John P. Cunningham — Academic Curriculum Vitae (2021/07/07)

Contact Information

email: jpc2181@columbia.edu
web: http://stat.columbia.edu/∼cunningham
post: Columbia University
Department of Statistics
Room 1007 SSW, MC 4690
1255 Amsterdam Ave
New York, NY 10027, USA

Research

Statistical machine learning and computational neuroscience

Academic Experience

Columbia University, New York, NY, USA, 2013-present

Associate Professor (tenured), Department of Statistics, 2019-present
Associate Professor (pre-tenure), Department of Statistics, 2017-2019
Assistant Professor, Department of Statistics, 2013-2017
Member: Data Science Institute, Grossman Center for the Statistics of Mind, Zuckerman Mind Brain Behavior, Neurobiology and Behavior Program, Center for Theoretical Neuroscience, NeuroTechnology Center

Washington University, St. Louis, MO, USA, 2012-2013

Assistant Professor, Department of Biomedical Engineering
Assistant Professor (by courtesy), Department of Computer Science

University of Cambridge, Cambridge, UK, 2010-2012

Postdoctoral Research Associate, Department of Engineering
Research Fellow, Christ's College, University of Cambridge
Advisors: Zoubin Ghahramani and Carl Rasmussen

Stanford University, Stanford, CA, USA, 2004-2009

Postdoctoral Fellow, Electrical Engineering, 2009
Ph.D., Electrical Engineering, 2004-2009
M.S., Electrical Engineering, 2004-2006
Advisor: Krishna Shenoy
Ph.D. Dissertation title: "Algorithms for understanding motor cortical processing and neural prosthetic systems

Dartmouth College, Hanover, NH, USA, 1998-2002

A.B., Computer Science

Honors and Awards

- Columbia University A&S Faculty Distinction, 2017
- McKnight Foundation Scholar, 2016-2019
- Honorable Mention, Columbia University President's Teaching Award, 2016
- Sloan Research Fellow, 2015-2017
- Sackler Foundation Research Fellow, Christ's College, Cambridge, 2010-2013
- 8th place (of 160) in the Stanford E.E. Ph.D. Qualifying Exams, 2006
- Rufus Choate Scholar, Dartmouth College, 2002
- Phi Beta Kappa, 2002-present

Publications

Note: all publications have authors listed in the order as published. Authorship convention in the field: lead senior author is listed last; lead junior author is listed first (and second, when asterisks denote joint lead authorship).

[100] G Pleiss and JP Cunningham (2021) "The Limitations of Large Width in Neural Networks: A Deep Gaussian Process Perspective" In Review.

[99] J Wenger, G Pleiss, P Hennig, JP Cunningham, JR Gardner (2021) "Reducing the Variance of Gaussian Process Hyperparameter Optimization with Preconditioning" In Review.

[98] Y Wang, D Blei, JP Cunningham (2021) "Posterior Collapse and Latent Variable Non-identifiability" AABI 2021 Workshop, also In Review.

[97] A Caterini*, G Loaiza-Ganem*, G Pleiss, JP Cunningham (2021) "Rectangular Flows for Manifold Learning" ICML INNF 2021 Workshop, also In Review.

[96] AC Miller, L Anderson, B Leistedt, JP Cunningham, D Hogg, DM Blei (2021) "Mapping Interstellar Dust with Gaussian Processes" In Review.

[95] MR Whiteway, D Biderman, Y Friedman, M Dipoppa, EK Buchanan, A Wu, J Zhou, JP Noel, International Brain Laboratory, JP Cunningham, L Paninski (2021) "Partitioning variability in animal behavioral videos using semi-supervised variational autoencoders" In Review.

[94] J Loper, D Blei, JP Cunningham, L Paninski (2021) "A general linear-time inference method for Gaussian Processes on one dimension" Journal of Machine Learning Research (22) 1-31.

[93] R Shad, JP Cunningham, EA Ashley, CP Langlotz, W Hiesinger (2021) "Designing clinically translatable artificial intelligence systems for high dimensional medical imaging" Nature Machine Intelligence.

[92] E Gordon-Rodriguez, TP Quinn, JP Cunningham (2021) "Learning Sparse Log-Ratios for High-Throughput Sequencing Data" Bioinformatics.

[91] W Hiesinger, R Shad, N Quach, R Fong, P Kasinpila, C Bowles, M Castro, A Guha, E Suarez, S Jovinge, S Lee, T Boeve, M Amsallem, X Tang, F Haddad, Y Shudo, YJ Woo, J Teuteberg, JP Cunningham, C Langlotz (2021) "Predicting post-operative right ventricular failure using video-based deep learning" Nature Communications.

[90] SR Bittner, A Palmigiano, AT Piet, CA Duan, CD Brody, KD Miller, JP Cunningham (2021) "Interrogating theoretical models of neural computation with emergent property inference" Elife.

[89] A Potapczynski*, L Wu*, D Biderman*, G Pleiss, JP Cunningham (2021) "Bias-Free Scalable Gaussian Processes via Randomized Truncations" ICML 2021.

[88] L Wu*, A Miller*, L Anderson, G Pleiss, D Blei, JP Cunningham (2021) "Hierarchical Inducing Point Gaussian Process for Inter-domain Observations" AISTATS 2021.

[87] J Couto, S Musall, XR Sun, A Khanal, S Gluf, S Saxena, I Kinsella, T Abe, JP Cunningham, L Paninski, AK Churchland (2021) "Chronic, cortex-wide imaging of specific cell populations during behavior" Nature Protocols.

[86] T Abe, I Kinsella, S Saxena, EK Buchanan, J Couto, J Briggs, S Lee Kitt, R Glassman, J Zhou, L Paninski, JP Cunningham (2021) "Neuroscience Cloud Analysis as a Service" In Review.

[85] D Biderman, CA Naesseth, L Wu, T Abe, AC Mosberger, LJ Sibener, R Costa, J Murray, JP Cunningham (2020) "Inverse articulated-body dynamics from video via variational sequential Monte Carlo." NeurIPS 2020 Workshop on Differentiable Vision, Graphics, and Physics.

[84] E Gordon-Rodriguez, G Loaiza-Ganem, JP Cunningham (2020) "The continuous categorical: a novel simplex-valued exponential family." ICML 2020.

[83] Potapczynski A, Loaiza-Ganem G, Cunningham JP (2020) "Invertible Gaussian Reparameterization: Revisiting the Gumbel-Softmax." NeurIPS 2020.

[82] Wu A, Buchanan EK, Whiteway M, Schartner M, Meiher G, Noel JP, Everett C, Norovich C, Schaffer E, Mishra N, Salzman CD, Angelaki D, Bendesky A, The International Brain Laboratory, Cunningham JP, Paninski L (2020) "Deep Graph Pose: a semi-supervised deep graphical model for improved animal pose tracking." NeurIPS 2020.

[81] Glaser J, Whiteway M, Cunningham JP, Paninski L, Linderman S (2020) "Recurrent Switching Dynamical Systems Models for Multiple Interacting Neural Populations" NeurIPS 2020.

[80] AA Russo, R Khajeh, SR Bittner, SM Perkins, JP Cunningham, LF Abbott, MM Churchland (2020) "Neural Trajectories in the Supplementary Motor Area and Motor Cortex Exhibit Distinct Geometries, Compatible with Different Classes of Computation" Neuron 107(4) 745-758.

[79] S Saxena, I Kinsella, S Musall, SH Kim, J Meszaros, DN Thibodeaux, C Kim, JP Cunningham, EMC Hillman, AK Churchland, L Paninski (2020) "Localized semi-nonnegative matrix factorization (LocaNMF) of widefield calcium imaging data" PLOS Computational Biology 16 (4), e1007791.

[78] F Najafi, GF Elsayed, R Cao, E Pnevmatikakis, PE Latham, JP Cunningham, AK Churchland (2020) "Excitatory and inhibitory subnetworks are equally selective during decision-making and emerge simultaneously during learning" Neuron 105 (1), 165-179.

[77] A Vehtari, A Gelman, T Sivula, P Jylanki, D Tran, S Sahai, P Blomstedt, JP Cunningham, D Schiminovich, CP Robert (2020) "Expectation Propagation as a Way of Life: A Framework for Bayesian Inference on Partitioned Data" Journal of Machine Learning Research 21 (17), 1-53.

[76] DL Kimmel, GF Elsayed, JP Cunningham, WT Newsome (2020) "Value and choice as separable, stable representations in orbitofrontal cortex" Nature Communications, 11:3466.

[75] Loaiza-Ganem G and Cunningham JP (2019) "The continuous Bernoulli: fixing a pervasive error in variational autoencoders." NeurIPS 2019.

[74] Loaiza-Ganem G, Perkins S, Schroeder K, Churchland MM, Cunningham JP (2019) "Deep random splines for point process intensity estimation of neural population data." NeurIPS 2019.

[73] Fu Y and Cunningham JP (2019) "Paraphrase generation with latent bag of words." NeurIPS 2019.

[72] Batty E, Whiteway M, Saxena S, Biderman D, Abe T, Musall S, Gillis W, Markowitz J, Churchland A, Cunningham JP, Datta SR, Linderman S, Paninski L (2019) "BehaveNet: nonlinear embedding and Bayesian neural decoding of behavioral videos." NeurIPS 2019.

[71] Miller AC, Obermeyer Z, Cunningham JP, Mullainathan S (2019) "Discriminative Regularization for Latent Variable Models with Applications to Electrocardiography" ICML 2019.

[70] Loaiza-Ganem G and Cunningham JP (2019) "Deep Random Splines for Point Process Intensity Estimation." ICLR DeepGenStruct Workshop.

[69] Bittner S and Cunningham JP (2019) "Approximating exponential family models (not single distributions) with a two-network architecture." ICML Workshop on Invertible Networks and Normalizing Flows.

[68] Saxena S and Cunningham JP (2019) "Towards the Neural Population Doctrine." Current Opinions in Neurobiology, 55:103-111.

[67] Tran G, Bonilla EV, Cunningham JP, Michiardi P, Fillippone M (2019) "Calibrating Deep Convolutional Gaussian Processes." AISTATS 2019.

[66] Miller AC, Obermeyer Z, Blei DM, Cunningham JP, Mullainathan S (2018) "A Probabilistic Model of Cardiac Physiology and Electrocardiograms." NeurIPS ML4Health Workshop.

[65] Lara AH, Elsayed GF, Cunningham JP, Churchland MM (2018) "Conservation of preparatory neural events in monkey motor cortex regardless of how movement is initiated." eLife. 7:e31826.

[64] Paninski L and Cunningham JP (2018) "Neural data science: accelerating the experiment-analysis-theory cycle in large-scale neuroscience." Current Opinions in Neurobiology. 50:232-241

[63] Lara AH, Cunningham JP, Churchland MM (2018) "Dissimilar population dynamics between the supplementary motor area and motor cortex." Nature Communications. 9:2754.

[62] Russo AA, Bittner SR, Perkins SM, Seely JS, London BM, Lara AH, Miri A, Marshall NJ, Kohn A, Jessell TM, Abbott LF, Cunningham JP, Churchland MM (2018) "Motor cortex embeds muscle-like commands in an untangled population response" Neuron. 97: 953-966.

[61] Linderman S*, Mena G*, Cooper H, Paninski L, Cunningham JP (2018) "Reparameterizing the Birkhoff Polytope for Permutation Variational Inference" AISTATS 2018.

[60] Hernandez D, Khalil-Moretti A, Wei Z, Saxena S, Cunningham JP, Paninski L (2018) "A Novel Variational Family for Hidden Nonlinear Markov Models." arXiv 1811.02459.

[59] Elsayed GF and Cunningham JP (2017) "Structure in neural population recordings: an expected byproduct of simpler phenomena?" Nature Neuroscience. 20:1310-1318.

[58] Mena G, Grosberg L, Madugula S, Hottowy P, Litke A, Cunningham JP, Paninksi L, Chichilnisky EJ (2017) "Large-scale separation of neural spikes from electrical stimulation artifacts" PLOS Computational Biology 13(11): e1005842.

[57] Mandt S, Wenzel F, Nakajima S, Cunningham JP, Lippert C, Kloft M (2017) "Sparse probit linear mixed model" Machine Learning. vol 106 (9-10).

[56] Miri A, Warriner CL, Seely JS, Elsayed GF, Cunningham JP, Churchland MM, Jessell TM (2017) "Behaviorally selective engagement of short-latency effector pathways by motor cortex" Neuron. 95:683-696.

[55] Loaiza-Ganem G*, Gao Y*, Cunningham JP (2017) "Maximum Entropy Flow Networks." ICLR 2017.

[54] Fagan F, Bhandari J, Cunningham JP (2017) "Annular Augmentation Sampling." AISTATS 2017.

[53] Buesing L, Calabrese A, Cunningham JP, Woolley S, Paninski L (2017) "A Statistical Model of Shared Variability in the Songbird Auditory System." Technical Report, biorXiv.

[52] Gao Y*, Archer E*, Paninski L, Cunningham JP (2016) "Linear dynamical neural population models through nonlinear embeddings." NIPS 2016.

[51] Elsayed GF*, Lara AH*, Churchland MM, Cunningham JP (2016) "Reorganization between preparatory and movement population responses in motor cortex." Nature Communications. 7:13239.

[50] Sumbul U, Roossien D, Chen F, Barry N, Boyden ES, Cai D, Cunningham JP, Paninski L (2016) "Automated scalable segmentation of neurons from multispectral images." NIPS 2016.

[49] Seely JS, Kaufman MT, Ryu SI, Shenoy KV, Cunningham JP, Churchland MM (2016) "Tensor Analysis Reveals Distinct Population Structure that Parallels the Different Computational Roles of Areas M1 and V1." PLOS Computational Biology. 12(11): e1005164.

[48] Bloem-Reddy B, Cunningham JP (2016) "Slice sampling on Hamiltonian trajectories." ICML 2016.

[47] Cutajar K, Osborne MA, Cunningham JP, Filippone M (2016) "Preconditioning kernel matrices." ICML 2016.

[46] Merel J, Carlson D, Paninski L, Cunningham JP (2016) "Neuroprosthetic decoder training as imitation learning." PLOS Computational Biology. 12(5): e1004948.

[45] Fagan F, Bhandari J, Cunningham JP (2016) "Elliptical slice sampling with expectation propagation." UAI 2016.

[44] Flaxman S, Sejdinovic D, Cunningham JP, Fillipi S (2016) "Bayesian learning of kernel embeddings." UAI 2016.

[43] Gao Y, Buesing L, Shenoy KV, Cunningham JP (2015) High-dimensional neural spike train analysis with generalized count linear dynamical systems. NIPS 2015.

[42] Gardner JR, Malkomes G, Garnett R, Weinberger K, Barbour DL, Cunningham JP (2015) Bayesian Active Model Selection with an Application to Automated Audiometry. NIPS 2015.

[41] Cunningham JP, Ghahramani Z (2015) Linear dimensionality reduction: survey, insights, and generalizations. Journal of Machine Learning Research.

[40] Gardner JR, Song XD, Barbour DL, Weinberger KQ, Cunningham JP (2015) Psychophysical testing with Bayesian active learning. UAI 2015.

[39] Merel J, Pianto DM, Cunningham JP, Paninski L (2015) Encoder-decoder optimization for brain-computer interfaces. PLOS Computational Biology. 11(6): e1004288.

[38] Mandt S, Wenzel F, Nakajima S, Cunningham JP, Lippert C, Kloft M (2015) "Sparse Estimation in a Correlated Probit Model." Technical Report, arXiv.

[37] Archer E, Park M, Buesing L, Cunningham, JP, Paninski L (2015) Black-box variational inference for state-space models. International Conference on Learning Representations (ICLR) 2016, Workshops.

[36] Kao JC, Nuyujukian P, Ryu SI, Churchland MM, Cunningham JP, Shenoy KV (2015) Incorporating neural population dynamics increases brain-machine interface performance. Nature Communications. 6:7759.

[35] Churchland MM, Cunningham JP (2015) A dynamical basis set for generating reaches. Cold Spring Harbor Laboratory Press. doi: 10.1101/sqb.2014.79.024703. vol LXXIX.

[34] Gilboa E, Saatci Y, Cunningham JP (2015) Scaling multidimensional inference for structured Gaussian Processes. IEEE Transactions on Pattern Analysis and Machine Intelligence. 37:424-436.

[33] Cunningham JP (2014) Analyzing neural data at huge scale. Nature Methods. 11:911-912.

[32] Cunningham JP, Yu BM (2014) Dimensionality reduction for large-scale neural recordings. Nature Neuroscience. 17:1500-1509.

[31] Buesing L, Machado T, Cunningham JP, Paninski L (2014) Clustered factor analysis of multineuronal spike data. NIPS 2014.

[30] Wilson AG*, Gilboa E*, Nehorai A, Cunningham JP (2014) Fast kernel learning for multidimensional pattern extrapolation. NIPS 2014.

[29] Gilboa E, Cunningham JP, Nehorai A, Gruev V (2014) Image interpolation and denoising for division of focal plane sensors using Gaussian Processes. Optics Express. 22:15277-15291.

[28] Gardner JR, Kusner MJ, Xu Z, Weinberger KQ, Cunningham JP (2014) Bayesian optimization with inequality constraints. ICML 2014: JMLR W+CP.

[27] Gilboa E, Saatci Y, Cunningham JP (2013) Scaling multidimensional Gaussian Processes using projected additive approximations. ICML 2013: JMLR W+CP.

[26] Leuthardt EC, Cunningham JP, Barbour D (2013) Towards a Speech BCI Using ECoG. In Brain-computer Interface Research: Springer, pp93-100. ISBN: 978-3-642-36082-4.

[25] Churchland MM*, Cunningham JP*, Kaufman MT, Foster JD, Nuyujukian P, Ryu SI, Shenoy KV (2012) Neural population dynamics during reaching. Nature, 487: 51-56.

[24] Gilja V, Nuyujukian P, Chestek CA, Cunningham JP, Fan JM, Yu BM, Ryu SI, Shenoy KV (2012) A high-performance continuous cortically-controlled prosthesis enabled by feedback control design. Nature Neuroscience, 15: 1752-1758.

[23] Cunningham JP, Rasmussen CE, Ghahramani Z (2012) Gaussian Processes for time-marked time-series data. AISTATS 2012: JMLR W+CP.

[22] Zhao M, Batista AP, Cunningham JP, Chestek CA, Rivera-Alvidrez Z, Kalmar R, Ryu SI, Shenoy KV, Iyengar S (2012) An L1-regularized logistic model for detecting short-term neuronal interactions. J Computational Neuroscience. 32(3):479-97. PMID: 22038503

[21] Macke JH, Busing L, Cunningham JP, Yu BM, Shenoy KV, Sahani M (2012) Empirical models of spiking in neural populations. NIPS 2012.

[20] Petreska B, Yu BM, Cunningham JP, Santhanam G, Ryu SI, Shenoy KV, Sahani M (2012) Dynamical Segmentation of single trials from population neural data. NIPS 2012.

[19] Cunningham JP, Nuyujukian P, Gilja V, Chestek CA, Ryu SI, Shenoy KV (2011) A closed-loop human simulator for investigating the role of feedback-control in brain-machine interfaces. Journal of Neurophysiology. 105:1932-1949. PMID: 20943945

[18] Cunningham JP, Hennig P, Lacoste-Julien S (2011) Gaussian probabilities and expectation propagation. Technical Report, arXiv.

[17] Chestek CA, Gilja V, Nuyujukian P, Foster JD, Fan JM, Kaufman MT, Churchland MM, Rivera-Alvidrez Z, Cunningham JP, Ryu SI, Shenoy KV (2011) Long-term stability of neural prosthetic control signals from silicon cortical arrays in rhesus macaque motor cortex. Journal of Neural Engineering. 8:045005.

[16] Churchland MM, Cunningham JP, Kaufman MT, Ryu SI, Shenoy KV (2010) Cortical preparatory activity: Representation of movement or first cog in a dynamical machine? Neuron. 68:387-400.

[15] Churchland MM*, Yu BM*, Cunningham JP, Sugrue LP, Cohen MR, Corrado GS, Newsome WT, Clark AM, Hosseini P, Scott BB, Bradley DC, Smith MA, Kohn A, Movshon JA, Armstrong KM, Moore T, Chang SW, Snyder LH, Lisberger SG, Priebe NJ, Finn IM, Ferster D, Ryu SI, Santhanam G, Sahani M, Shenoy KV (2010) Stimulus onset quenches neural variability: a widespread cortical phenomenon. Nature Neuroscience. 13:369-378.

[14] Cunningham JP (2009) Algorithms for understanding motor cortical processing and neural prosthetic systems. Stanford University PhD Thesis.

[13] Chestek CA*, Cunningham JP*, Gilja V, Nuyujukian P, Ryu SI, Shenoy KV (2009) Neural prosthetic systems: Current problems and future directions. IEEE EMBS 2009.

[12] Cunningham JP, Gilja V, Ryu SI, Shenoy KV (2009) Methods for estimating neural firing rates and their application to brain-machine interfaces. Neural Networks, 22:1235-1246.

[11] Chang C, Cunningham JP, Glover GH (2009) Influence of heart rate on the BOLD signal: The cardiac response function. Neuroimage, 44:857-869.

[10] Yu BM, Cunningham JP, Santhanam G, Ryu SI, Shenoy KV, Sahani M (2009) Gaussian-process factor analysis for low-dimensional single-trial analysis of neural population activity. NIPS 2009.

[9] Yu BM, Cunningham JP, Santhanam G, Ryu SI, Shenoy KV*, Sahani M* (2009) Gaussian-process factor analysis for low-dimensional single-trial analysis of neural population activity. Journal of Neurophysiology, 102:614-635.

[8] Cunningham JP, Yu BM, Gilja V, Ryu SI, Shenoy KV (2008) Toward optimal target placement for neural prosthetic devices. Journal of Neurophysiology. 100:3445-3457.

[7] Cunningham JP, Sahani M, Shenoy KV (2008) Fast gaussian process methods for point process intensity estimation. ICML 2008.

[6] Cunningham JP (2008) Derivation of Expectation Propagation for "Fast Gaussian process methods for point process intensity estimation". Technical Report.

[5] Cunningham JP, Yu BM, Shenoy KV, Sahani M (2008) Inferring neural firing rates from spike trains using Gaussian Processes. NIPS 2008.

[4] Chestek CA*, Batista AP*, Santhanam G, Yu BM, Afshar A, Cunningham JP, Gilja V, Ryu SI, Churchland MM, Shenoy KV (2007) Single-neuron stability during repeated reaching in macaque premotor cortex. Journal of Neuroscience. 27:10742-10750.

[3] Yu BM, Cunningham JP, Shenoy KV, Sahani M (2007) Neural decoding of movements: From linear to nonlinear trajectory models. Neural Information Processing, M. Ishikawa et al. (Eds.): ICONIP 2007, Part I, LNCS. Springer-Verlag Berlin Heidelberg. ISBN 978-3-540-69154-9. 4984:586-595.

[2] Cunningham JP, Yu BM, Shenoy KV (2006) Optimal target placement for neural communication prostheses. IEEE EMBS.

[1] Shenoy KV, Santhanam G, Ryu SI, Afshar A, Yu BM, Gilja V, Linderman MD, Kalmar RS, Cunningham JP, Kemere CT, Batista AP, Churchland MM, Meng TH (2006) Increasing the performance of cortically-controlled prostheses. IEEE EMBS.

Professional Service

- Editorial Board: Journal of Machine Learning Research, 2020-
- Organizing Committee: ICML (2016 and 2017 finance co-chair; 2019 and 2020 diversity co-chair)
- Conference Program Committee: NIPS, ICML
- Study Section/Grant Reviewer: NSF (2015, 2018), NIH (2016), EC FP7 (2012), Chan Zuckerberg (2019)
- Journal Reviewer: Nature Methods, Nature Neuroscience, IEEE PAMI, ICML, NIPS, ICLR, J Neurosci, J Neurophysiol, PLOS CB, IEEE TNSRE, Network, J Comp Neurosci, J Neural Eng
- Co-author: American Statistical Association working group letter re: the NIH BRAIN Initiative, "Statistical Research and Training Under the BRAIN Initiative".

- Workshop Co-organizer: "Automated Analyses of Behavior and High-Dimensional Neurobehavioral Analysis" (COSYNE 2017), "Probabilistic Numerics" (NIPS 2012), "Numerical Mathematics in Machine Learning," (ICML 2009), "Dimensionality reduction for multi-channel neural recordings" (COSYNE 2009).
- Invited Instructor, "Gaussian Processes for Machine Learning", Machine Learning Summer School (MLSS), 2012

University Service

- 2020- Data Science Institute Executive Committee
- 2020- Statistics Promotion and Tenure Committee
- 2019- Statistics High Performance Computing Center Committee
- 2018-2019 Faculty Search Committee: Statistics
- 2017-2018 Faculty Search Committee: joint search in Statistics and Neuroscience
- 2016-2017 Ph.D. Program Admissions Committee in Department of Statistics
- 2016 Co-organized annual Grossman Center for Statistics of Mind Workshop "Quantifying Structure in Large Neural Datasets"
- 2016 "NSF Career Award" Panel membership, sponsored by the Research Office
- 2015 Speaker at "Brain Trust" meeting to University President, trustees, and key administrative leadership
- 2015 Speaker at University "Brain Series" event; public outreach and alumni/donor stewardship on the Brain and Data Sciences
- 2015 Columbia Data Science Society Hackathon judge
- 2014 Co-organized annual Grossman Center for Statistics of Mind Workshop "Quantifying Structure in Large Neural Datasets"
- 2013 Co-organized annual Grossman Center for Statistics of Mind Workshop "Quantifying Structure in Large Neural Datasets"

Research Support

[10] **Computational and circuit mechanisms underlying motor control**
Total award: $15,251,000
Funding agency: NIH NINDS (National Inst of Neurological Disorder and Stroke)
Award #: 1U19NS104649
Award period: 9/25/17 - 7/31/22
Lead PIs: R. Costa, T. Jessell
Co-Is: L. Abbott, R. Bose, R. Bruno, M. Churchland, J. Cunningham, S. Escola, E. Hillman, A. Mueller, L. Paninski, D. Peterka, N. Sawtell, T. Tabachnik, T. Zheng, J. Caremena

[9] **Understanding the computational structure of neural populations**
Total award: $1,000,000
Funding agency: Simons Foundation
Award #: 542963
Award period: 7/1/17 - 6/30/22
PI: J. Cunningham

[8] **NeuroNex Theory Team: Columbia University Theoretical Neuroscience Center**
Total award: $7,600,000
Funding agency: NSF
Award #: DBI- 1707398
Award period: 8/1/17 - 7/31/22
Lead PI: L. Abbott
Co-Is: J. Cunningham, S. Fusi, K. Miller, L. Paninski

[7] **McKnight Endowment Fund for Neuroscience: McKnight Scholar Award**
Total award: $225,000
Funding agency: McKnight Foundation
Award #: N/A
Award period: 7/1/16 - 6/30/19
PI: J. Cunningham

[6] **Understanding flexible neural computations in the motor cortex**
Total award: $937,400
Funding agency: NIH NINDS (National Inst of Neurological Disorder and Stroke)
Award #: 5R01NS100066
Award period: 8/1/16 - 7/31/19
PI: J. Cunningham
Co-PI: M. Churchland

[5] **Alfred P. Sloan Fellowship**
Total award: $50,000
Funding agency: Alfred P. Sloan Foundation
Award #: FG-2015-65496
Award period: 9/15/15 - 9/14/17 PI: J. Cunningham

[4] **Spatiotemporal structure of neural population dynamics in the motor system**
Total award: $600,000
Funding agency: Simons Foundation
Award #: 325233
Award period: 7/1/14 - 6/30/18 (NCE)
Lead PI: J. Cunningham
Co-Is: L. Abbott, M. Churchland, L. Paninski

[3] **Understanding neural computations across the global brain**
Total award: $360,000
Funding agency: Simons Foundation
Award #: 325171
Award period: 7/1/14 - 6/30/18 (NCE)
PI: M. Ahrens
Co-PIs: L. Abbott, J. Cunningham, J. Freeman, L. Paninski

[2] **Advanced algorithms for neural prosthetic systems**
Total award: £407,559
Funding agency: UK EPSRC (Engineering and Physical Sciences Research Council)
Award #: EP/H019472/1
Award period: 1/1/10 - 6/30/2013
PI: Z. Ghahramani
Co-Is: C. Rasmussen, J. Cunningham

[1] **Michael Flynn Stanford Graduate Fellowship**
Total award: 5 years of Ph.D. support
Award #: N/A
Award period: 9/1/2004-9/1/2009.

Teaching Experience

[23] 2020 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 002)

[22] 2020 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 001)

[21] 2019 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 002)

[20] 2019 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 001)

[19] 2019 Spring: Deep Generative Models; Columbia (STAT GR8201, grad)

[18] 2018 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 002)

[17] 2018 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 001)

[16] 2017 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 002)

[15] 2017 Fall: Advanced Machine Learning; Columbia (STAT GR5242, grad, Section 001)

[14] 2016 Fall: Introduction to Probability and Statistics with Calculus; Columbia (STAT UN1201, undergrad, Section 003)

[13] 2016 Fall: Introduction to Probability and Statistics with Calculus; Columbia (STAT UN1201, undergrad, Section 001)

[12] 2016 Spring: Statistical Machine Learning; Columbia (STAT W4400, grad)

[11] 2015 Fall: Gaussian Processes and Kernel Methods; Columbia (STAT G8325, grad)

[10] 2015 Fall: Statistical Machine Learning; Columbia (STAT W4400, grad)

[9] 2015 Spring: Statistical Machine Learning; Columbia (STAT W4400, grad)

[8] 2014 Fall: Statistical Machine Learning; Columbia (STAT W4400, grad)

[7] 2014 Fall: Probability and Statistics; Columbia (STAT W4700, grad)

[6] 2014 Spring: Data Mining; Columbia (STAT W4240, grad)

[5] 2013 Fall: Probability and Statistics; Columbia (STAT W4700, grad)

[4] 2011 Easter Term: Probability; Cambridge (Eng Maths IB, undergrad)

[3] 2011 Lent Term: Linear Algebra; Cambridge (Eng Maths IB, undergrad)

[2] 2011 Michaelmas Term: Vector Calculus; Cambridge (Eng Maths IB, undergrad)

[1] 2007-2009: Math/Physics; Foundation for a College Ed. (Tutor, high school)

Student Advising

[19] 2020-Present: L. Wu, Ph.D. student, Statistics (primary advisor)

[18] 2019-Present: D. Biderman, Ph.D. student, Neuroscience (primary advisor)

[17] 2019-Present: E. Gordon-Rodriguez, Ph.D. student, Statistics (primary advisor)

[16] 2019-2021: A. Potapczynski, M.S. student, Data Science (project supervisor)

[15] 2019: Y. Fu, M.S. student, Computer Science (project supervisor)

[14] 2018-2020: A. Dimitrienko, Undergraduate, Statistics (project supervisor)

[13] 2018-Present: K. Buchanan, Ph.D. student, Neuroscience (project supervisor)

[12] 2018-Present: T. Abe, Ph.D. student, Neuroscience (primary advisor)

[11] 2017-2021: S. Bittner, Ph.D. student, Neuroscience (primary advisor)

[10] 2016-2019: G. Loaiza-Ganem, Ph.D. student, Statistics (primary advisor)

[9] 2017-2017: T. Wang, M.S. student, Computer Science (project supervisor)

[8] 2014-2017: Y. Gao, Ph.D., Statistics (primary advisor)

[7] 2013-2017: G.F. Elsayed, Ph.D., Neuroscience (primary advisor)

[6] 2015-2016: J. Bhandari, Ph.D. student, IEOR (project supervisor)

[5] 2015-2016: F. Fagan, Ph.D. student, IEOR (project supervisor)

[4] 2015-2016: B. Bloem-Reddy, Ph.D. student, Statistics (project supervisor)

[3] 2016: S.K. Lee, M.S. student, Computer Science (project supervisor)

[2] 2015: R. Sun, M.S. student, Statistics (project supervisor)

[1] 2015: X. Ren, M.S. student, Statistics (project supervisor)

Postdoctoral Advising

[11] 2020-Present: G. Pleiss, postdoc, Statistics

[10] 2018-2021: A. Wu, postdoc (co-advised with L. Paninski), MBBI

[9] 2018-2019: A. Miller, postdoc (co-advised with D. Blei), DSI

[8] 2018-Present: K. Kay, postdoc (co-advised with L. Paninski), MBBI

[7] 2017-Present: J. Glaser, postdoc (co-advised with L. Paninski), MBBI

[6] 2017-2020: S. Saxena, postdoc (co-advised with L. Paninski), Statistics

[5] 2016-2019: D. Hernandez-Diaz, postdoc (co-advised with L. Paninski), Statistics

[4] 2014-2017: J. Friedrich, postdoc (co-advised with L. Paninski), Statistics

[3] 2014-2016: E. Archer, postdoc (co-advised with L. Paninski), Statistics

[2] 2014-2017: U. Sumbul, postdoc (co-advised with L. Paninski), Statistics

[1] 2013-2015: L. Buesing, postdoc (co-advised with L. Paninski), Statistics

Thesis Committee Membership (partial list)

[26] D. Zhou, Statistics (reader)

[25] A. Djieng, Computer Science (reader)

[24] E. Batty, Neuroscience (reader)

[23] D. Biderman, Neuroscience (primary advisor)

[22] Y. Wang, Statistics (reader)

[21] S.R. Bittner, Neuroscience (primary advisor)

[20] G. Laoiza-Ganem, Statistics (primary advisor)

[19] Y. Gao, Statistics (primary advisor)

[18] G. Elsayed, Neuroscience (primary advisor)

[17] J. Wu, Statistics (reader)

[16] R. Sun, Biology (reader)

[15] F. Fagan, IEOR (reader)

[14] A. Zhang, Computer Science (reader)

[13] E. Cheng, Statistics (reader)

[12] J.P. Lee, Statistics (reader)

[11] A. Zimnik, Neuroscience (reader)

[10] G. Mena, Statistics (reader)

[9] S. Sahai, Statistics (reader)

[8] B. Bloem-Reddy, Statistics (reader)

[7] W. Wang, Statistics (reader)

[6] A. Dieng, Statistics (reader)

[5] J. Seely, Neuroscience (reader)

[4] A. Russo, Neuroscience (reader)

[3] P. Stinson, Neuroscience (reader)

[2] J. Merel, Neuroscience (reader)

[1] B. dePasquale, Neuroscience (reader)

Select Invited Talks

[40] "Interrogating theoretical models of neural computation with deep generative models" Duke CTN Invited Seminar, Durham, NC, Apr. 15, 2021.

[39] "Interrogating theoretical models of neural computation with deep generative models." COSYNE Invited talk, Denver, CO, Feb. 28, 2020.

[38] "Inference in theoretical models of cognition." Grossman/University of Chicago Meeting, Aspen, CO, Oct. 07, 2019.

[37] "Learning to trust neural populations." McKnight Foundation Annual Meeting, Aspen, CO, Jun. 08, 2019.

[36] "Computational structure in large-scale neural data: how to find it, and when to believe it." Georgia Tech, Atlanta, GA, Feb. 20, 2019.

[35] "Computational structure in large-scale neural data: how to find it, and when to believe it." Houston NeuroNex / Rice University, Houston, TX, Feb. 01, 2019.

[34] "Finding structure in neural populations: from HMMs to deep state space models." Houston NeuroNex / Rice University, Houston, TX, Jan. 31, 2019.

[33] "Expressive and interpretable time series models with modern machine learning." TwoSigma Investments, New York, NY, Jan. 15, 2019.

[32] "Latent statistical structure in large-scale neural data: how to find it, and when to believe it." Princeton CSML/PNI Seminar, Princeton, NJ, USA, Oct. 16, 2018.

[31] "Structure in latent codes of high-dimensional data: a trivial byproduct of simpler phenomena?" Google DeepMind, London, UK, May 24, 2018.

[30] "AI in the Enterprise" Federal Reserve Bank Financial Markets Conference, Amelia Island, FL, May 07, 2018.

[29] "Computational structure in large-scale neural population recordings: how to find it, and when to believe it" University of Pennsylvania Invited Seminar, Philadelphia, PA, Mar. 12, 2018.

[28] "Structure in tensor-variate data: a trivial byproduct of simpler phenomena?" UCL Gatsby Unit, London, UK, Mar. 09, 2018.

[27] "Structure in multi-index tensor data: a trivial byproduct of simpler phenomena?" Oxford Department of Statistics Invited Seminar, Oxford, UK, Mar. 06, 2018.

[26] "Structure in multi-index tensor data: a trivial byproduct of simpler phenomena?" Cambridge Computational and Biological Learning Invited Seminar, Cambridge, UK, Mar. 05, 2018.

[25] "Computational structure in large-scale neural recordings: how to find it, and when to believe it" Stanford Neurosciences Institute, Palo Alto, CA, Feb. 15, 2018.

[24] "Structure in multi-index tensor data: a trivial byproduct of simpler phenomena?" MIT SDSC Seminar, Cambridge, MA, Oct. 19, 2017.

[23] "Structure in multi-index tensor data: a trivial byproduct of simpler phenomena?" CMU Statistics Seminar, Pittsburgh, PA, Sep. 25, 2017.

[22] "Generative modeling with maximum entropy" Google Research, New York, NY, May 31, 2017.

[21] "Structure in multi-index tensor data: a trivial byproduct of simpler phenomena?" Princeton CSML Seminar, Princeton, NJ, USA, Apr. 25, 2017.

[20] "Statistical testing of epiphenomena for multi-index data" Intelligent Systems Colloquium, Max Planck Institute for Intelligent Systems, Tübingen, Germany, Mar. 07, 2017.

[19] "Structure in neural population data: interesting or epiphenomenal?" Simons Foundation, Simons Collaboration on the Global Brain, New York, NY, Sep. 12, 2016.

[18] "Finding and statistically validating hypothesized structure in high-dimensional data." Cubist Systemic Strategies, New York, NY, May 23, 2016.

[17] "Statistical testing for neural population data." Neyman Seminar, Department of Statistics, University of California Berkeley, Berkeley, CA, USA, Feb. 17, 2016.

[16] "Statistical testing for neural population recordings." Keynote Speaker, Institute of Neuroscience, University of Washington, Seattle, WA, USA, Jan. 29, 2016.

[15] "How the brain controls movement: a journey of neural and data science." Zuckerman Institute Brain Trust, New York, NY, USA, Oct. 01, 2015.

[14] "Neuroscience in the data era, data in the neuroscience era." Zuckerman Institute Brain Series, New York, NY, USA, Apr. 22, 2015.

[13] "Correlation structure of movement preparation and execution." Cold Spring Harbor Laboratory, NY, USA, Apr. 21, 2015.

[12] "Hypothesis-guided dimensionality reduction and its application to large-scale neuroscience" Brown University, Division of Applied Mathematics, Providence, RI, USA, Dec. 03, 2014.

[11] "Computation in populations of neurons," Neurosurgery Grand Rounds, Washington University, St. Louis, MO, USA, Apr. 24, 2013.

[10] "Computation in populations of neurons," Electrical Engineering Department Seminar, Stanford University, Stanford, CA, USA, Mar. 05, 2013.

[9] "From single neuron statistics to neural population analyses," Neuroscience Department Seminar, Washington University, St. Louis, MO, USA, Jan. 08, 2013.

[8] "Statistical analyses of populations of neurons," Statistics Department Seminar, Columbia University, NY, NY, USA, Nov. 26, 2012.

[7] "From single neuron statistics to neural population analyses," Neurotheory Center Seminar, Columbia University, NY, NY, USA, Oct. 26, 2012.

[6] "R-100 is a big place," at Swartz/Gatsby/Janelia Dimensionality Reduction Meeting, HHMI/Janelia Farm, VA, USA, Jul. 26, 2012.

[5] "Extracting Rotational Structure from Motor Cortical Data," at Swartz/Gatsby/Janelia Dimensionality Reduction Meeting, HHMI/Janelia Farm, VA, USA, Jul. 25, 2012.

[4] "Extracting Rotational Structure from Motor Cortical Data," at Machine Learning and Neuroscience Meeting, HHMI/Janelia Farm, VA, May 07, 2012.

[3] "Gaussian Processes for machine learning." Machine Learning Summer School 2012, La Palma, Spain, Apr. 18, 2012.

[2] "Single Neuron Thinking (and my hope that we end it by 2025)." at the New York Academy of Sciences, NY, NY, USA. Mar. 11, 2012.

[1] "High performance neural prostheses: understanding and exploiting closed-loop feedback control" British Neuroscience Association Annual Meeting, Harrogate, UK, Apr. 19, 2011.

Selected Other Talks

[50] "Large width is detrimental to neural networks" Columbia University Neurotheory Meeting, New York, NY, May 17, 2021.

[49] "This probability stuff is important: the continuous bernoulli and continuous categorical" Columbia University Neurotheory Meeting, New York, NY, Jun. 15, 2020.

[48] "Free and easy: neural data analysis as it should be" Columbia University ZMBBI, New York, NY, Oct. 10, 2019.

[47] "Generalized-count linear dynamical systems" Columbia University, New York, NY, Sep. 04, 2019.

[46] "Fault-tolerant deep learning: cosmic rays, single event upsets, and things that go bump in the night" Columbia University, New York, NY, Jul. 24, 2019.

[45] "Learning Exponential Families" Columbia University Neurotheory Meeting, New York, NY, Jun. 25, 2018.

[44] "Artificial Intelligence" St. Louis Roundtable, St. Louis, MO, May 29, 2018.

[43] "The wonderland of higher space" Columbia University Statistics/Computer Science Seminar, New York, NY, Dec. 01, 2017.

[42] "Structure in neural population data: interesting or epiphenomenal?" Stanford University, Stanford, CA, Jun. 16, 2016.

[41] "Your brain and high-dimensional data." Columbia University MA Student Seminar Series, New York, NY, Mar. 09, 2016.

[40] "Statistical testing for neural population data, or, are population analyses all a bunch of nonsense?" Computational and Systems Neuroscience (COSYNE) Workshop, Snowbird, UT, USA, Feb. 29, 2016.

[39] "Generalized count linear dynamical systems for single-trial analysis of neural populations." Columbia University Center for Theoretical Neuroscience, New York, NY, USA, Jul. 27, 2015.

[38] "Correlation structure of movement preparation and execution." Gatsby Tri-Center meeting, New York, NY, USA, Jun. 04, 2015.

[37] "Expectation propagation: factorization and entropy approximation." Gaussian Process workshop, Copenhagen, Denmark, May 22, 2015.

[36] "Hypothesis-guided dimensionality reduction and its application to large-scale neuroscience" Columbia University Center for Theoretical Neuroscience, New York, NY, USA, Nov. 24, 2014.

[35] "Your brain and high-dimensional statistics" Columbia University Undergraduate Seminar, New York, NY, USA, Oct. 10, 2014.

[34] "Generic linear dimensionality reduction for high-dimensional neural data," Computational and Systems Neuroscience (COSYNE) Workshop, Snowbird, UT, USA, Mar. 03, 2014.

[33] "The computational structure of neural population responses," Center for Neural Engineering and Computation, Columbia University, New York, NY, USA, Nov. 20, 2013.

[32] "Fast multidimensional pattern extrapolation with Gaussian processes," Department of Statistics Student Seminar, Columbia University, New York, NY, USA, Nov. 13, 2013.

[31] "Model testing with neural populations," Grossman Center workshop on 'Quantifying structure in large neural datasets', Columbia University, New York, NY, USA, Oct. 17, 2013.

[30] "The wonderland of higher space," Math Club, Washington University, St. Louis, MO, USA, Mar. 25, 2013.

[29] "R-100 is a big place," at Swartz/Gatsby/Janelia Dimensionality Reduction Meeting, HHMI/Janelia Farm, VA, USA, Jul. 26, 2012.

[28] "Extracting Rotational Structure from Motor Cortical Data," at Swartz/Gatsby/Janelia Dimensionality Reduction Meeting, HHMI/Janelia Farm, VA, USA, Jul. 25, 2012.

[27] "Extracting Rotational Structure from Motor Cortical Data," at Machine Learning and Neuroscience Meeting, HHMI/Janelia Farm, VA, May 07, 2012.

[26] "Gaussian Processes for machine learning." Machine Learning seminar, Washington University, St. Louis, MO, USA, Apr. 16, 2012.

[25] "Approximate Inference." Machine Learning RCC, Cambridge, UK, Dec. 08, 2011. With David Knowles.

[24] "Nothing that is can pause or stay; The moon will wax, the moon will wane, The mist and cloud will turn to rain, The rain to mist and cloud again, To-morrow be to-day." CBL Tea Talk, Cambridge, UK, Dec. 07, 2011.

[23] "Extracting Rotational Structure from Motor Cortical Data," at Society for Neuroscience, Washington, DC, USA. Nov. 13, 2011.

[22] "What is this that thou hast done? And the [developer] said, 'The serpent beguiled me, and I did eat.'" CBL Tea Talk, Cambridge, UK, Sep. 30, 2011.

[21] "Gaussian Probabilities and Expectation Propagation," CBL Research Talk, Cambridge, UK, Apr. 11, 2011.

[20] "Cortical preparatory activity: representation of movement or first cog in a dynamical machine?" Computational Neuroscience Journal Club, Cambridge, UK, Feb. 01, 2011.

[19] "A closed-loop human simulator for understanding feedback-control and its relevance for brain-machine interfaces," at Society for Neuroscience, San Diego, CA, USA. Nov. 13, 2010.

[18] "The jewel has facets, and it is possible that many [histories] are moderately true... But we are only moderately certain," CBL Tea Talk, Cambridge, UK, Oct. 01, 2010.

[17] "Analysing Time Marked Data," CBL Research Talk, Cambridge, UK, Jul. 19, 2010.

[16] "Numerical Linear Algebra," Machine Learning RCC, Cambridge, UK, Apr. 29, 2010. With Peter Orbanz.

[15] "Gravely the men turn [the matrix] - the wrong [matrix]. But no one knows [Heywood's] name, and no one cares." CBL Tea Talk, Cambridge, UK, Apr. 28, 2010.

[14] "Neural Prosthetic Systems: Past, Present, and Future," CBL Research Talk, Cambridge, UK, Feb. 8, 2010.

[13] "Neural Prosthetic Systems: Current Problems and Future Directions," at IEEE EMBC 2009, Minneapolis, MN, USA. Sep. 4, 2009.

[12] "Numerical Mathematics in Machine Learning," at ICML 2009, Montreal, Quebec, Canada. Jun. 18, 2009. Organized with M. Seeger and S. Sra.

[11] "Algorithms for Understanding Motor Cortical Processing and Neural Prosthetic Systems," Faculty job talk and Ph.D. oral defense talk, given several times throughout 2009.

[10] "Dimensionality reduction for multi-channel neural recordings," at COSYNE 2009, Snowbird, UT, USA. Mar. 3, 2009. Organized with B.M. Yu.

[9] "Toward an Improved Understanding of Motor Cortical Processing," at MIT/MGH, Charlestown, MA, USA. Dec. 15, 2008.

[8] "Decoding arm movements: a framework and suite of approaches," at DARPA prosthetic signal analysis summit, Columbia, MD, USA. Nov. 14, 2008. with C.A. Chestek and V. Gilja.

[7] "Fast Gaussian Process Methods for Point Process Intensity Estimation," at the 25th International Conference on Machine Learning, Helsinki, Finland. Jul. 7, 2008

[6] "Practical Optimization Tricks and Tips," at the Gatsby Computational Neuroscience Unit, University College London, London, UK. Jun. 19, 2008

[5] "Engineering Challenges in Neural Prosthetic Systems," at the Stanford Bioengineering Forum, Stanford, CA, USA. Feb. 26, 2008

[4] "Neural Basis of Reach Preparation and Neural Communication Prostheses," at the Neukom Inst. for Comp. Sci., Dartmouth College, Hanover, NH, USA. Feb. 11, 2008

[3] "Engineering Challenges in Neural Prosthetic Systems," at the Thayer School of Engineering, Dartmouth College, Hanover, NH, USA. Feb. 8, 2008

[2] "Inferring Neural Firing Rates from Spike Trains using Gaussian Processes," Spotlight Presentation at Neural Information Processing Systems 20 (NIPS 20), Vancouver, BC, CA. Dec. 5, 2007

[1] "Inferring Neural Firing Rates from Spike Trains using Gaussian Processes," Research Talk, Gatsby Computational Neuroscience Unit, University College London, London, UK. Nov. 27, 2007