

DAN BIDERMAN, CURRICULUM VITAE

PhD Student
Center for Theoretical Neuroscience
Zuckerman Institute, Columbia University

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(last updated May 17, 2024)

INTERESTS

I develop efficient machine learning systems – for video, text, and timeseries – that are used daily in neuroscience and industry.

EDUCATION

- 2018– COLUMBIA UNIVERSITY (New York, NY, USA)
Ph.D., Neuroscience (Expected June 2024)
M.S., Neuroscience (2020)
Advisor: John P. Cunningham
Committee: Daniel Wolpert (chair), Liam Paninski, Ashok Litwin-Kumar, Alexander Rush
Thesis: Resource-efficient Machine Learning Systems: From Natural Behavior to Natural Language
- 2013–2018 TEL AVIV UNIVERSITY (Israel)
The Adi Lautman Interdisciplinary Program for Outstanding Students (2013-2017)
The university's excellence program; leading directly to a Master's degree.
[\[See background and notable alumni\]](#)
Coursework: Cognitive Sci., Math, Neurobiology, History and Philosophy of Science
M.A., Cognitive Science (2018)
Advisor: Liad Mudrik
Thesis: Contextual effects on the perception of ambiguous objects (psychophysics and hierarchical Bayesian models)

PROFESSIONAL EXPERIENCE

- May 2023– MOSAIC ML / DATABRICKS
Student Researcher, NLP team. Parameter-efficient finetuning, evaluation, code generation (supervisor: Jonathan Frankle)

PUBLICATIONS

** denotes equal author contribution (shared first-authorship).*

- [A1] **Dan Biderman**, Jose Gonzalez Ortiz, Jacob Portes, Mansheej Paul, Philip Greengard, Connor Jennings, Daniel King, Sam Havens, Vitaliy Chiley, Jonathan Frankle, Cody Blakeney, and John P. Cunningham. Lora learns less and forgets less, 2024.

- [A2] The International Brain Laboratory, Kush Banga, Julius Benson, Jai Bhagat, **Dan Biderman**, Daniel Birman, Niccolò Bonacchi, Sebastian A Bruijns, Robert A Campbell, Matteo Carandini, Gaëlle A Chapuis, Anne K Churchland, M Felicia Davatolhagh, Hyun Dong Lee, Mayo Faulkner, Berk Gerçek, Fei Hu, Julia M Huntenburg, Cole Hurwitz, Anup Khanal, Christopher Krasniak, Guido T Meijer, Nathaniel J Miska, Zeinab Mohammadi, Jean-Paul Noel, Liam Paninski, Alejandro Pan-Vazquez, Noam Roth, Michael Schartner, Karolina Socha, Nicholas A Steinmetz, Karel Svoboda, Marsa Taheri, Anne E Urai, Miles Wells, Steven J West, Matthew R Whiteway, Olivier Winter, and Ilana B Witten. Reproducibility of in-vivo electrophysiological measurements in mice. *Revision Under Review, bioRxiv*, 2023.
- [A3] **Dan Biderman***, Matthew R Whiteway*, Cole Hurwitz, Nicholas R Greenspan, Robert S Lee, Ankit Vishnubhotla, Michael Schartner, Julia M Huntenburg, Anup Khanal, Guido T Meijer, and others. Lightning pose: improved animal pose estimation via semi-supervised learning, bayesian ensembling, and cloud-native open-source tools. *BioRxiv*, In Press.
- [A4] Matthew R Whiteway, **Dan Biderman**, Yoni Friedman, Mario Dipoppa, E Kelly Buchanan, Anqi Wu, John Zhou, Niccolò Bonacchi, Nathaniel J Miska, Jean-Paul Noel, and others. Partitioning variability in animal behavioral videos using semi-supervised variational autoencoders. *PLoS computational biology*, 17(9):e1009439, 2021.
- [A5] Andres Potapczynski*, Luhuan Wu*, **Dan Biderman***, Geoff Pleiss, and John P. Cunningham. Bias-free scalable Gaussian processes via randomized truncations. In *International Conference on Machine Learning*, 2021.
- [A6] **Dan Biderman**, Christian A Naesseth, Luhuan Wu, Taiga Abe, Alice C Mosberger, Leslie J Sibener, Rui Costa, James Murray, and John P Cunningham. Inverse articulated-body dynamics from video via variational sequential Monte Carlo. In *Neural Information Processing Systems Workshop on Differentiable Computer Vision, Graphics, and Physics in Machine Learning (Oral)*, 2020.
- [A7] **Dan Biderman**, Yarden Shir, and Liad Mudrik. B or 13? Unconscious top-down contextual effects at the categorical but not the lexical level. *Psychological science*, 31(6):663–677, 2020.
- [A8] Eleanor Batty, Matthew Whiteway, Shreya Saxena, **Dan Biderman**, Taiga Abe, Simon Musall, Winthrop Gillis, Jeffrey Markowitz, Anne Churchland, John P Cunningham, and others. Behavenet: nonlinear embedding and Bayesian neural decoding of behavioral videos. *Advances in Neural Information Processing Systems*, 32, 2019.
- [A9] **Dan Biderman***, Natalie Biderman*, Alon Zivony, and Dominique Lamy. Contingent capture is weakened in search for multiple features from different dimensions. *Journal of Experimental Psychology: Human Perception and Performance*, 43(12):1974, 2017.
- [A10] Rony Hirschorn, **Dan Biderman**, Natalie Biderman, Itai Yaron, Rotem Bennet, Meir Plotnik, and Liad Mudrik. Multi-trial inattention blindness in virtual reality. *Under Revision, Behavior Research Methods*, 2023.
- [A11] Amir Tal, May Sar-Shalom, Tzahi Krawitz, **Dan Biderman**, and Liad Mudrik. Awareness is needed for contextual effects in ambiguous object recognition. *Cortex*, 173:49–60, 2024.

SELECTED OPEN SOURCE SOFTWARE

Lightning Pose Ecosystem

- 2021– **Lightning Pose** (208 stars and 28 forks)
 A widely-used package for semi-supervised pose estimation from video.
<https://github.com/danbider/lightning-pose>

- 2021– **Pose Tracking Diagnostics**
A set of unsupervised diagnostic metrics for model comparison and Streamlit dashboards.
<https://github.com/paninski-lab/tracking-diagnostics>
- 2021 **Lightning Pose App**
a cloud-deployed application supporting image annotation, accelerated training and evaluation. Builds on Lightning.ai.
<https://github.com/Lightning-AI/lightning-pose-app>

Scalable Gaussian Processes (GPs)

- 2022– **Cyclic GPs**
a PyTorch implementation of cyclic reduction for accelerated GP learning and inference.
<https://github.com/cunningham-lab/cyclic-gps>
- 2021 **Randomized Telescoped GPs**
Performs Unbiased Randomized Truncation of scalable GP algorithms in GPyTorch.
<https://github.com/cunningham-lab/RTGPS>

LLM evaluation

- 2023 **LLM evaluation dashboard**
A streamlit app comparing different LLMs' performance on numerous evaluation metrics from MosaicML's "Model Gauntlet".
<https://github.com/mosaicml/llm-eval-dashboard>

INVITED TALKS

Resource-constrained machine learning systems for neuroscience and beyond

- Jan. 2024 Presentation at the Center for Computational Mathematics, Flatiron Institute
Oct. 2023 Presentation at the Linderman and Ré Labs, Stanford University

Behavioral video analysis: a new frontier for systems neuroscience

- Nov. 2023 NSF AI Institute for Artificial and Natural Intelligence (ARNI) kickoff meeting, Columbia University

Inverse Articulated-Body Dynamics from Video via Variational Sequential Monte Carlo

- Sep. 2021 Zuckerman Institute Open House for Simons-Emory Motor Control Consortium, (virtual)
Oct. 2020 Theoretical Neuroscience Seminar, University of Oregon (virtual)
Sep. 2020 Neurotheory meeting, Columbia University (virtual)

Lightning Pose: better, faster and easier animal pose estimation via semi-supervised learning

- October 2023 Presentation at Flatiron Institute's Center for Computational Neuroscience (New York, NY, USA)

June 2023	Presentation at NIH U19 BRAIN site-visit at Columbia University (New York, NY, USA)
June 2022	Featured Developer at Lightning.ai’s first developers conference (New York, NY, USA)
June 2022	Gatsby Computational Neuroscience Tri-Center Meeting, Hebrew University (Jerusalem, Israel)
May 2022	AiCure (virtual)
Apr. 2022	Neurotheory meeting, Columbia University
Dec. 2021	Lightning.ai (New York, NY, USA)
Nov. 2021	Special Seminar on Pose Estimation, Siegelbaum Lab, Columbia University (virtual)

The Elephant in the room: Cerebellar Motor Control of the Mormyrid Fish’s Elephant Nose

July. 2021	Neurotheory meeting, Columbia University
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SELECTED ABSTRACTS

Mar. 2023	Biderman, D., Whiteway, M, et al., Lightning Pose— Pose estimation made better, faster and easier via video semi-supervised learning on the cloud. <i>COSYNE 2023: Computational and Systems Neuroscience</i> (Montréal, Canada)
Apr. 2022	Biderman, D. et al., Lightning Pose—A suite of semi-supervised networks for robust video tracking with minimal manual annotation. <i>From Neuroscience to Artificially Intelligent Systems</i> (Cold Spring Harbor Laboratory, NY, USA)
May 2017	Biderman, D. et al., Context modulation of ambiguous object perception in the absence of awareness <i>Vision Sciences Society conference (VSS)</i> (Tampa, Florida, USA)
Mar. 2020	Batty*, E., Whiteway*, M., Saxena, S., Biderman, D., ... , Linderman, s., Paninski, L. (2020). BehaveNet: Nonlinear embedding and Bayesian neural decoding of behavioral videos. <i>Computational and Systems Neuroscience</i> (COSYNE).
Nov. 2019	Batty*, E., Whiteway*, M., Saxena, S., Biderman, D., ... , Linderman, s., Paninski, L. (2019). BehaveNet: Nonlinear embedding and Bayesian neural decoding of behavioral videos. <i>Conference of the Society for Neuroscience</i> (SFN).

HONORS AND AWARDS

2022	Lightning AI Academic Ambassador
2017	Outstanding Graduate Student Award (Social Sciences Department, Tel Aviv University)
2017	Student Travel Award, for the <i>Vision Sciences Society Conference (VSS)</i> (Tampa, Florida, USA, May 2017), Sagol School of Neuroscience, Tel Aviv University.
2016	Student Travel Award, for an advanced course on <i>Consciousness: from Theory to Practice</i> (Brassenone, Italy, August 2016). The Adi Lautman Interdisciplinary program for outstanding students.
2015	Outstanding Achievements Award, the Adi Lautman Interdisciplinary Program for Outstanding Students
2013–2017	Adi Lautman Interdisciplinary Program Merit Scholarship (full-tuition recipient)

TEACHING

Columbia University

Fall 2022/2023 GR6103 — Statistical Analysis of Neural Data (Prof. Liam Paninski). Guest lecture on modeling animal behavior.

Spring 2020 NBHVG4360 — Introduction to Theoretical Neuroscience (Asst. for Prof. Ashok Litwin-Kumar)

STUDENT MENTORSHIP

07/21 – 07/22 Nicholas Greenspan, Columbia College Computer Science (Pose Estimation, Gaussian Processes)

07/20 – 07/21 Sunand Raghupathi, Columbia College Applied Physics (3D Reconstruction, Pose Estimation)

PROFESSIONAL SERVICE

Conference Reviewer

NeurIPS workshop: Gaussian Processes, Spatiotemporal Modeling, and Decision-making Systems (2022)

Artificial Intelligence and Statistics (2022)

NeurIPS workshop: Differentiable Computer Vision, Graphics and Physics for Machine Learning (2020)

Computational Cognitive Neuroscience (2018–2019)

Organizing Committee Member

Zuckerman Institute Open House for Simons-Emory Motor Control Consortium (virtual, Sep. 2021)

Zuckerman Institute Motor Control Club, Columbia University (2020–)

Student Moderator for NeuroNex Extramural Advisory Committee meeting (May 2020)

Zuckerman Institute Scientific Writing Workshop, Columbia University (Oct. 2019)

Center for Theoretical Neuroscience Retreat (Palisades, New Jersey, USA, Sep. 2019)