing; Caroline Zhang, Janelia/JHU, ongoing; Haoze Zhu,

University of Goettingen, ongoing; Greggory Heller, MIT, ongoing; Samuele Virgili, CNRS, 2024; Sarah Armstrong, Oxford, 2024; Katya Tsimring, MIT, 2024; Ervin Tasnadi, University of Szeged, 2024; Haoran Chen, CMU, 2023; Cesar Echavarria, Harvard, 2020

Janelia service: Advisory committee for Advanced Imaging Core, Janelia, 2025-present; Janelia Graduate Training committee, 2023-present; Janelia DEI committee, 2019-2021

Conference organizer: Junior Scientist Workshop on Theoretical Neuroscience, Janelia, 2019; Junior Scientist Workshop on Mechanistic Cognitive Neuroscience, Janelia, 2023, 2025, NeuroAI conference, Janelia, 2026

MEDIA COVERAGE

- New computational model could help shed light on how we see, Howard Hughes Medical Institute
- Doing This Might Actually Make You Smarter, Vice
- "Zoning Out" Actually Helps You Learn? Data From Up To 90,000 Brain Cells Says So, IFL Science
- Zoning out could be beneficial—and may actually help us learn faster, Howard Hughes Medical Institute
- Newest version of Cellpose can spot cell boundaries even in cloudy conditions, Howard Hughes Medical Institute
- Novel visualization method helps make sense of large neuronal activity datasets, Medical Xpress
- New tool helps scientists spot patterns in mountains of data, Howard Huges Medical Institute
- Six tips for going public with your lab's software, Nature
- Janelia scientists release state-of-the-art spike-sorting software Kilosort4, Howard Hughes Medical Institute
- Predicting neural activity from facial expressions, Nature Methods
- Tiny faces, big expressions: Reading rodent faces, Penn NeuroKnow
- Reading the mouse mind from its face: New tool decodes neural activity using facial movements, Howard Hughes Medical Institute
- Noisy solo neurons show consistency in groups, Howard Hughes Medical Institute
- High precision coding: How the visual cortex processes information about the world, Scientifica
- New tool maps boundaries of diverse cells in microscope images, Howard Hughes Medical Institute
- Python power-up: new image tool visualizes complex data, Nature
- A Power Law Keeps the Brain's Perceptions Balanced, Quanta magazine
- Power Law Discovery May Explain Why You Can See the Forest and the Trees, Simons Foundation
- 'Noise' in the Brain Encodes Surprisingly Important Signals, Quanta magazine
- Thinking on the Go: Why Does the Whole Brain Light Up for Just the Smallest Movements?, Simons Foundation
- profile + podcast, Stories of Women in Neuroscience (WIN) by Daniela Cassataro
- Understanding 40,000 neurons, Brain Inspired podcast by Paul Middlebrooks

TALKS

2026: Washington University, Rockefeller University Leon Levy Seminar, Princeton Neuroscience Insitute Seminar, Bioimage Analysis Workshop at University of Maryland Baltimore, Euro-Bioimaging seminar series, University of Washington, Allen Institute, NWB Neurodata Workshop (upcoming)

2025: AI Revolution Meets 4D Cellular Physiology (Janelia), Mechanistic Cognitive Neuroscience Conference (Janelia), Northwestern Pharmacology, RIKEN CBS Brain Science Seminar Series, NWB Neurodata Workshop, Imperial Volumetric Imaging Workshop, JHU Graduate Symposium, NIH NINDS Career Panel, Bernstein Computational Neuroscience Seminar, Allen Institute Openscope Meeting, UCL Neuropixels Course

2024: Gatsby UCL, University of Oxford, CSHL NAISys conference, Ulster University, Northeast Bioimage Analysis Meeting, Theoretical Neuro Columbia University, Boston University ML+Photonics in Neuro conference

2023: Princeton-CUNY symposium, Cosyne workshop talk, MIT Brain Research Colloquium, Broad Institute, EIT Health Imaging school, Killam lecture & Quantitative Life Sciences lecture @ McGill, Mila - Montreal, University of Montreal, University of Bonn, Human Technopole, Society for Bioimaging conference, Harvard Kempner seminar, Statistical Analysis of Neural Data conference (Pitt/CMU)

2022: UCL NeuroAI seminar, University of Virginia, NIH/NINDS, Harvard Medical School, Bernstein Conference main meeting + workshop talk, Zuckerman Columbia University, Scuola Normale Superiore Pisa, Bristol University, MDC Berlin, University of Pittsburgh, NIH/NHLBI, Images2Knowledge Talk and Workshop, Fluidigm Cell Segmentation Panel, Cosyne Workshops (2x), Albert Einstein School of Medicine, EPFL FNIP, Chan Zuckerberg Institute NDCN, Queensland Brain Institute, NEUBIAS, Simons Flatiron Institute

2021: Crick Bioimage Analysis Symposium, Janelia-EMBL, University of Chicago, ETH Zurich, MPI for Biological Cybernetics, Worldwide Theoretical Neuroscience Seminar, University of Illinois Urbana-Champaign, UC San Diego, Allen Institute Modelling Workshop, Allen/UW Summer Workshop on the Dynamic Brain, University of Melbourne, Bernstein Conference, UC Irvine, UC Riverside, MIT, Neural Interface Conference, Columbia University, Cornell University, NYU

2020: Hebrew University, Queens University, Duke University, University of Melbourne, Barrels symposium, SAIDL, Neuromath Seminar, Nilearn ML Day, Oxford CortexClub, Cognitive Neuroscience Society meeting, Yale symposium (keynote)

2019: Janelia workshop, University of Oregon, Columbia University workshop, SAND Pitt/CMU conference

2018: Cosyne workshop talk

2016: Cosyne main meeting talk

2015: SfN Nanosymposium, NCCD, Gatsby Tri-Center meeting at Columbia University