Ian Stevenson

Assistant Professor

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Research Interests

Computational Neuroscience, Neural Data Analysis, Motor Control, Bayesian Statistics

Education

2006-2011	**PhD Neuroscience** Northwestern University
	THESIS: Probabilistic models of interactions between neurons, ADVISOR: Konrad Kording
2002-2006	**BA Physics** Rice University

Positions

2013-	**Assistant Professor** University of Connecticut
	Psychological Sciences and Biomedical Engineering
2011-2013	**Postdoctoral Fellow** University of California, Berkeley
	Redwood Center for Theoretical Neuroscience, ADVISOR: Bruno Olshausen

Grants & Awards

2017-2022	CAREER: Statistical tools for tracking synaptic plasticity in neural spiking data
	NSF CAREER IIS-1651396, PI
2015-2020	CRCNS: The role of statistical regularities for neural discrimination and coding of sounds
	NIH NIDCD 1R01DC015138-01, Co-Investigator with Monty Escabi (PI) and Heather Read
2011-2013	NSF Computing Innovation Fellowship
	NSF-0937060 CIF-D-018
2017	UConn Vice President for Research, Scholarship Facilitation Fund
2016	NVIDIA Academic GPU Grant
2011	Baskin Award for Excellence in Research - Rehabilitation Institute of Chicago
2009-2010	Yahoo! Key Scientific Challenges Award - Statistics/Machine Learning
2007-2008	NIH T32 Northwestern University - Neuroscience in the Early Years Grant
2005-2006	Federal Employee Education and Assistance Fund Scholarship Award

Publications

preprint   Ghanbari A, Ren N, Keine C, Stoelzel C, Englitz B, Swadlow H, and **Stevenson IH**. Functional connectivity with short-term dynamics explains diverse patterns of excitatory spike transmission in vivo, *bioRxiv* 475178; doi: https://doi.org/10.1101/475178. [PDF]

preprint   Sadeghi M, Zhai X, **Stevenson IH**, and Escabi M. A neural ensemble correlation code for sound category identification, *bioRxiv* 317735; doi: https://doi.org/10.1101/317735. [PDF]

2018   **Stevenson IH**. Omitted variable bias in GLMs of neural spiking activity, *Neural Computation* 30 (12), 3227-3258. [PDF]

2018   Michaels TI, Long LL, **Stevenson IH**, Chrobak JJ, and Chen C-M. Effects of chronic ketamine on hippocampal cross-frequency coupling: Implications for schizophrenia pathophysiology, *European Journal of Neuroscience* 48, 2903-2914. [PDF]

2017   Ghanbari A, Malyshev A, Volgushev M, and **Stevenson IH**. Estimating short-term synaptic plasticity from pre- and postsynaptic spiking, *PLoS Computational Biology* 13(9): e1005738. [PDF]

2016   **Stevenson IH**. Flexible models for spike count data with both over- and under- dispersion, *Journal of Computational Neuroscience* 41(1), 29-43. [PDF]

2015   Volgushev M, Ilin V, and **Stevenson IH**. Identifying and tracking simulated synaptic inputs from neuronal firing: Insights from in vitro experiments, *PLoS Computational Biology* 11(3): e1004167. [PDF]

2014   Fernandes HL, **Stevenson IH**, Phillips AN, Segraves MA, and Kording KP. Saliency and saccade encoding in the frontal eye field during natural scene search, *Cerebral Cortex* 24 (12): 3232-3245. [PDF]

2014   Ilin V, **Stevenson IH**, and Volgushev M. Injection of fully-defined signal mixtures: a novel high-throughput tool to study neuronal encoding and computations, *PLoS ONE* 9(10): e109928. [PDF]

2014   Wei K, Glaser JI, Deng L, Thompson CK, **Stevenson IH**, Wang Q, Hornby TG, Heckman CJ, and Kording KP. Serotonin affects movement gain control in the spinal cord, *Journal of Neuroscience* 34(38):12690-12700. [PDF]

2014   Long LL, Hinman JR, Chen C-M, **Stevenson IH**, Read HL, Escabi MA, and Chrobak JJ. Novel acoustic stimuli can alter locomotor speed to hippocampal theta relationship, *Hippocamus* 24(9): 1053-1058. [PDF]

2014   Fernandes HL, **Stevenson IH**, Vilares I, and Kording KP. The generalization of prior uncertainty during reaching, *Journal of Neuroscience* 34(34): 11470-11484. [PDF]

2014   Agarwal G, **Stevenson IH**, Berenyi A, Mizuseki K, Buzsaki G, and Sommer FT. Spatially distributed local fields in the hippocampus encode rat position, *Science* 344(6184): 626-630. [PDF]

2013   Ding Q, **Stevenson IH**, Wang N, Li W, Sun Y, Körding KP, and Wei K. Motion games improve balance control in stroke survivors: a preliminary study based on the principle of constraint-induced movement therapy, *Displays* 32(2): 125-131. [PDF]

2013   Yan X, Wang Q, Lu Z, **Stevenson IH**, Körding KP, and Wei K. Generalization of unconstrained reaching with hand weight changes, *Journal of Neurophysiology* 109: 137-146. [PDF]

2012   **Stevenson IH**, London BM, Oby ER, Sachs NA, Reimer J, Englitz B, David SV, Shamma

SA, Blanche TJ, Mizuseki K, Zandvakili A, Hatsopoulos NG, Miller LE, and, Körding KP. Functional connectivity and tuning curves in populations of simultaneously recorded neurons, *PLoS Computational Biology* 8(11): e1002775. [PDF]

2012 Fernandes HL, **Stevenson IH** and Körding KP. Generalization of stochastic visuomotor rotations, *PLoS ONE* 7(8): e43016. [PDF]

2011 **Stevenson IH** and Körding KP. Inferring spike-timing-dependent plasticity from spike train data, *Advances in Neural Information Processing Systems* 24, 2582–2590. [PDF]

2011 **Stevenson IH**, Cherian A, London BM, Sachs N, Lindberg E, Reimer J, Slutzky MW, Hatsopoulos NG, Miller LE, and Körding KP. Statistical assessment of the stability of neural movement representations, *Journal of Neurophysiology* 106: 764-774. [PDF]

2011 **Stevenson IH** and Körding KP. How advances in neural recording affect data analysis, *Nature Neuroscience* 14: 139-142. [PDF]

2010 Wei K, **Stevenson IH**, and Körding KP. The uncertainty associated with visual flow fields and their influence on postural sway: Weber's law suffices to explain the nonlinearity of vection, *Journal of Vision* 10(14): 4. [PDF]

2010 **Stevenson IH***, Cronin B*, Sur M, and Körding KP. Sensory adaptation and short term plasticity as Bayesian correction for a changing brain. *PLoS ONE* 5(8): e12436. (* contributed equally) [PDF]

2010 Rebesco JM, **Stevenson IH**, Körding KP, Solla SA, and Miller LE. Rewiring neural interactions by micro-stimulation. *Frontiers in Systems Neuroscience* 4:39. [PDF]

2010 **Stevenson IH** and Körding KP. On the similarity of functional connectivity between neurons estimated across timescales. *PLoS ONE* 5(2): e9206. [PDF]

2010 Cronin B*, **Stevenson IH***, Sur M, and Körding KP. Hierarchical Bayesian modeling and Markov chain Monte Carlo sampling for tuning curve analysis. *Journal of Neurophysiology* 103: 591-602. (* contributed equally) [PDF]

2009 **Stevenson IH**, Fernandes HL, Vilares I, Wei K, and Körding KP. Bayesian integration and non-linear feedback control in a full-body motor task. *PLoS Computational Biology* 5(12): e1000629. [PDF]

2009 **Stevenson IH** and Körding KP. Structural inference affects depth perception in the context of potential occlusion. *Advances in Neural Information Processing Systems* 22. 1777-1784. [PDF]

2009 **Stevenson IH**, Rebesco JM, Hatsopoulos NG, Haga Z, Miller LE, and Körding KP. Bayesian inference of functional connectivity and network structure from spikes. *IEEE Trans. Neural Systems and Rehabilitation (Special Issue on Brain Connectivity).* 17, 3: 203-213. [PDF]

2008 **Stevenson IH**, Rebesco JM, Miller LE, and Körding KP. Inferring functional connections between neurons. *Current Opinion in Neurobiology.* 18: 582-588. [PDF]

2007 Whitehead JA and **Stevenson I**. Turbulent Mixing of two-layer stratified fluid. *Physics of Fluids* 19 (12). [PDF]

2007 Chen Y, **Stevenson I**, Pouy R, Wang L, McIlroy D, Pounds T, Norton M, and Aston D. Mechanical elasticity of vapour–liquid–solid grown GaN nanowires, *Nanotechnology* 18, 135708. [PDF]

2006 Dobrokhotov V, McIlroy D, Norton M, Abuzir A, Yeh W, **Stevenson I**, Pouy R, Bochenek J, Cartwright M, Wang L, Dawson J, Beaux M, and Berven C. Principles and mechanisms of gas sensing by GaN nanowires functionalized with gold nanoparticles, *Journal of Applied Physics* 99, 104302. [PDF]

Recent Conference Abstracts & Papers

2018 Ren N, Ito S, Hafizi H, Beggs JM, and Stevenson IH. 'Model-based detection of putative synaptic connections from multi-electrode spike recordings'. *Neuroinformatics* P45.

2018 Ghanbari A, Ren N, Keine C, Stoelzel C, Englitz B, Swadlow H, and Stevenson I. 'Disentangling diverse patterns of synaptic efficacy in vivo and their causes.' *Computational Neuroscience* P95.

2018 Lee SL, Troha R, Pattoli M, Roy R, Subramanian D, Kumar K, Katz M, Stevenson I, and Markus E. 'Firing characteristics of dorsal and ventral place cells in response to spatial novelty'. *International Conference on Learning and Memory*, 203.6.13.

2017 Lee SL, Katz D, Pattoli M, Troha R, Stevenson I, and Markus EJ. 'Comparison of Dorsal and Ventral Hippocampal Place Cell Activity after a Novel Trajectory or Social Stimuli', *Association for Psychological Science* XII-130.

2017 Escabi MA, Khatami F, Sadeghi M, Read HL, and Stevenson IH. 'Using neuron-to-neuron correlation statistics to categorize sounds in the mammalian auditory midbrain', *Society for Neuroscience.*586.03 / DD1.

2017 Khatami F, Sadeghi M, Read H, Stevenson IH, and Escabi M. 'Neural discrimination of sound category utilizes high-order sound statistics in the central auditory nervous system', CRCNS Meeting, Poster 18.

2017 Ghanbari A and Stevenson IH. 'Modeling dispersion improves decoding of population neural response', *Computational and Systems Neuroscience.* I-107.

2017 Khatami F, Sadeghi M, Read H, Stevenson IH, and Escabi M. 'Neural discrimination of sound category utilizes high-order sound statistics in the central auditory',*Computational and Systems Neuroscience.* II-45.

2016 Long LL, Stevenson IH, Escabi MA, Chrobak JJ. 'Hippocampal theta across its areal axis: predicting, preparing or manipulating future locomotor speed?' *Society for Neuroscience,* 462.19 / LLL33.

2016 Michaels TI, Long LL, Stevenson IH, Chrobak JJ, Chen C-MA. 'The acute and chronic effects of ketamine on cross-frequency couplings and alterations in locomotive speed in the rat hippocampus: Implications for translational models of schizophrenia.' *Society for Neuroscience,* 466.15 / MMM26.

2016 Khatami F, Sadeghi M, Read HL, Stevenson IH, and Escabi MA. 'Neural coding and discrimination of high-order sound statistics in the inferior colliculus.' *Society for Neuroscience,* 326.01 / DD3.

2016 Sadeghi M, Stevenson IH, and Escabi MA. 'Nonstationary correlation statistics allow robust sound category identification.' *Society for Neuroscience,* 326.04 / DD6.

2016 Ghanbari A, Ilin V, Volgushev M, and Stevenson IH. ' Estimating short-term synaptic plasticity from paired spikes in vitro', *Computational and Systems Neuroscience.* I-31.

2015 Volgushev M, Ilin V, and Stevenson IH. ' Identifying and tracking simulated synaptic inputs from neuronal firing: insights from in vitro experiments', *Computational Neuroscience.* 262.

2015 Ghanbari A, Ilin V, Volgushev M, and Stevenson IH. 'Estimating short-term synaptic plasticity from paired spike recordings', *Statistical Analysis of Neural Data 7.* 17.

2014 Ilin V, Stevenson IH, and Volgushev M. 'Injection of fully-defined signal mixtures: A novel high-throughput paradigm to study neuronal encoding and computations', *Society for Neu-*

roscience. 187.14/TT63.

2014   Long LL, Norris AA, Hinman JR, Chen C-M, Stevenson IH, Read HL, Escabi MA, and Chrobak JJ. 'Novel acoustic stimuli can alter locomotor speed-theta relationship across the septotemporal axis of the hippocampus', *Society for Neuroscience.* 751.08/UU7.

2013   Zhu M, Stevenson I, Koster U, Gray C, Olshausen B, and Rozell C. 'Sparse coding model captures V1 population response statistics to natural movies', *Computational Neuroscience Meeting.* 14: P334.

2013   Mudigonda M, Stevenson I, Koster U, Hillar C, Gray C, and Olshausen B. 'Predicting V1 neural responses to natural movies using the shift-invariant bispectrum', *Computational and Systems Neuroscience.* Poster I-77.

2013   Agarwal G, Stevenson I, Mizuseki K, Buzsaki G, and Sommer F. 'Traveling waves of the hippocampal theta rhythm encode rat position', *Computational and Systems Neuroscience.* Poster I-46.

2013   Zhu M, Stevenson I, Koster U, Gray C, Olshausen B, and Rozell C. 'Sparse coding model and population response statistics to natural movies in V1', *Computational and Systems Neuroscience.* Poster I-5.

2012   Stevenson IH, Koster U, Gray CM, and Olshausen BA. 'Estimating border-ownership selectivity from V1 responses to natural movies', *Society for Neuroscience.* Selected Talk for Nanosymposium on Data Analysis and Statistics IV.

2012   Stevenson IH, Koster U, Gray CM, and Olshausen BA. 'Towards parametric models of V1 responses to natural movies', *Statistical Analysis of Neural Data.* Poster 39.

2012   Khosrowshahi A, Stevenson I, Koster U, Gray CM, and Olshausen BA. 'How does V1 encode dynamic natural scenes', *Collaborative Research in Computational Neuroscience.*

Selected & Invited Talks

2018 Jun	Yale University, Department of Psychiatry
2018 Feb	Stony Brook University, Department of Neurobiology and Behavior
2016 July	Computational Neuroscience Conference, Workshop Talk
2015 Feb	University of Connecticut, Department of Biomedical Engineering
2014 Mar	University of Connecticut, Department of Statistics
2014 Mar	Kyoto University Systems Neurobiology Spring School, Lecture
2013 Dec	Neural Information Processing Systems Conference, Workshop Talk
2013 Jun	Modeling Neural Activity Conference, Workshop Talk
2013 Jan	University of Connecticut, Department of Psychology
2013 Jan	Baylor College of Medicine, Department of Neuroscience
2011 May	UC Berkeley, Redwood Center for Theoretical Neuroscience
2011 Feb	Computational and Systems Neuroscience Conference
2010 May	Statistical Analysis of Neural Data Conference, Young Investigator Talk
2009 Apr	Neural Control of Movement Conference, Workshop Talk
2009 Jan	Chicago Chapter of the American Statistical Association

Teaching

University of Connecticut
Psych 2100, Principles of Research in Psychology (Fall 2014-present)
Psych 5270/BME 6086, Statistical Analysis of Neural Data (Spr 2014, Spr 2018)
Psych 5200, Behavioral Neuroscience Seminar (Fall 2014-Spr 2017)

Psych 5270, Measuring and Modeling Neural Activity (Fall 2013)

UC Berkeley, Guest Lecturer
Vision Science 265, Neural Computation (Fall 2012)

Northwestern University, Teaching Assistant (with lectures)
Biological Sciences 326, Neurobiology of Learning and Memory (Spr 2008)
Biological Sciences 302, Fundamentals of Neurobiology I (Fall 2007)

Mentoring

PhD Students: Abed Ghanbari (BME 2014-present), Naixin Ren (Neuroscience 2017-present)

PhD Thesis Committees: Tommy Lee (Neuroscience, 2016-present), Mina Sadeghi (BME, 2016-present), Fatemeh Khatami (BME, 2014-2017), Ahmad Osman (BME, 2013-2017), Lauren Long (Neuroscience, 2013-2016), Mohammad Abdolvahab (Psychology, 2013-2014)

Undergraduate Honors Theses: Madeleine Youngstrom (PNB, 2017), Shreevida Periyasamy (PNB, 2016), Sonal Muzumdar (PNB, 2016), Matthew Kessenich (PNB, 2016), Pranav Singla (PNB, 2015)

Service & Reviewing

2016	Workshop Co-organizer: Statistical Analysis of Neural Time Series (CNS)
2013	Workshop Co-organizer: High Dimensional Statistical Inference in the Brain (NIPS)
2016-present	University of Connecticut, Dept of Psychological Sciences Vision Committee
2010-present	Associate Faculty Member, Faculty of 1000 - Motor Systems Section
2014-present	Member, Organization for Computational Neuroscience
2009-present	Member, Society for the Neural Control of Movement, Student Member (2009-2011)
2009-present	Member, Society for Neuroscience, Student Member (2009-2011)
2008-2011	Assistant Editor of Scholarpedia.org - peer-reviewed encyclopedia

Reviewer: Cell, Computational Intelligence and Neuroscience, Computational and Systems Neuroscience Conference (CoSyNe), Clinical Interventions in Aging, Frontiers in Computational Neuroscience, IEEE Transactions in Neural Systems and Rehabilitation Engineering, Journal of Computational Neuroscience, Journal of Neural Engineering, Journal of Neurophysiology, Journal of Neuroscience, Journal of Neuroscience Methods, Nature Communications, Neural Computation, Neural Information Processing Systems Conference (NIPS), Neuron, PLoS Computational Biology, Psychological Review

Guest Editor: PLoS Computational Biology
Editorial Board: Neurons, Behavior, Data Analysis and Theory