Lars Buesing

Personal Information

Office Address	Department of Statistics, Columbia University
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Academic Experience

2013-	Research Fellow
	Grossman Center for the Statistics of Mind, Department of Statistics, Columbia University
	Advisors: Liam Paninski, John P. Cunningham
2010-2013	Research Associate
	Gatsby Computational Neuroscience Unit, University College London, UK
	Advisor: Maneesh Sahani
2007-2010	Ph.D., Computer Science
	Institute for Theoretical Computer Science, Graz University of Technology, Austria
	Advisor: Wolfgang Maass
10-11/2009	Visiting Researcher
	Department of Computer Science, University of Sheffield, UK
	Advisors: Eleni Vasilaki, Kevin Gurney
03-06/2007	Visiting Researcher
	Laboratory of Computational Neuroscience, EPFL, Lausanne, Switzerland
	Advisor: Wulfram Gerstner
2001-2007	M.Sc., Physics (with distinction)
	Heidelberg University, Germany

Awards

2013	Reviewer Award, *Advances in Neural Information Processing Systems* (NIPS)
2009	Funding by EPSRC Grant "Bridging the Gap between Mathematics, ICT and Engineering", University of Sheffield, UK (3000£)
2008	Student Paper Award (honorable mentions), *Advances in Neural Information Processing Systems* (NIPS) 2008 (500$)
2007	Award of the Physics Department, Heidelberg University for best M.Sc. thesis in theoretical physics (500 €)
2004	Grant "Baden-Württemberg Stipendium", Germany (4000 €)

Professional Activities

2014-	Code package for analysis of high-dimensional neural recordings: https://bitbucket.org/mackelab/pop_spike_dyn
2013	Co-organization of workshop on "Acquiring and Analyzing the Activity of Large Neural Ensembles" at *Advances in Neural Information Processing Systems* (NIPS) 2013
2011-2014	Co-organization of theoretical neuroscience external seminar at Statistics Department, Columbia University and Gatsby Unit, UCL

2009-2010	Organisation of research seminar at Department for Theoretical Computer Science, Graz University of Technology, Austria
Reviewing	Reviewer for PLoS Computational Biology, Journal of Neurophysiology, Neural Computation, Royal Society Interface, PLoS One, NIPS, ESANN, CoSyNe

TEACHING

10-11/2012	Co-supervision of visiting graduate student David Pfau from Columbia University (senior supervisor: Maneesh Sahani). Project title: System identification with nuclear norm minimization
06-08/2012	Co-supervision of visiting undergraduate student Ahmad Qamar from University of Chicago (senior supervisor: Maneesh Sahani). Project title: Probabilistic manifold learning
2009	Teaching assistant for the course "Neural Networks B" on advanced topics in neural networks at Graz University of Technology, Austria

TALKS

06/2014	"Factor Models for Analyzing Shared Neural Variability", workshop "Modeling variability in neuronal populations", New York University
03/2014	"Unsupervised Segmentation of Neural Data", CoSyNe 2014 workshop "Scalable Models for High-Dimensional Neural Data"
12/2012	"Spectral learning of linear dynamics from generalized-linear observations with application to neural population data", *Advances in Neural Information Processing Systems* (NIPS) 2012, main conference
12/2011	"Empirical models of spiking in neural populations", *Advances in Neural Information Processing Systems* (NIPS) 2011, main conference
12/2008	"On Computational Power and the Order-Chaos Phase Transition in Reservoir Computing", *Advances in Neural Information Processing Systems* (NIPS) 2008, main conference
12/2008	"Information Bottleneck Optimization with Spiking Neurons with Application to Predictive Coding", NIPS 2008 workshop "Principled Theoretical Frameworks for the Perception-Action Cycle"

Journal Publications and Book Chapters

[33] J. Macke, L. Buesing, and M. Sahani. *Advanced State Space Methods for Neural and Clinical Data*, chapter Estimating State and Parameters in State-Space Models of Spike Trains. Cambridge Univ Press. in press.

[32] B. Nessler, M. Pfeiffer, L. Buesing, and W. Maass. Bayesian computation emerges in generic cortical microcircuits through Spike-Timing-Dependent Plasticity. *PLoS Computational Biology*, 9(4):e1003037, 2013.

[31] L. Buesing, J. Macke, and M. Sahani. Learning stable, regularised latent models of neural population dynamics. *Network: Computation in Neural Systems*, 23(1,2):24–47, 2012.

[30] D. Pecevski, L. Buesing, and W. Maass. Probabilistic Inference in General Graphical Models through Sampling in Stochastic Networks of Spiking Neurons. *PLoS Computational Biology*, 7(12):e1002294, 2011.

[29] L. Buesing, J. Bill, B. Nessler, and W. Maass. Neural Dynamics as Sampling: A Model for Stochastic Computation in Recurrent Networks of Spiking Neurons. *PLoS Computational Biology*, 7(11):e1002211, 2011.

[28] L. Buesing and W. Maass. A spiking neuron as information bottleneck. *Neural Computation*, 22(8):1961–1992, 2010.

[27] C. Clopath, L. Buesing, E. Vasilaki, and W. Gerstner. Connectivity reflects coding: a model of voltage-based STDP with homeostasis. *Nature Neuroscience*, 13(3):344–352, 2010.

[26] L. Buesing, B. Schrauwen, and R. Legenstein. Connectivity, dynamics, and memory in reservoir computing with binary and analog neurons. *Neural Computation*, 22(5):272–1311, 2010.

[25] C. Clopath, L. Ziegler, E. Vasilaki, L. Buesing, and W. Gerstner. Tag-trigger-consolidation: A model of early and late long-term-potentiation and depression. *PLoS Computational Biology*, 4(12):e1000248, 2008.

[24] E. Muller, L. Buesing, J. Schemmel, and K. Meier. Spike-frequency adapting neural ensembles: Beyond mean adaptation and renewal theories. *Neural Computation*, 19(11):2958–3010, 2007.

Peer Reviewed Conference Publications

[23] L. Buesing, T. Machado, J. P. Cunningham, and L. Paninski. Clustered factor analysis of multineuronal spike data. In *Advances in Neural Information Processing Systems (NIPS) 27*. 2014. **selected for spotlight presentation**.

[22] S. Turaga, L. Buesing, A. M. Packer, H. Dalgleish, N. Pettit, M. Hausser, and J. Macke. Inferring neural population dynamics from multiple partial recordings of the same neural circuit. In *Advances in Neural Information Processing Systems (NIPS) 26*. 2013.

[21] L. Buesing, J. Macke, and M. Sahani. Spectral learning of linear dynamics from generalised-linear observations with application to neural population data. In *Advances in Neural Information Processing Systems (NIPS) 25*. 2012. **selected for oral presentation**.

[20] J. Macke, L. Buesing, J. P. Cunningham, B. M. Yu, K. V. Shenoy, and M. Sahani. Empirical models of spiking in neural populations. In *Advances in Neural Information Processing Systems (NIPS) 24*. 2011. **selected for oral presentation**.

[19] B. Schrauwen, L. Buesing, and R. Legenstein. On computational power and the order-chaos phase transition in reservoir computing. In *Advances in Neural Information Processing Systems (NIPS) 21*. 2009. **Student Paper Award (honorable mentions)**.

[18] L. Buesing and W. Maass. Simplified rules and theoretical analysis for information bottleneck optimization and PCA with spiking neurons. In *Advances in Neural Information Processing Systems (NIPS) 20*. 2008.

Conference Abstracts

[17] L. Buesing. Unsupervised identification of excitatory and inhibitory populations from multi-cell recordings. In *Proc. of Computational and Systems Neuroscience*, 2014.

[16] Srini Turaga, Lars Buesing, Adam M Packer, Henry Dalgleish, Noah Pettit, Michael Hausser, and Jakob Macke. Predicting noise correlations for non-simultaneously measured neuron pairs. In *Proc. of Computational and Systems Neuroscience*, 2014.

[15] M. Pachitariu, L. Buesing, , and M. Sahani. Recurrent generalized linear models with correlated Poisson observations. In *Proc. of Computational and Systems Neuroscience*, 2013.

[14] L. Buesing, J. Macke, and M. Sahani. Robust estimation for neural state-space models. In *Proc. of Computational and Systems Neuroscience*, 2013.

[13] L. Buesing, J. Macke, and M. Sahani. Identifying temporal continuity of neural population activity with regularised latent dynamical systems. In *Areadne*, 2012.

[12] L. Buesing, J. Macke, and M. Sahani. Regularisation reveals smooth dynamics of shared variability in neural population activity. In *Proc. of Computational and Systems Neuroscience*, 2012.

[11] J. Macke, L. Buesing, and M. Sahani. Modelling low-dimensional dynamics in recorded spiking populations. In *Proc. of Computational and Systems Neuroscience*, 2011.

[10] L. Buesing, J. Bill, B. Nessler, and W. Maass. A spiking neural network implementation of MCMC sampling. In *Proc. of Computational and Systems Neuroscience*, 2011.

[9] L. Buesing, J. Bill, S. Habenschuss, B. Nessler, and W. Maass. Emergence of bayesian computation in generic motifs of cortical microcircuits? In *40th Annual Conference of the Society for Neuroscience*, 2010.

[8] C. Clopath, L. Buesing, E. Vasilaki, and W. Gerstner. Why is connectivity in barrel cortex different from that in visual cortex? - A plasticity model. In *Proc. of Computational and Systems Neuroscience*, 2010.

[7] C. Clopath, L. Ziegler, L. Buesing, E. Vasilaki, and W. Gerstner. Tag-trigger-consolidation: A model of early and late long-term potentation and depression. In *Proc. of Computational and Systems Neuroscience*, 2009.

[6] C. Clopath, L. Ziegler, L. Buesing, E. Vasilaki, and W. Gerstner. Modeling plasticity across different time scales: the TagTriC model. In *BMC Neuroscience*, volume 10, page 192, 2009.

[5] B. Schrauwen and L. Buesing. A hierarchy of recurrent networks for speech recognition. In *Deep Learning for Speech Recognition and Related Applications (NIPS Workshop)*, 2009.

[4] C. Clopath, L. Buesing, E. Vasilaki, and W. Gerstner. A unified voltage-based model for STDP, LTP and LTD. In *Proc. of Computational and Systems Neuroscience*, 2008.

[3] L. Buesing and W. Maass. Information Bottleneck Optimization with Spiking Neurons with Application to Predictive Coding. In *Principled Theoretical Frameworks for the Perception-Action Cycle (NIPS Workshop)*, 2008.

Other Publications

[2] L. Buesing. *Phenomenological and Theoretical Models of Learning in Spiking Neural Networks*. PhD thesis, Graz University of Technology, Austria, 2010.

[1] L. Buesing. A population density approach to spike-frequency adapting integrate-and-fire neurons. Master's thesis, Heidelberg University, Germany, 2007.