Ian Stevenson

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Research Interests

Computational Neuroscience, Neural Data Analysis, Bayesian Models of Behavior

Education

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

Positions

2019-	**Associate Professor** University of Connecticut
2013-2019	**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

2021-2026	NIH NIDCD 1R01DC020097. CRCNS: The role of statistical structure for natural sound recognition in noise. Co-Investigator with Monty Escabi (PI) and Heather Read.
2020-2024	NSF IOS-1931249. Adaptive decoding of noisy, non-stationary neural spiking activity.
2019-2022	NIH NIMH 1R01MH121350. Physiological markers of forebrain circuit engagement regulating effort-based decision making. Co-Investigator with John Salamone (PI), James Chrobak, and Heather Read.
2017-2022	NSF CAREER IIS-1651396. CAREER: Statistical tools for tracking synaptic plasticity in neural spiking data.
2015-2020	NIH NIDCD 1R01DC015138. CRCNS: The role of statistical regularities for neural discrimination and coding of sounds. Co-Investigator with Monty Escabi (PI) and Read.
2011-2013	NSF-0937060 CIF-D-018. NSF Computing Innovation Fellowship
2020	UConn Vice President for Research, Research Excellence Program (Co-PI with Escabi)
2017	UConn Vice President for Research, Scholarship Facilitation Fund
2011	Baskin Award for Excellence in Research - Rehabilitation Institute of Chicago
2009-2010	Yahoo! Key Scientific Challenges Award - Statistics/Machine Learning

Publications

preprint   Wei G and **Stevenson IH**. Dynamic modeling of spike count data with Conway-Maxwell Poisson variability, *arRxiv* 2205.00507. [PDF]

preprint   He F, **Stevenson IH**, and Escabi MA. Two stages of bandwidth scaling drives efficient neural coding of natural sounds, *bioRxiv* 2022.04.12.488076. [PDF]

preprint   Ren N, Wei G, Ghanbari A, and **Stevenson IH**. Predictable fluctuations in excitatory synaptic strength due to natural variation in presynaptic firing rate, *bioRxiv* 2022.04.14.488362. [PDF]

preprint   Hafizi H, Nigam S, Barnathan J, Ren N, **Stevenson IH**, Masmanidis SC, Newman EL, Sporns O, and Beggs JM. Inhibition-dominated rich-club shapes dynamics in cortical microcircuits in awake behaving mice, *bioRxiv* 2021.05.07.443074. [PDF]

2022   Ren N, Carratala-Ros C, Ecevitoglu A, Rotolo RA, Edelstein GA, Presby RE, **Stevenson IH**, Chrobak JJ, and Salamone JD. Effects of the dopamine depleting agent tetrabenazine on detailed temporal parameters of effort-related choice responding, *Journal of the Experimental Analysis of Behavior* in press. [PDF]

2021   Wei G and **Stevenson IH**. Tracking fast and slow changes in synaptic weights from simultaneously observed pre- and postsynaptic spiking, *Neural Computation* 33 (10): 2682–2709. [PDF]

2020   Ren N, Ito S, Hafizi H, Beggs JM, and **Stevenson IH**. Model-based detection of putative synaptic connections from spike recordings with latency and type constraints, *Journal of Neurophysiology* 124 (6) 1588-1604. [PDF]

2020   Zhai X, Khatami F, Sadeghi M, He F, Read HL, **Stevenson IH**, and Escabi MA. Distinct midbrain response statistics are associated with sound recognition and discrimination during the construction of natural sound textures, *PNAS* 117 (49) 31482-31493. [PDF]

2020   Ghanbari A, Ren N, Keine C, Stoelzel C, Englitz B, Swadlow H, and **Stevenson IH**. Modeling the short-term dynamics of in vivo spike transmission, *Journal of Neuroscience* 40 (21) 4185-4202. [PDF]

2019   Ghanbari A, Lee CM, Read HL, and **Stevenson IH**. Modeling stimulus-dependent variability improves decoding of population neural responses, *Journal of Neural Engineering* 16, 066018. [PDF]

2019   Sadeghi M, Zhai X, **Stevenson IH**, and Escabi M. A neural ensemble correlation code for sound category identification, *PLoS Biology* 17(10): e3000449. [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 in-

puts 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

2021   Wei G and Stevenson IH. 'Adaptive Modeling of Neural Spike Count Data with Non-Poisson Variability.' *Joint Statistical Meeting*, 318071.

2021   Ren N, Ghanbari A, Wei G, and Stevenson IH. 'Predictable fluctuations in synaptic strength due to natural variation in presynaptic firing rate.' *Society for Neuroscience* P107.06.

2021   Sadeghi M, Zhai X, Pedrick D, Read HL, Stevenson IH, Escabi MA, 'Categorical perception and auditory midbrain representations of chimeric sound textures.' *Society for Neuroscience* P442.01.

2021   Pedrick D, Zhai X, Stevenson IH, Escabi MA. 'Modulation content of interfering natural background sounds affects neural population synchrony and response power during vocalization processing.' *Society for Neuroscience* P442.02

2021   Zhai X, Sadeghi M, He F, Read HL, Stevenson IH, Esabi MA. 'The role of rate-based and correlation-based neural activity towards the recognition and discrimination of natural sound textures.' *Society for Neuroscience* P442.03

2021   Lee S, Troha R, Hu Q, Stevenson IH, Markus EJ. 'Dorsal and ventral hippocampus cell firing patterns in response to novel stimuli.' *Society for Neuroscience* P810.06.

2021   Ecevitoglu A, Rotolo RA, Presby RE, Ren N, Zorda E, Srinath SM, Meka NM, Carratala-Ros C, Arias-Sandoval E, Chrobak J, Stevenson I, Correa M, Salamone JD. 'Effort-related motivational effects of the vmat-2 inhibitor tetrabenazine and the da transport inhibitor methylphenidate on male and female rats.' *Society for Neuroscience* P702.01.

2021   Salamone JD, Rotola RA, Ecevitoglu A, Ren N, Presby RE, Carratala-Ros C, Meka NM, Srinath SM, Arias-Sandoval E, Yu A, Canfield D, Correa M, Stevenson IH, Chrobak JJ. 'Behavioral and EEG effects of dopaminergic drugs that alter effort-related aspects of motivation: Implications for avolition and anergia.' *Society for Neuroscience* P702.03.

2020   Ren N, Ito S, Hafizi H, Beggs JM, and Stevenson IH. 'Detection of putative synaptic connections from multi-electrode spike recordings: a model-based method with structural constraints.' *Statistical Analysis of Neural Data 9* Poster 42.

2020   Stevenson IH. 'Omitted variable bias in GLMs of neural spiking activity.' *Statistical Analysis of Neural Data 9* Poster 54.

2020   Lee S, Troha R, Anam A, Katz M, Citrin K, Pietruszewski T, Stevenson IH, and Markus EJ. 'Persistence of dorsal and ventral hippocampal remapping after exploring a novel environment.' *Society for Neuroscience* 161.17.

2020   Zhai X, Sadeghi M, Khatami F, He F, Pedrick D, Read HL, Stevenson IH, and Escabi MA. 'Neural correlation codes for sound identification and categorization: The contribution of sound spectrum and envelope correlation structure.' *Society for Neuroscience* 401.17.

2020   Pedrick D, Zhai X, He F, Stevenson IH, and Escabi MA. 'Encoding vocalizations in background sounds at the cocktail party and in the woods.' *Society for Neuroscience* 401.18.

2020   Zhai X, Stevenson IH, and Escabi MA. 'The contribution of stimulus-driven and noise correlation for neural decoding and identification of texture sounds.' *Society for Neuroscience* 401.20.

2019   Lee S, Troha R, Anam A, Katz M, Citrin K, Pietruszewski T, Stevenson IH, and Markus EJ. 'Persistence of dorsal and ventral hippocampal remapping after exploring a novel environment.' *Society for Neuroscience.* 161.17.

2019   Zhai X, Sadeghi M, Khatami F, He F, Pedrick D, Read HL, Stevenson IH, and Escabi MA. 'Neural correlation codes for sound identification and categorization: The contribution of sound spectrum and envelope correlation structure.' *Society for Neuroscience* 401.17.

2019   Pedrick D, Zhai X, He F, Stevenson IH, and Escabi MA. 'Encoding vocalizations in background sounds at the cocktail party and in the woods.' *Society for Neuroscience* 401.18.

2019   Zhai X, Stevenson IH, and Escabi MA. 'The contribution of stimulus-driven and noise correlation for neural decoding and identification of texture sounds.' *Society for Neuroscience* 401.20.

2019   Zhai X, Khatami F, Sadeghi M, Read HL, Stevenson IH, and Escabi MA. 'Decoding Sound Texture Identity via Statistics of Neuron Ensembles.' *Association for Research in Otolaryngology* PD49.

2019   Zhai X, Khatami F, Sadeghi M, Read HL, Stevenson IH, and Escabi MA. 'The Contribution of Stimulus-driven and Noise Correlations for Neural Decoding and Identification of Texture Sounds.' *Association for Research in Otolaryngology* PS325.

2019   Ren N, Ito S, Hafizi H, Beggs JM, and Stevenson IH. 'Detection of putative synaptic connections from multi-electrode spike recordings: a model-based method with structural constraints.' *Statistical Analysis of Neural Data 9* Poster 42.

2019   Stevenson IH. 'Omitted variable bias in GLMs of neural spiking actibity.' *Statistical Analysis of Neural Data 9* Poster 54.

2018   Zhai X, Sadeghi M, Khatami F, Read HL, Stevenson IH, and Escabi MA. 'Decoding sound texture identity via statistics of auditory neuron ensembles.' *Society for Neuroscience* 450.08.

2018   Escabi MA, Sadeghi M, Zhai X, and Stevenson IH. 'A neural ensemble correlation code for sound category identification.' *Society for Neuroscience* 450.07.

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 5104, Foundations of Research in Psychological Sciences I (Fall 2019-present)
Psych 2100, Principles of Research in Psychology (Fall 2014-present)
Psych 5270/BME 6086, Statistical Analysis of Neural Data (Spr 2014, 2018, 2019, 2021)
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 2014-2019), Mina Sadeghi (EECS, 2016-2020), Naixin Ren (Neuroscience 2017-present), Ganchao Wei (Statistics 2019-present)

PhD Thesis Committees: Chuyi Su (Neuroscience, 2021-), Xiao Yang (Clinical Psychology, 2021-), Tommy Lee (Neuroscience, 2016-2022), Stefan Sumsky (BME, 2018-2019), 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)

2022-present   Program Committee Member, Organization for Computational Neuroscience
2020-present   Director, University of Connecticut, Quantitative Research Methods Certificate
2016-present   University of Connecticut, Dept of Psychological Sciences Vision Committee
2014-present   Member, Organization for Computational Neuroscience
2009-present   Member, Society for Neuroscience, Student Member (2009-2011)
2009-2014   Member, Society for the Neural Control of Movement, Student Member (2009-2011)
2010-2011   Associate Faculty Member, Faculty of 1000 - Motor Systems Section
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, eLife, Frontiers in Computational Neuroscience, Frontiers in Synaptic Neuroscience, Frontiers in Systems 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 (NeurIPS), Neuron, PLoS Computational Biology, PLoS ONE, PNAS, Psychological Review

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