Curriculum Vitae (.pdf)
Liam Paninski
July 30, 2009

Current position

Associate Professor, Department of Statistics, Center for Theoretical Neuroscience, and Doctoral Program in Neurobiology and Behavior, Columbia University (2008-present).

Education

New York University; Ph.D., Neural Science, 2003.
Brown University; B.S., Neuroscience, 1999.

Previous experience

Assistant Professor, Department of Statistics, Center for Theoretical Neuroscience, and Doctoral Program in Neurobiology and Behavior, Columbia University (2005-8).

Senior research fellow, Gatsby Computational Neuroscience Unit, University College London, 2004-5.

Postdoctoral fellow, Center for Neural Science, HHMI, NYU: May-Dec 2003.

Selected papers

[50] Lawhern, V., Wu, W., Hatsopoulos, N. & Paninski, L. (2009). Population neuronal decoding using a generalized linear model with hidden states. Submitted.

[49] Paninski, L. (2009). Fast Kalman filtering on quasilinear dendritic trees. Submitted.

[48] Rahnama Rad, K. & Paninski, L. (2009). Efficient estimation of two-dimensional firing rate surfaces via Gaussian process methods. Under review, Network.

[47] Escola, S. & Paninski, L. (2009). Hidden Markov models for the inference of neural states and improved estimation of linear receptive fields. Under review, Neural Computation.

[46] Ahmadian, Y., Pillow, J. & Paninski, L. (2009). Efficient Markov Chain Monte Carlo methods for decoding population spike trains. Under review, Neural Computation.

[45] Paninski, L. (2009). Inferring synaptic inputs given a noisy voltage trace. Under review, Journal of Computational Neuroscience.

[44] Pillow, J., Ahmadian, Y. & Paninski, L. (2009). Model-based decoding, information estimation, and change-point detection in multi-neuron spike trains. Under review, Neural Computation.

[43] Paninski, L., Ahmadian, Y., Ferreira, D., Koyama, S., Rahnama, K., Vidne, M., Vogelstein, J. & Wu, W. (2009). A new look at state-space models for neural data. In press, Journal of Computational Neuroscience (special issue on statistical analysis of neural data).

[42] Lalor, E., Ahmadian, Y. & Paninski, L. (2009). Decoding stimulus velocity using a probabilistic model of ganglion cell populations in primate retina. In press, Journal of the Optical Society of America A (special issue on ideal observers and efficiency).

[41] Wu, W., Kulkarni, J., Hatsopoulos, N. & Paninski, L. (2009). Neural decoding of goal-directed movements using a linear state-space model with hidden states. In press, IEEE Trans. Biomed. Engineering.

[40] Koyama, S. & Paninski, L. (2009). Efficient computation of the most likely path in integrate-and-fire and more general state-space models. In press, Journal of Computational Neuroscience (special issue on statistical analysis of neural data).

[39] Vogelstein, J., Watson, B., Packer, A., Yuste, R., Jedynak, B. & Paninski, L. (2009). Spike inference from calcium imaging using sequential Monte Carlo methods. In press, Biophysical Journal.

[38] Escola, S., Eisele, M., Miller, K. & Paninski, L. (2009). Maximally reliable Markov chains under energy constraints. Neural Computation 21: 1863-912..

[37] Toyoizumi, T., Rahnama Rad, K. & Paninski, L. (2009). Mean-field approximations for coupled populations of generalized linear model spiking neurons. Neural Computation 21, 1203-1243.

[36] Huys, Q. & Paninski, L. (2009). Smoothing of, and parameter estimation from, noisy biophysical recordings. PLOS Computational Biology 5: e1000379.

[35] Lewi, J., Butera, R. & Paninski, L. (2009). Sequential optimal design of neurophysiology experiments. Neural Computation 21: 619-687.

[34] Fudenberg, G. Paninski, L. (2009). Bayesian image recovery for low-SNR dendritic structures. IEEE Trans. Image Processing 18: 471-482.

[33] Lewi, J., Butera, R., Schneider, D., Woolley, S. & Paninski, L. (2008). Designing neurophysiology experiments to optimally constrain receptive field models along parametric submanifolds. NIPS.

[32] Paninski, L. (2008). A coincidence-based test for uniformity given very sparsely-sampled discrete data. IEEE Transactions on Information Theory 54: 4750-4755.

[31] Pillow, J., Shlens, J., Paninski, L., Sher, A., Litke, A., Chichilnisky, E. & Simoncelli, E. (2008). Spatiotemporal correlations and visual signaling in a complete neuronal population. Nature 454: 995-999.

[30] Paninski, L. & Yajima, M. (2008). Undersmoothed kernel entropy estimators. IEEE Transactions on Information Theory 54: 4384-4388.

[29] Kulkarni, J. & Paninski, L. (2008). Efficient analytic computational methods for state-space decoding of goal-directed movements. IEEE Signal Processing Magazine 25 (special issue on brain-computer interfaces): 78-86.

[28] Ahrens, M., Paninski, L. & Sahani, M. (2008). Inferring input nonlinearities in neural encoding models. Network: Computation in Neural Systems 19: 35-67.

[27] Paninski, L., Haith, A. & Szirtes, G. (2008). Differentiable integral equation methods for computing likelihoods in the stochastic integrate-and-fire model. J. Comput. Neuroscience 24: 69-79.

[26] Kulkarni, J. & Paninski, L. (2007). Common-input models for multiple neural spike train data. Network: Computation in Neural Systems 18: 375-407.

[25] Lewi, J., Butera, R. & Paninski, L. (2007). Efficient active learning with generalized linear models. Artificial Intelligence and Statistics (AISTATS) 11.

[24] Townsend, B., Paninski, L. & Lemon, R. (2006). Linear encoding of muscle activity in primary motor cortex and cerebellum. J. Neurophys. 96: 2578-92.

[23] Huys, Q., Ahrens, M. & Paninski, L. (2006). Efficient estimation of detailed single-neuron models. Journal of Neurophysiology 96: 872-890.

[22] Paninski, L. (2006). The spike-triggered average of the integrate-and-fire cell driven by Gaussian white noise. Neural Computation 18: 2592-2616.

[21] Paninski, L. (2006). The most likely voltage path and large deviations approximations for integrate-and-fire neurons. Journal of Computational Neuroscience 21: 71-87.

[20] Pillow, J., Paninski, L., Uzzell, V., Simoncelli, E. & Chichilnisky, E. (2005). Structure and precision of retinal light responses analyzed with a noisy integrate-and-fire model. Journal of Neuroscience 25: 11003-11013.

[19] Paninski, L. (2005). Inferring prior probabilities from Bayes-optimal behavior. Advances in Neural Information Processing 18.

[18] Shoham, S., Paninski, L., Fellows, M., Hatsopoulos, N., Donoghue, J. & Normann, R. (2005). Optimal decoding for a primary motor cortical brain-computer interface. IEEE Transactions on Biomedical Engineering 52: 1312-1322.

[17] Paninski, L. (2005). Asymptotic theory of information-theoretic experimental design. Neural Computation 17: 1480-1507.

[16] Paninski, L. (2004). Log-concavity results on Gaussian process methods for supervised and unsupervised learning. Advances in Neural Information Processing 17.

[15] Paninski, L. (2004). Variational minimax estimation of discrete distributions under Kullback-Leibler loss. Advances in Neural Information Processing 17.

[14] Paninski, L. (2004). Maximum likelihood estimation of cascade point-process neural encoding models. Network: Computation in Neural Systems 15: 243-262.

[13] Paninski, L., Pillow, J. & Simoncelli, E. (2004). Comparing integrate-and-fire-like models estimated using intra- and extra-cellular data. Neurocomputing 65: 379-385.

[12] Paninski, L., Pillow, J. & Simoncelli, E. (2004). Maximum likelihood estimation of a stochastic integrate-and-fire neural encoding model. Neural Computation 16: 2533-2561.

[11] Paninski, L. et al. (2004). Superlinear population encoding of dynamic hand trajectory in primary motor cortex. Journal of Neuroscience 24: 8551-8561.

[10] Paninski, L. (2004). Estimating entropy on m bins given fewer than m samples. IEEE Transactions on Information Theory 50: 2200-2203.

[9] Paninski, L., Fellows, M., Hatsopoulos, N. & Donoghue, J. (2004). Spatiotemporal tuning properties for hand position and velocity in motor cortical neurons. Journal of Neurophysiology 91: 515-532.

[8] Hatsopoulos, N., Paninski, L. & Donoghue, J. (2003). Sequential movement representations based on correlated neuronal activity. Experimental Brain Research 149: 478-486.

[7] Serruya, M., Hatsopoulos, N., Paninski, L., Fellows, M. & Donoghue, J. (2003). Robustness of neuroprosthetic decoding algorithms. Biological Cybernetics 88: 219-228.

[6] Paninski, L. (2003). Estimation of entropy and mutual information. Neural Computation 15: 1191-1253.

[5] Paninski, L. (2003). Convergence properties of three spike-triggered analysis techniques. Network: Computation in Neural Systems 14: 437-464. (Special issue on natural scene statistics and neural codes.)

[4] Paninski, L., Lau, B. & Reyes, A. (2003). Noise-driven adaptation: *in vitro* and mathematical analysis. Neurocomputing 52: 877-883.

[3] Serruya, M., Hatsopoulos, N., Paninski, L., Fellows, M. & Donoghue, J. (2002). Instant neural control of a movement signal. Nature 416: 141-142.

[2] Paninski, L. & Hawken, M. (2001). Stochastic optimal control and the human oculomotor system. Neurocomputing, 38-40: 1511-1517.

[1] Hatsopoulos, N,, Ojakangas, C., Paninski, L. & Donoghue, J. (1998). Information about movement direction obtained from synchronous activity of motor cortical neurons. PNAS 95: 15706-11.

Book

Paninski, L., Eden, U., Brown, E. & Kass, R. Statistical analysis of neurophysiological data. Under contract.

Invited book chapters

Paninski, L., Kass, R., Brown, E. & Iyengar, I. (2008). Statistical analysis of neuronal data via integrate-and-fire models. To appear in: Stochastic Methods in Neuroscience, eds. Laing, C. & Lord, G., Oxford University Press.

Paninski, L., Pillow, J. & Lewi, J. (2007). Statistical models for neural encoding, decoding, and optimal stimulus design. Computational Neuroscience: Progress in Brain Research, eds. Cisek, P., Drew, T. & Kalaska, J.; pp. 493-507.

Simoncelli, E., Paninski, L., Pillow, J. & Schwartz, O. (2004). Characterization of neural responses with stochastic stimuli. Chapter 23 of The New Cognitive Neurosciences: Third Edition, ed. Gazzaniga, M.; pp. 327-338.

Grants

NSF Faculty Early Career Development (CAREER) IOS-0641912, 2007-

Collaborative Research in Computational Neuroscience, NEI R01 EY018003, co-PI w/ E. Simoncelli and E.J. Chichilnisky, 2006-.

Gatsby Initiative in Brain Circuitry Pilot Grant, co-PI w/ S. Woolley, 2006-8.

Awards and Honors

McKnight Scholar award, 2008.
Alfred P. Sloan Research Fellowship, 2007.
"Scientist to watch," *The Scientist* magazine, June 2007.
Named one of top 35 innovators under 35 years old by *Technology Review* MIT, 2006.
Honorable mention, outstanding student paper award (to J. Lewi), NIPS, 2006.
Royal Society International Research Fellowship, 2004.
Best student paper award (w/ J. Pillow), NIPS, 2003.
Howard Hughes Medical Institute Predoctoral Fellowship in Biological Sciences, 1999.
National Science Foundation Predoctoral Fellowship, 1999.
Royce Fellowship, Brown University, 1998.

Selected recent invited talks

Neuroscience, Biomed. Eng., and Statistics seminars (Johns Hopkins 2005)
Statistics and Computational Neuroscience seminars (University of Chicago 2006)
Stochastic dynamics of neurons and networks workshop, CNS (Edinburgh 2006)
Statistics seminar (Yale 2006)
Brain and Cognitive Sciences seminar (MIT 2006)
Computational Neuroscience Forum (NYU 2006)
Statistics seminar (Carnegie Mellon 2007)
Emerging information-theoretic methods workshop, COSYNE (Salt Lake City 2007)
Applied Math and Computational Science Colloquium (U. Penn 2007)
Joint Statistical Meetings panel on neural data analysis (Salt Lake City 2007)
Neyman Seminar (Statistics dept.) and Redwood Center Seminar (UC Berkeley 2007)
Statistical analysis of neural data conference (CMU 2008)
Principles of biological computation workshop (Santa Fe Institute 2008)
SIAM conference on the life sciences (Montreal 2008)

Selected Teaching

Co-instructor, Statistical analysis and modeling of neural systems (NYU), 2002.
Invited lecturer, Advanced European computational neuroscience course (Obidos), 2004.
Invited lecturer, Neural coding (Gatsby theoretical neuroscience graduate course), 2004.
STAT4107, Statistical inference, Columbia University, 2005.
STAT4315, Linear regression models, Columbia University, 2006.
STAT4109, Probability and statistical inference, Columbia University, 2006-8.
STAT8285, Statistical analysis and modeling of neural spike train data, Columbia, 2007,9.
Invited lecturer, Program in Comput. Bio., Gulbenkian Science Institute, Lisbon, 2007.
Invited lecturer, Computational Modeling of Neuronal Systems, NYU, 2007.
Invited lecturer, Ignorance, Columbia University Biology Dept., 2008.
Invited lecturer, Okinawa Computational Neuroscience Course, 2009.

Advising

Primary postdoctoral research advisor: J. Kulkarni, Q. Huys, Y. Ahmadian, Y. Mishchenko
Ph.D. research advisor: S. Escola, J. Vogelstein, D. Ferreira, J. Lewi, K. Rahnama, M. Nikitchenko, M. Vidne
Undergraduate research advisor: G. Fudenberg

Other duties

Reviewer: Bayesian Analysis; COLT08; CRC Press; IEEE Transactions on: Biomedical Engineering, Information Theory, Pattern Analysis and Machine Intelligence, Neural Networks, and Signal Processing; ISIT08; J. Computat. Neuro.; J. Machine Learning Research; J. Neurophysiology; J. Neuroscience; J. Optical Soc. Am. A; J. Physics A; J. Vision; Machine Learning, Nature; Nature Neuroscience; Network: Computation in Neural Systems; Neural Computation; Neuron; NIPS02-7; Oxford University Press; PNAS; Science; SIAM J. Applied Math; Statistics in Medicine; Technometrics.
Invited participant: NSF Workshop, "Brain Science at the Interface," 2007.
NSF review panelist: 2007-9.