

Jonathan W. Pillow

Education

- Ph.D.**, New York University, Center for Neural Science 1998-2005
Thesis: "Neural coding and the statistical modeling of neuronal responses."
Thesis Advisor: Eero Simoncelli
- U.S. Fulbright Fellow**, Rabat, Morocco. Francophone Literature of North Africa 1997-1998
- B.A. with honors, *summa cum laude*.** 1990-1993
University of Arizona. majors: mathematics and philosophy

Positions

- Assistant Professor**, Princeton Neuroscience Institute & Department of Psychology. Princeton University Sept 2014-present
- Assistant Professor**, Departments of Psychology, Neuroscience, & Statistics, Center For Perceptual Systems, The University of Texas at Austin. Jan 2009-2014
- Postdoctoral Fellow**, Gatsby Computational Neuroscience Unit, UCL Oct 2005-2008
- Postdoctoral Fellow**, NYU and Howard Hughes Medical Institute May-Oct 2005

Publications

1. Park IM, Meister MLR, Huk AC, & **Pillow JW** (2014). Deciphering the code for sensorimotor decision-making in parietal cortex, *Nature Neuroscience* 17, 1395–1403.
2. Archer E, Park I, & **Pillow JW** (2014). Bayesian Entropy Estimation for Countable Discrete Distributions. *Journal of Machine Learning Research* 15 (Oct): 2833–2868.
3. Park M, Weller JP, Horwitz GD, & **Pillow JW** (2014). Bayesian active learning of neural firing rate maps with transformed Gaussian process priors. *Neural Computation* 26(8):1519-1541.
4. Archer, EW, Koster U, **Pillow JW**, & Macke JH (2014). Low-dimensional models of neural population activity in sensory cortical circuits. *Advances in Neural Information Processing Systems* 27, 343-351.
5. Latimer KW, Chichilnisky EJ, Rieke F, **Pillow, JW** (2014). Inferring synaptic conductances from spike trains with a biophysically inspired point process model. *Advances in Neural Information Processing Systems* 27, 954-962.
6. Knudson KC, Yates JL, Huk AC, **Pillow, JW** (2014). Inferring sparse representations of continuous signals with continuous orthogonal matching pursuit. *Advances in Neural Information Processing Systems* 27, 1215-1223.
7. Wu A, Park M, Koyejo OO, **Pillow, JW** (2014). Sparse Bayesian structure learning with dependent relevance determination priors. *Advances in Neural Information Processing Systems* 27, 1628-1636.
8. Grabska-Barwinska A, & **Pillow JW** (2014). Optimal prior-dependent neural population codes under shared input noise. *Advances in Neural Information Processing Systems* 27, 1880-1888.
9. Archer E, Park I & **Pillow JW** (2013). Bayesian entropy estimation for binary spike train data using parametric prior knowledge. *Advances in Neural Information Processing Systems* 26, 1700-1708.
10. Knudson, K., & **Pillow JW** (2013). Spike train entropy-rate estimation using hierarchical Dirichlet process priors. *Advances in Neural Information Processing Systems* 26, 2076-2084.

11. Park I, Archer E, Priebe NJ, & **Pillow JW** (2013). Spectral methods for neural characterization using generalized quadratic models. *Advances in Neural Information Processing Systems 26*, 2454-2462.
12. Park I, Archer E, Latimer K, & **Pillow JW** (2013). Universal models for binary spike patterns using centered Dirichlet processes. *Advances in Neural Information Processing Systems*, 2463-2471.
13. Park M, & **Pillow JW** (2013). Bayesian inference for low-rank spatiotemporal neural receptive fields. *Advances in Neural Information Processing Systems 26*, 2688-2696.
14. Archer E, Park I, & **Pillow JW** (2013). Bayesian and quasi-bayesian estimators for mutual information from discrete data. *Entropy 15*(5), 1738-1755.
15. **Pillow JW**, Shlens J, Chichilnisky EJ, & Simoncelli EP (2013). A model-based spike sorting algorithm for removing correlation artifacts in multi-neuron recordings. *PLoS ONE*. 8(5), 1-14. doi:10.1371/journal.pone.0062123
16. Park M, Koyejo S, Poldrack RA, Ghosh J, & **Pillow JW** (2013). Bayesian structure learning for functional neuroimaging. *Proceedings of the 16th International Conference on Artificial Intelligence and Statistics (AISTATS), Scottsdale, AZ, USA, 31*, 489-497.
17. Archer E, Pillow JW, & Park I (2012). Bayesian estimation of discrete entropy with mixtures of stick-breaking priors. In P. Bartlett, F. C. N. Pereira, C. J. C. Burges, L. Bottou, & K. Q. Weinberger (Eds.) *Advances in Neural Information Processing Systems 25*, 2024-2032.
18. Park M, & **Pillow JW** (2012). Bayesian active learning with localized priors for fast receptive field characterization. In P. Bartlett, F. C. N. Pereira, C. J. C. Burges, L. Bottou, & K. Q. Weinberger (Eds.) *Advances in Neural Information Processing Systems 25*, 2357-2365.
19. **Pillow JW**, & Scott, J.G. (2012) Fully Bayesian inference for neural models with negative-binomial spiking. In P. Bartlett, F. C. N. Pereira, C. J. C. Burges, L. Bottou, & K. Q. Weinberger (Eds.) *Advances in Neural Information Processing Systems 25*, 1907-1915.
20. Vidne, M., Ahmadian, Y., Shlens J, **Pillow JW**, Kulkarni, J., Litke, A. M., Chichilnisky EJ, Simoncelli, E., & Paninski, L. (2012). Modeling the impact of common noise inputs on the network activity of retinal ganglion cells. *Journal of Computational Neuroscience*, 33(1), 97-121.
21. Park I & **Pillow JW** (2011). Bayesian spike-triggered covariance analysis. In J. Shawe-Taylor, R. Zemel, P. Bartlett, F. Pereira & K. Weinberger (Eds.) *Advances in Neural Information Processing Systems 24*, 1692-1700.
22. Park M, Horwitz, G., & **Pillow JW** (2011). Active learning of neural response functions with Gaussian processes. In J. Shawe-Taylor J, R. Zemel, P. Bartlett, F. Pereira & K. Weinberger (Eds.) *Advances in Neural Information Processing Systems 24*, 2043-2051.
23. Park M, & **Pillow JW** (2011). Receptive field inference with localized priors. *PLoS Computational Biology* 7(10), 1-16. doi:10.1371/journal.pcbi.1002219
24. **Pillow JW**, Ahmadian, Y., & Paninski, L. (2011). Model-based decoding, information estimation, and change-point detection techniques for multineuron spike trains. *Neural Computation* 23(1), 1-45.
25. Ahmadian, Y., **Pillow JW**, & Paninski, L. (2011). Efficient Markov chain Monte Carlo methods for decoding neural spike trains. *Neural Computation* 23(1), 46-96.
26. Nirenberg, S., Bomash, I., **Pillow JW**, & Victor J. D. (2010). Heterogeneous response dynamics in retinal ganglion cells: The interplay of predictive coding and adaptation. *Journal of Neurophysiology* 103(6), 3184-3194.
27. **Pillow JW** (2009). Time-rescaling methods for the estimation and assessment of non-Poisson neural encoding models. In Y. Bengio, D. Schuurmans, J. Lafferty, C. Williams and A. Culotta (Eds.) *Advances in Neural Information Processing Systems 22*, 1473-1481.

28. Berkes, P., Wood, F., & **Pillow JW** . (2009). Characterizing neural dependencies with copula models. In D. Koller, D. Schuurmans, Y. Bengio, L. Bottou (eds.) *Advances in Neural Information Processing Systems 21*, 129-136.
29. **Pillow JW**, Shlens J, Paninski, L., Sher, A., Litke, A. M., Chichilnisky EJ, & Simoncelli EP (2008). Spatio-temporal correlations and visual signalling in a complete neuronal population. *Nature* 454(21 August 2008), 995-999.
30. **Pillow JW** & Latham, P. (2008) Neural characterization in partially observed populations of spiking neurons. In J. C. Platt, D. Koller, Y. Singer, & S. Roweis (Eds.) *Advances in Neural Information Processing Systems 20*, 1161-1168.
31. **Pillow JW** & Simoncelli EP (2006). Dimensionality reduction in neural models: An information-theoretic generalization of spike-triggered average and covariance analysis. *Journal of Vision*, 6(4), 414-428.
32. Schwartz, O., **Pillow J. W.**, Rust, N. C., & Simoncelli EP (2006). Spike-triggered neural characterization. *Journal of Vision*, 6(4), 484-507.
33. Paninski, L., **Pillow JW** & Simoncelli EP (2005). Comparing integrate-and-fire models estimated using intracellular and extracellular data. *Neurocomputing 65-66*(2005), 379-385.
34. **Pillow JW**, Paninski, L., Uzzell, V. J., Simoncelli EP, & Chichilnisky EJ (2005). Prediction and decoding of retinal ganglion cell responses with a probabilistic spiking model. *Journal of Neuroscience* 25(47), 11003-11013.
35. Paninski, L., **Pillow JW** & Simoncelli EP (2004). Maximum likelihood estimation of a stochastic integrate-and-fire neural encoding model. *Neural Computation*, 16(12), 2533-2561.
36. **Pillow JW**, Paninski, L., & Simoncelli EP (2004) Maximum likelihood estimation of a stochastic integrate-and-fire neural encoding model. In S. Thrun, L. K. Saul, & B. Schölkopf (Eds.) *Advances in Neural Information Processing Systems 16*. 8 pages. Cambridge, MA: MIT Press.
37. **Pillow JW** & Simoncelli EP (2003). Biases in white noise analysis due to non-Poisson spike generation. *Neurocomputing*, 52-54(2003), 109-115.
38. **Pillow JW** & Rubin N. (2002). Perceptual completion across the vertical meridian and the role of early visual cortex. *Neuron* 33(5), 805-13.
39. Zemel, R. S. & **Pillow JW** (2000). Encoding multiple orientations in a recurrent network. *Neurocomputing*, 32-33 (June 2000), 609-616.
40. Histed, M. H., & **Pillow JW** (2011). The 8th annual computational and systems neuroscience (Cosyne) meeting. *Neural Systems & Circuits* 1(8), 1-3. (invited meeting review).
41. **Pillow JW** (2007). Likelihood-based approaches to modeling the neural code. (K. Doya, S. Ishii, A. Pouget, & R. Rao, Eds.) In *Bayesian Brain: Probabilistic Approaches to Neural Coding* (pp. 53-70). Cambridge, MA: MIT press.
42. Paninski, L., **Pillow JW** & Lewi, J. (2007). Statistical models for neural encoding, decoding, and optimal stimulus design. (P. Cisek, T. Drew, & J. F. Kalaska, Eds.) In *Progress in Brain Research* (pp. 93-507). Oxford, UK: Elsevier B. V.
43. Simoncelli EP, Paninski, L., **Pillow JW**, & Schwartz, O. (2004). Characterization of neural responses with stochastic stimuli. (M Gazzaniga, Ed.) In *The Cognitive Neurosciences III* (pp. 327-338). Cambridge, MA: MIT Press.
44. Zemel, R. S. & **Pillow JW** (2002). A probabilistic network model of population responses. (R. Rao, B. Olshausen, & M. Lewicki, Eds.) In *Probabilistic Models of the Brain: Perception and Neural Function* (pp. 223-242). Cambridge, MA: MIT Press.

Research Support

Ongoing Support

- *CAREER: Unlocking the neural code with spikes, currents and conductances* (IIS-1150186). Faculty Early Career Development Program Award, National Science Foundation (PI: Pillow). 5-year grant, 2012-2017.
- *CRCNS: Detailed multi-neuron coding of decisions in the parietal cortex*. (R01-MH099611), NIH/NSF Collaborative Research In Computational Neuroscience (PIs: JW Pillow & AC Huk). 5-year grant, 2012-2017.
- *McKnight Scholar Award*. 3-year grant, 2012-2015.
- *Population dynamics across pairs of cortical areas in learning and behavior* - Simons Global Brain Award. 3-year grant (PIs: JW Pillow & SL Smith). 2014-2017.
- *Hierarchical methods for decoding high-dimensional brain imaging data* - Princeton Innovation Award: J. Insley Blair Pyne Fund for Innovation. 2-year grant (PIs: JW Pillow, BE Engelhardt, KA Norman). 2015-2016.

Completed Research Support

- *Sloan Research Fellowship*. 2-year grant, \$50K. 2011-2013.
- University of Texas Summer Research Assignment (SRA) Award. one month, \$8.2K. summer 2010.

Honors & Awards

Presidential Early Career Award for Scientists and Engineers (PECASE)	2014
NSF Career Award	2012-2017
McKnight Scholar Award	2012-2015
NSF Mentorship Travel Grant (Cosyne meeting)	2012
Sloan Research Fellow	2011-2012
Royal Society USA/Canada Research Fellowship	2005-2008
Dean's Dissertation Fellowship Award	2003-2004
Best Student Paper, Neural Information Processing Systems (NIPS)	2003
National Science Foundation Graduate Fellowship	1997-2000
National Defense Science and Engineering Graduate Fellowship (declined)	1997
NCAA Graduate Fellowship	1997
U.S. Fulbright Fellowship	1997-1998
Freeman Medal (outstanding Univ. Arizona graduate)	1997
Sapphire Award (outstanding Univ. Arizona student-athlete)	1997
Outstanding Senior, Department of Mathematics	1997
Flinn Foundation Scholar	1993-1997
National Science Scholar	1993
Presidential Scholar	1993

Teaching

Perception - PSY 323 (undergraduate). Fall 2009-13 (UT Austin)

Topics in Statistics and Neural Coding - PSY 394U/ NEU 394P (graduate). Spring 2010-14 (UT Austin).

Summer Courses:

Co-organizer, *Computational Neuroscience: Vision*. Cold Spring Harbor Laboratory (July, 2014).

Course faculty, *Methods in Computational Neuroscience*. Woods Hole, MA (Aug, 2014)

Lecturer, *Methods in Computational Neuroscience*. Woods Hole, MA (Aug, 2008-2011, 2013).

Lecturer, *Berkeley summer course in mining and modeling of neuroscience data*. Berkeley, CA (July, 2011,2012,2013).

Lecturer, *Okinawa Computational Neuroscience Course*. Okinawa, Japan. (2004, 2013).

Lecturer, *Advanced Course in Computational Neuroscience*. Freiburg, Germany (Aug, 2008-2010).

Lecturer, *Bayesian Methods in Neuroscience*. PhD Programs in Neuroscience and Computational Biology. Instituto Gulbenkian de Ciencia, Lisbon, Portugal. (June 2009).

Lecturer, *Computational Neuroscience*. PhD Program in Computational Biology. Instituto Gulbenkian de Ciencia, Lisbon, Portugal. (June 2007).

Lecturer, *Dartmouth Summer Institute in Cognitive Neuroscience*, Lake Tahoe, CA (July 2003).

Teaching Assistant, *Computational Neuroscience: Vision*. Cold Spring Harbor, NY (July 2002).

Service

PNI Graduate Admissions Committee (Fall 2014).

o-Founder & Organizer (with Ila Fiete): Computational and Theoretical Neuroscience Journal Club, UT Austin. (summer 2009-2014).

Faculty search committee, Statistics and Scientific Computation (SSC), 2011 & 2012.

Faculty search committee, Center for Perceptual Systems (CPS), 2012.

General Chair (with Nicole Rust), Computational & Systems Neuroscience (Cosyne) Meeting 2013.

Program Chair (with Nicole Rust), Computational & Systems Neuroscience (Cosyne) Meeting 2012.

Program Committee, Computational & Systems Neuroscience (Cosyne) 2010 & 2011

Program Area Chair, Neural Information Processing Systems (NIPS) 2010, 2011 & 2013.

Program Committee, Bernstein Conference on Computational Neuroscience and Neurotechnology (BCCN, 2009)

Journal reviewer: *Annals of Applied Statistics*; *IEEE Trans Neur. Sys. & Rehabilitation Engr.*, *Frontiers in Comp. Neurosci*, *J. Comp Neurosci*, *J. Neurophys*, *J. Neurosci*, *J. Neurosci Methods*, *J. of Vision*, *Nature*, *Nature Neuroscience*, *Network: Computation in Neural Systems*, *Neural Computation*, *Neuron*, *PLoS Biology*, *PLoS Computational Biology*, *PLoS One*, *Proc. Nat. Academy Sci. (PNAS)*, *Science*, *Vision Research*

Grant reviewer: NSF panelist (Robust Intelligence), NSF ad hoc reviewer (Perception, Action & Cognition), National Agency for Research in France (ANR), The Wellcome Trust, Human Frontier Science Program (HFSP).

Conference submission reviewer: Computational Neuroscience (CNS) (2005-06), Neural Information Processing Systems (NIPS) (2002-2014).

Workshop Organizer, "The role of natural images in guiding our understanding of visual function" Cosyne 2006. (co-organized with Nicole Rust and Eero Simoncelli).

Workshop Organizer, "New Approaches to Characterizing Neural Responses," Cosyne 2005 (co-organized with Nicole Rust.)

Member: Society for Neuroscience (2003-present)

Public Outreach

Saturday Morning Math Group - *sponsored outreach program aimed at junior high and high school students, their teachers, and their parents* (<http://www.ma.utexas.edu/users/smmg/index.html>). Gave 2-hour lecture and problem session on information theory and neural coding, entitled "Information, Bits, Coding, and the Brain". April 13, 2013

First Bytes - *one-week residential camp program for high school girls, sponsored by UT Austin department of Computer Science* (<http://www.cs.utexas.edu/outreach/first-bytes>). Presented 1-hour lecture on "Computational neuroscience and neural coding". June 2013 & 2014.