

Ian Stevenson

Associate 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

- 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

- 2020-2024 NSF IOS-1931249. Adaptive Decoding of Noisy, Non-stationary Neural Spiking Activity. PI.
- 2019-2022 NIH NIMH 1R01MH121350-01. 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. PI.
- 2015-2020 NIH NIDCD 1R01DC015138-01. CRCNS: The role of statistical regularities for neural discrimination and coding of sounds. Co-Investigator with Monty Escabi (PI) and H. 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
- 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

Publications

- preprint Wei G and **Stevenson IH**. Tracking fast and slow changes in synaptic weights from simultaneously observed pre- and postsynaptic spiking, *arxiv* 2102.01803. [\[PDF\]](#)
- 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 mid-brain 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 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, *Hippocampus* 24(9): 1053-1058. [\[PDF\]](#)
- 2014 Fernandes HL, **Stevenson IH**, Vilares I, and Kording KP. The generalization of prior un-

- certainty 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 Dobrokhoto 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

- 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 activity.' *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.
- 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 Neuroscience*. 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.

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, Spr 2018, Spr 2019)
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: Tommy Lee (Neuroscience, 2016-present), 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)
- 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, 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, Psychological Review

Guest Editor: PLoS Computational Biology

Editorial Board: Neurons, Behavior, Data Analysis and Theory