

David Zoltowski

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Education

- 09/2017 – 05/2022
Princeton, NJ **Princeton University**, *Ph.D. in Neuroscience*
Graduate Certificate in Statistics & Machine Learning
Advised by Professor Jonathan Pillow
- 09/2015 - 09/2016
Cambridge, UK **University of Cambridge**, *Master of Philosophy in Engineering*
Advised by Professor Máté Lengyel
- 08/2011 - 05/2015
East Lansing, MI **Michigan State University**, *B.S. in Electrical Engineering*
Concentration in Biomedical Engineering

Postdoctoral Employment

- 07/2022 –
Palo Alto, CA **Stanford University**, *Postdoctoral Fellow in Statistics*
Advised by Scott Linderman and David Sussillo
- 06/2022 - 06/2022
Princeton, NJ **Princeton University**, *Princeton Neuroscience Institute*
One month postdoctoral employment at PhD institution continuing work on projects

Predocutorial Employment and Research Experiences

- 07/2020 - 10/2020
Menlo Park, CA **Facebook Reality Labs**, *Research Intern*
Research intern developing non-invasive, EMG-based neural interfaces
- 09/2016 - 08/2017
Princeton, NJ **Princeton University**, *Research Assistant to Prof. Jonathan Pillow*
Developed latent variable models of neural spike train dynamics during sensory decision-making
- 08/2013 - 05/2015
East Lansing, MI **Michigan State University**, *Undergraduate Research Assistant to Prof. Selin Aviyente*
Used graph-theoretic and tensor decomposition approaches to track and detect change points in time-varying human brain EEG functional connectivity data
- 06/2013 – 08/2013
Minneapolis, MN **University of Minnesota**, *Electrical & Computer Engineering Summer Research Experience for Undergraduates* advised by Prof. Mihailo Jovanović
Devised and implemented a computationally efficient algorithm for the design of sparse and distributed optimal controllers for spatially-invariant systems

Research Interests

- Statistical models of neural dynamics and computation
- Brain-computer interfaces
- Scalable methods for neural data analysis

- Sensory decision-making
- Probabilistic machine learning and approximate inference

Publications

- bioRxiv* 2023 Bukwich, Michael, Malcolm G. Campbell, **David Zoltowski**, Lyle Kingsbury, Momchil S. Tomov, Joshua Stern, HyungGoo R. Kim, Jan Drugowitsch, Scott W. Linderman, and Naoshige Uchida. "Competitive integration of time and reward explains value-sensitive foraging decisions and frontal cortex ramping dynamics." *bioRxiv* (2023).
- bioRxiv* 2022 Orren Karniol-Tambour, **David Zoltowski**, E. Mika Diamanti, Lucas Pinto, David W. Tank, Carlos W. Brody, and Jonathan W. Pillow. "Modeling communication and switching nonlinear dynamics in multi-region neural activity." *bioRxiv* (2022).
- NeurIPS* 2021 **David Zoltowski**, Diana Cai, and Ryan P. Adams. "Slice Sampling Reparameterization Gradients." *Advances in Neural Information Processing Systems* 34 (2021).
- NeurIPS* 2021
Benchmark Track Felix Pei, Joel Ye, **David Zoltowski**, Anqi Wu, Rameed H. Chowdhury, Hansem Sohn, Joseph E. O'Doherty et al. "Neural Latents Benchmark '21: Evaluating latent variable models of neural population activity." In *Thirty-fifth Conference on Neural Information Processing Systems Datasets and Benchmarks Track (Round 2)*. 2021.
- C.O. Neurob.* 2020 Stephen Keeley, **David Zoltowski**, Mikio Aoi, and Jonathan Pillow. "Modeling statistical dependencies in multi-region spike train data." *Current Opinion in Neurobiology* 65 (2020): 194-202.
- ICML* 2020 **David Zoltowski**, Jonathan Pillow, and Scott Linderman. "A general recurrent state space framework for modeling neural dynamics during decision-making." *International Conference on Machine Learning*. PMLR, 2020.
- ICML* 2020 Stephen Keeley, **David Zoltowski**, Yiyi Yu, Spencer Smith, and Jonathan Pillow. "Efficient non-conjugate Gaussian process factor models for spike count data using polynomial approximations." *International Conference on Machine Learning*, pp. 5177-5186. PMLR, 2020.
- Neuron* 2019 **David Zoltowski**, Kenneth Latimer, Jacob Yates, Alexander Huk, and Jonathan Pillow. "Discrete stepping and nonlinear ramping dynamics underlie spiking responses of LIP neurons during decision-making." *Neuron*, 2019.
- NeurIPS* 2018 **David Zoltowski** and Jonathan Pillow. "Scaling the Poisson GLM to massive neural datasets." *32nd Conference on Neural Information Processing Systems (NeurIPS 2018)*.
- IEEE TBME* 2017 Arash Mahyari, **David Zoltowski**, Edward Bernat, and Selin Aviyente. "A tensor decomposition based approach for detecting dynamic network states from EEG." *IEEE Transactions on Biomedical Engineering*, 2017.
- GlobalSIP* 2014 **David Zoltowski** and Selin Aviyente. "Low-rank tensor decomposition based dynamic network tracking." In *2014 IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, pp. 468-472. IEEE, 2014.
- EMBS* 2014 **David Zoltowski**, Edward Bernat, and Selin Aviyente. "A Graph Theoretic Approach to Dynamic Functional Connectivity Tracking and Network State Identification."

Proceedings of the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2014.

ACC 2014 **David Zoltowski**, Neil Dhingra, Fu Lin, and Mihailo Jovanovic. “Sparsity-promoting optimal control of spatially-invariant systems.” *Proceedings of the 2014 American Control Conference*, 2014.

Talks

Asilomar 2023 Asilomar Conference on Signals, Systems, and Computers
Reverse engineering nonlinear dynamics of neural spiking activity

SFN 2022 Society for Neuroscience, Neuronal Mechanisms of Decision Making Nanosymposium
A general framework for modeling neural dynamics during decision-making with extensions to neural populations

Allen Institute 2022 NeuroDataReHack Hackathon
SSM: state space modeling for neural data

Abstracts

Cosyne 2023 **David Zoltowski**, Adam Charles, Jonathan W Pillow, and Stephen Keeley. Improved estimation of latent variable models from calcium imaging data. Cosyne Abstracts 2023, Montreal, Canada.

Cosyne 2023 Orren Karniol-Tambour, E Mika Diamanti, **David Zoltowski**, Lucas Pinto, Carlos Brody, David W Tank, and Jonathan W Pillow. Identifying state-dependent interactions between brain regions during decision making. Cosyne Abstracts 2023, Montreal, Canada.

Cosyne 2022 Orren Karniol-Tambour, **David Zoltowski**, Lucas Pinto, Efthymia Diamanti, David W Tank, Carlos D Brody, and Jonathan Pillow. Modeling multi-region neural communication during decision making with recurrent switching dynamical systems. Cosyne Abstracts 2022, Lisbon, Portugal.

Cosyne 2020 **David Zoltowski**, Jacob Yates, Jonathan Pillow, and Scott Linderman. A framework for unifying and generalizing models of neural dynamics during decision-making. Cosyne Abstracts 2020, Denver, CO, USA.

Cosyne 2019 Ádám Koblinger, **David Zoltowski**, József Fiser, and Máté Lengyel. Noise or signal? Psychophysical evidence for the role of sensory variability. Cosyne Abstracts 2019, Lisbon, Portugal.

Cosyne 2018 **David Zoltowski**, Kenneth Latimer, Alexander Huk, and Jonathan Pillow. Extending models of latent dynamics in area LIP during perceptual decision-making. Cosyne Abstracts 2018, Denver, CO, USA.

SFN 2017 **David Zoltowski**, Kenneth Latimer, Alexander Huk, and Jonathan Pillow. Extending models of latent dynamics in area LIP during perceptual decision-making. Washington, DC: Society for Neuroscience, 2017. Online.

SFN 2016

David Zoltowski, Ádám Koblinger, József Fiser, and Máté Lengyel. The role of time in perceptual decision-making. Program No. 267.11. 2016 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2016. Online.

Honors and Awards

2023	Wu Tsai Interdisciplinary Scholar
2018-20	Appointment to NIH T32 Training Grant in Quantitative Neuroscience (<i>Princeton</i>)
2018	McDonnell Fellows in Neuroscience (<i>Princeton University</i>)
2015-16	Churchill Scholarship
2015	MSU Board of Trustees' Award (<i>top graduating GPA at MSU</i>)
2015	Tau Beta Pi Laureate Award (<i>one of five awarded in USA</i>)
2015	Capital-One NCAA Academic All-American, Second Team
2014	Goldwater Scholarship
2014	Tau Beta Pi, Engineering Honor Society
2013	Eta Kappa Nu, IEEE Student Honor Society

Academic Service

2023	Reviewer for <i>NeurIPS 2023</i>
2022	Reviewer for <i>NeurIPS 2022</i> , <i>ICML 2022</i> (top 10% of reviewers)
2021	Reviewer for <i>AISTATS 2021</i> , <i>Cosyne 2022</i>
2019	Reviewer for <i>AISTATS 2020</i> , <i>NeurIPS 2019</i> (top 400 reviewer)

Teaching

2019	From Molecules to Systems to Behavior (NEU 502A, Princeton), Assistant in Instruction
2018	Mathematical Tools for Neuroscience (NEU 314, Princeton), Assistant in Instruction

Other Education

June 2018	Machine Learning Summer School (MLSS). Buenos Aires, Argentina.
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Software

slicereparam	JAX implementation of slice sampling reparameterization gradients
SSMDM	A recurrent state-space framework for modeling neural activity during decision-making
SSM (contributor)	Contributed variational Laplace EM inference to state-space modeling package
paGLM	Fast approximate inference for Poisson GLMs