

DAN BIDERMAN, CURRICULUM VITAE

PhD Student
Center for Theoretical Neuroscience
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(last updated August 18, 2023)

INTERESTS

I develop data-efficient and compute-efficient machine learning systems that are used daily in neuroscience and industry. Currently expanding my work to LLM efficiency and robustness.

EDUCATION

- 2018– COLUMBIA UNIVERSITY (New York, NY, USA)
Ph.D., Neuroscience (Expected 2024)
M.S., Neuroscience (2020)
Advisor: John P. Cunningham
Committee: Daniel Wolpert (chair), Liam Paninski, Ashok Litwin-Kumar
Thesis: Scalable Machine Learning Systems with Applications to Neuroethology
- 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

- Summer 2023 MOSAIC ML
Research internship, LLM scalability/robustness (supervisor: Jonathan Frankle)

MILITARY SERVICE

- 2008–2013 ISRAELI NAVAL INTELLIGENCE (Tel Aviv, Israel)
Lieutenant; last role: Special Operations Section Chief
First in Class, Intelligence Officers Training (2009)
First in Class, Intelligence Analysts Training (2008)

PUBLICATIONS

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

- [A1] 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. *bioRxiv*, 2023.
- [A2] **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*, pages 2023–04, 2023.
- [A3] 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.
- [A4] 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.
- [A5] **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.
- [A6] **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.
- [A7] Eleanor Batty, Matthew Whiteway, Shreya Saxena, **Dan Biderman**, Taiga Abe, Simon Musall, Winthrop Gillis, Jeffrey Markowitz, Anne Churchland, John P Cunningham, and others. Be-havenet: nonlinear embedding and Bayesian neural decoding of behavioral videos. *Advances in Neural Information Processing Systems*, 32, 2019.
- [A8] **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.

SELECTED OPEN SOURCE SOFTWARE

Lightning Pose Ecosystem

- 2021– **Lightning Pose** (184 stars and 25 forks; a month after release)
A suite of semi-supervised pose estimation networks implemented in PyTorch Lightning. Efficient GPU video loading using NVIDIA-DALI.
<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>

INVITED TALKS

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

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

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. *COSYNE 2023: Computational and Systems Neuroscience* (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	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)